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ORIGINAL ARTICLE

Green banks in Tunisia: Issues and challenges

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ABSTRACT

This paper explores the development of the concept of "green banks" in Tunisia, focusing on the role of regulators and the central bank in ensuring this transmission. The paper also examines the involvement of banks in the green economic transition and the various challenges. The study is based on the review of articles and research works regarding the emergence of green banks, especially in Tunisia (2018–2022); it also collected information and statistics from the websites and reports of Tunisian banks. The results of this work showed the critical role played by the Central Bank of Tunisia in encouraging banks to move towards greening the system. Also, several Tunisian banks are aware of the seriousness of climate change and have tried to implement several initiatives and services to accelerate green growth. However, Tunisia still needs to catch up with developed and some developing countries. Our findings help bankers and regulators better address climate change and its effect on the financial sector to achieve greater financial stability. These results contribute to banking in Tunisia by providing bankers and regulators with new tools to manage the impact of climate change on the banking sector.

KEYWORDS

green bonds; green finance; greens banking; finance; Tunisia

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1. Introduction

Burning of fossil fuels caused extreme weather event, consequently, it disrupts the production system. Therefore, investing in green finance is one of the ways to solve this problem (Chenguel and Mansour, 2023; Elahi et al., 2022). The concept of green finance emerged as a result of the awareness of the existence of climate risks by financial institutions. Authorities and regulators have encouraged financial institutions to recognize the climate risks in their asset portfolios (Caldecott et al., 2021).

Nevertheless, the consequences of global warming push everyone to act at their level, as consumers, and as savers. Everyone can favor a banking product oriented towards sustainable development (Elisa et al., 2021).

Thus, the financial sector is beginning to concern itself with the fight against global warming, and financial flows are being directed toward renewable energy (van Veelen, 2021).

The Maghreb countries, like other countries in the world, need more available capital and experience, which has hampered the adoption of sustainable and efficient energy technologies and practices by companies. However, companies have facilitated hundreds of green finance transactions, resulting in positive financial and environmental outcomes for businesses, residents, and communities. In this context, the Tunisian banking and financial sector is mobilizing for social and ecological responsibility (Khiari and Ben Sassi, 2019; Marzougui et al., 2022) under the impetus of campaigns by non-governmental organizations and civil society associations.

However, little academic research has focused on the emergence of green banking in developing countries. So, our contribution is to study the emergence of green finance, especially in the banking sector in Tunisia. With the persistence of climate change, we will focus on the aspects that have caused the inefficiency of green finance and contributed to its low impact on the ecological transition process. So, how can we define green banks? What role do they play in Tunisia in tackling climate change? Will the banking sector be able to play an active and positive role in the energy and environmental transition if public policies themselves do not change?

To answer these questions, we will use a descriptive research methodology based on a literature review, one of the most popular techniques in management research. To do this, we examined relevant articles and websites, paying particular attention to the expressions “green finance” and “green banks”.

The paper is structured as follows. Section 2 presents the literature review on the emergence of green finance and green finance policy. Section 3 will discuss the research methodology, examine the case of the Tunisian banking sector with a focus on the role of the central bank in greening the banking sector, and present the study’s main results. Finally, we will show the conclusion.

2. Literature review

2.1. Green finance

The construction and improvement of a green financial system and using market-based instruments to guide green investment are essential.

In the 1950s and 1960s, as industrialization continued, environmental and resource problems became increasingly prominent in Western countries, becoming a significant problem for the sustainable development of human society (Du Pisani, 2006).

In 1972, the Club of Rome published *The Limits to Growth*, which pointed out that the long-term social problems of resource constraints and environmental degradation were affecting the future course of human society. The key to solving these problems depends on the speed and efficiency with which countries can respond. *The Limits to Growth*, which introduced the

concept of sustainable development, has led to extensive reflection by Western scholars and social organizations on resource and environmental issues (Robinson, 1973).

The resulting market failure may further endanger the economy's and society's sustainable development. The idea is to promote the endogeneity of externalities through industrial, fiscal, and financial policies. For example, in the 1990s, American professor William Nordhaus developed the Dynamic Integrated Model of Climate-Economy (DICE). The DICE, which integrates environmental climate factors such as the carbon cycle and greenhouse gas emissions control into the traditional framework of economic analysis, has become a fundamental study in the field of climate change economics (Nordhaus, 2007).

Stern (2007) published *The Economics of Climate Change: The Stern Review*. The Japanese economist Hirofumi Uzawa published *Economic Theory and Global Warming*, which gives a formal economic analysis of climate change, among others (Uzawa, 2003). The role of finance as a crucial market-directed resource allocation in addressing environmental externalities is attracting increasing attention. The sub-discipline of environmental finance evolved and became an early concept of green finance (Aslam and Jawaid, 2022).

2.1.1. Origin of the concept

The concept of green finance first originated in the field of practice. In 1974, the Federal Republic of Germany established the world's first "ethical bank" (GLS Bank), which focused on social and ecological business (Valls Martínez et al., 2021). In 1992, the United Nations Conference on Environment and Development in Rio adopted the Declaration on Environment and Development (United Nations Conference on Environment and Development: Rio Declaration on Environment and Development, 1992).

In the same year, the United Nations Environment Programme (UNEP, 2011) announced the creation of the Finance Initiative (UNEP FI) at the Rio Earth Summit to promote the sustainable development of financial institutions and issued the *Banking Sector Statement on Environmental Sustainability*.

This concept was extended to insurance and reinsurance institutions in 1995. The United Nations Environment Programme (UNEP), the International Finance Corporation (IFC), and others, as key players in green finance, continue to promote green finance to finance global and regional sustainable development. Many countries and regions have taken various measures to promote green economy strategies, green investments, and circular economy development schemes.

Some countries have also introduced laws, regulations, and guidelines to promote financial institutions and financial markets to reduce their contribution to pollution.

Devas (1994) was the first to use the concept of green finance in the literature, summarising the international practice of green finance and the potential legal and environmental risks financial institutions face. White (1996) further enriches the concept and content of green finance by analyzing the mutual constraints between finance and the environment and pointing out the importance of developing green finance (Dziwok and Jäger, 2021).

2.1.2. Evolution of the concept

In greater depth and scope, the international community understands the concept of green finance. "Green" involves all aspects of environmental, social, and economic development. Green finance is often used interchangeably with environmental finance, sustainable finance, carbon finance, etc., and the concepts overlap and differ (Sabine and Christian, 2018).

At the same time, there are differences and divergent definitions of green finance among countries at different stages of development. There needs to be a unified concept of green finance.

From abroad, international organizations and research institutions have defined the concept and scope of green finance mainly from the perspective of investment and financing (CICC Research, CICC Global Institute, 2022).

The International Development Finance Club (IDFC, 2012) defines green finance from a policy perspective as the promotion of financial investment into sustainable development, project initiatives, environmentally friendly products, and policies that encourage sustainable economic development. It focuses on various environmental objectives, including climate change mitigation, industrial pollution control, water sanitation, and biodiversity conservation.

Zadek and Flynn (2013) argue that green finance refers to green investments, mainly in environmental goods (CICC Research, CICC Global Institute, 2022).

The German Development Institute (DIE, 2016) considers green finance to include all investments or loans that consider environmental impact and enhance environmental sustainability (Noh, 2018). The critical element is the integration of environmental screening and risk assessment into investment and lending decisions.

A questionnaire survey conducted by the International Finance Corporation (IFC, 2016) on the definition and progress of green finance shows that most countries and markets believe that renewable energy, green buildings, energy efficiency management, waste management, and green finance should be included in the definition of green finance.

According to the G20 Green Finance Study Group (2016), green finance refers to investment and financing activities that generate environmental benefits to support sustainable development. These environmental benefits include reducing air, water, and soil pollution, lowering greenhouse gas emissions, improving resource efficiency, and mitigating and adapting to climate change. In addition, the G20 encourages differentiated technical interpretations of green finance across countries and markets.

2.2. Green financial policy framework

2.2.1. Green credit standards and policies

The current internationally recognized green credit guidelines are the Equator Principles (EPs).

In October 2002, ABN AMRO and the International Finance Corporation (IFC) held a meeting in London with nine commercial banks to discuss environmental and social risks in project financing (Korzeb et al., 2022).

In 2003, the IFC, with Citibank, ABN AMRO, and ten other banks, proposed the Equator Principles, which have become the basis for financial institutions to identify, assess and evaluate environmental and social risks (H. Chen et al., 2019; Z. Chen et al., 2022).

The Equator Principles set out the specific terms and principles on which Equator banks must base their investment decisions and establish a management framework for identifying, assessing, and managing environmental and social risks in project finance.

The principles are voluntary and independent for financial institutions to adopt and implement and therefore are only softly binding on financial institutions.

The EP III has been revised three times and is now the mainstream internationally accepted standard for banks to meet their environmental responsibilities and manage environmental risks. There are limitations as it focuses on reviewing green credit and needs to address other aspects of sustainable finance.

For example, the primary policy basis for green credit in China is the *Green Credit Guidelines* issued by the CBRC in 2012, which provides for the management of environmental and social risks, the establishment of risk management systems, and the improvement of relevant credit policies, systems, and process management (Mansour, 2023).

In addition, there are two major green credit statistical systems in China, one being the *Guidelines on Reporting Green Credit* issued by the CBRC in 2013. The first is the *Notice on the Submission of Green Credit Statistical Forms* issued by the CBRC in 2013, which established the domestic green credit statistical system.

Secondly, in 2018, the People's Bank of China issued the *Special Statistical System for Green Loans*, which aims to guide financial institutions to strengthen their green credit capacity building and establish a practical green credit assessment and evaluation system.

2.2.2. Green bond policy

Green bonds are bonds issued to ensure that the funds raised are used only for projects with environmental benefits (green projects) (Hadaś-Dyduch et al., 2022).

The first example of a green bond is the Climate Awareness Bond (CAB) issued by the European Investment Bank (EIB) in 2007. Subsequently, the World Bank and other international development finance institutions have issued Green Bonds (Cortellini and Panetta, 2021).

In recent years, GB issuance has proliferated worldwide with increasing awareness of environmental protection, including the entry into force of the *Paris Agreement*, an international agreement on climate change. In 2021, the green bond issuance in the United States amounted to US$81.9, while China came in second with US$68.1 billion worth of green bonds (Statista, 2022). **Figure 1** shows the different types of green bonds.

The benefits of issuing GBs include a diversified investor base for the issuer and increased recognition and appreciation of the issuer's environmental protection efforts. On the other hand, even start-up companies that have difficulty obtaining financing from financial institutions may be able to take advantage of the benefits of GB issuance (Hadaś-Dyduch et al., 2022).

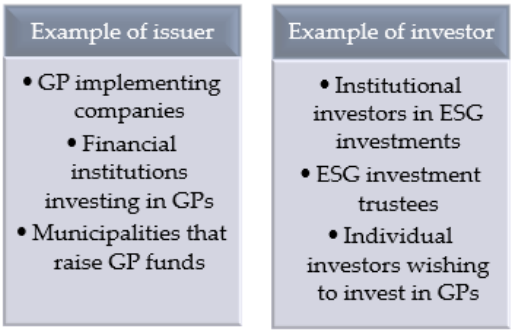

Figure 1. Issuing and investing entities for green bonds.
Source: Author.

Furthermore, as a large number of funds are required to be invested in climate change measures globally in the future, it will be possible to attract more private-sector funds to invest in this area.

This situation will provide an opportunity to invest in local environmental conservation projects for individual investors, who have yet to traditionally have an investment channel for environmental conservation projects, which will stimulate local communities.

As a result, it can be expected to have the effect of revitalizing local communities.

2.3. Green finance practice

The direction of investments in the world has turned towards clean energy, i.e., green finance. Governments, financial organizations, and investors spending their money on technologies that cause minor damage to the environment have begun (Hailiang et al., 2022).

Green financing has been developed in our age of rising energy demand and depleting fossil fuels and natural. It offers appropriate solutions to the problems caused by resources (Holechek et al., 2022).

Renewable energy sources and the use of other environmentally friendly technologies can stimulate socio-economic growth and offer attractive opportunities to investors worldwide. Increasing awareness of environmentalism worldwide and governments' explicit support for clean energy will make green finance famous for the foreseeable future.

At this point, for financial institutions (primarily banks and others), climate change is the main challenge when acquiring new business opportunities and customers (Zimmermann, 2019).

For nearly two decades, developed countries have been concerned with the extent to which production and consumption damage the environment.

As energy needs increase, interest in clean energy investments will also increase. One of the main reasons for this increase in demand is state interventions. International Energy Agency (IEA) estimates that by 2030, demand for renewable energy will increase by 40% thanks to the regulatory policies of governments around the world.

To accelerate the fight against environmental pollution studies, for example, cheaper cost borrowing to encourage firms in China, cheaper cost borrowing in Europe feed-in tariffs for solar projects, or support for intelligent technologies such as electric vehicles (Supriyanto et al., 2022).

One of the incentive instruments of green finance is the green energy certificate. This certificate is issued on a project basis to organizations that use renewable energy sources in their production. By including its investment in the green certification system, the producing company earns international certificates and an additional income per KWH compared to its current production (Delardas and Giannos, 2023). It is mainly applied in the Netherlands, Denmark, and Italy.

Banking and finance play crucial roles in all trade and industry sectors to the environment (Delardas and Giannos, 2023). In playing this role, they provide loans to companies or projects that cause significant environmental damage and indirectly cause environmental pollution (F. Zhang et al., 2011).

Initially, environmental issues did not attract the attention of the financial industry and banks. The relationship between environmental protection and the financial industry began to emerge in a recent century or later.

Banks have begun to pay closer attention to the potential risks arising from environmental performance, especially in their lending, asset management, investment, and insurance businesses. They began to pay more attention to environmental impacts.

In 1997, some banks under the UN Environment Programme Finance Initiative had environmental departments and started to design environmentally orientated products. An increasing number of financial institutions use their resources to prevent ecological degradation to ensure sustainable customer satisfaction and curb the economic crisis (United Nation Environment Programme, 2009).

Today, banks can lead in the transition to a low-carbon and greener economy by considering the entire risk spectrum and assessing the projects from economic and environmental perspectives (European Banking Federation, 2017). They can define their lending strategy regarding which sectors and projects are eligible for lending and can impose higher costs on projects that threaten the environment (Khairunnessa et al., 2021).

3. Methodology and results

3.1. Methodology

The research methodology is descriptive and is composed of two parts. A literature review is a most widely used technique in management research (Denyer and Tranfield, 2006) based on a detailed and in-depth knowledge of the topic (Petticrew and Roberts, 2008). To do this, we analyzed the articles on the topic, focusing on the buzzwords green finance and green banks. The search was mainly performed in the Web of Science (WoS), Science Direct, Emerald, and MDPI databases, as well as websites dealing with the subject, such as the World Bank website. As shown in **Table 1**, several articles based on the research method have been published in the last four years (Kotb et al., 2020; Mansour, 2023).

Secondly, we studied the reports and websites of commercial banks in Tunisia and the websites of different organizations, such as the Central Bank of Tunisia and the World Bank. The research follows a qualitative approach, and the research design involves organizing, collating, and evaluating these data samples for valid research findings (Khairunnessa et al., 2021).

Table 1. The literature review analysis (2018–2022).

Study	Focus	Objective	Scope
Elisa et al. (2021)	Sustainable banking: A literature review and integrative framework	China's 14th Five-Year Plan and post-pandemic recovery provide an important opportunity to accelerate the transition to a zero-carbon economy. Against this background, this paper discusses key action areas for China's 14th Five-Year Plan, focusing on three aspects: the energy transition, a new kind of sustainable urban development, and investment priorities.	Review
Khairunnessa et al. (2021)	A review of the recent developments of green banking in Bangladesh	This paper aims to explore the emergence of "Green Banking" in Bangladesh, with a focus on the role of financial regulation and regulators in greening the financial sector. It also examines the contribution and involvement of banks and non-bank financial institutions in promoting green economic transition.	Bangladesh
J. Chen et al. (2022)	The effect of green banking practices on banks' environmental performance and green financing: An empirical study	The main purpose of this study was to identify the impact of GB practices on banks' environmental performance and sources of green financing of private commercial banks (PCBs) in Bangladesh. Using a survey method, the primary data were obtained from a cross-sectional sample of 322 banking employees of PCBs in Bangladesh.	Commercial banks in Bangladesh
X. Zhang et al. (2022)	The mediating effect of green financing	The main purpose of this study is to identify the impact of green banking activities on green financing and banks' environmental performance. It also identifies the mediating effect of green financing on the relationship between green banking activities and environmental performance of private commercial banks (PCBs) in Bangladesh.	Commercial banks in Bangladesh
Azad et al. (2022)	Revisiting the current status of green finance and sustainable finance disbursement: A policy insights	This paper examines the recent target accomplishment scenario of green finance and sustainable finance through banks and NBFIs in Bangladesh for the year of 2021 (four quarters). This study also observes the highest and lowest contributors in both schemes and is descriptive in nature.	Commercial banks in Bangladesh
Mir and Bhat (2022)	Green banking and sustainability—A review	The purpose of this article is to study green banking practices, its methods of adoption and importance of practicing green banking. This study also includes the role and contribution of banks in environmental sustainability and UN Sustainable Development Goals.	Review
Sakaya (2023)	Fear of COVID-19 and green bank service purchase intention: The mediating effect of customer empowerment and customers' perceived value of digital service transactions	The paper intends to show the role of fear of COVID-19 and the relevance of customer empowerment and customers' perceived value of digital service transactions in promoting green bank service purchase intention.	The structured questionnaire helped collect survey data from 323 small business people

3.2. Green banking in Tunisia

Tunisia is a North African country and also one of the developing economies. After years of the 2011 revolution and the start of the Arab Spring, it wants to make significant progress in social, economic, and technological transformation. The country has increased gross national income from US$108.5 billion PPP (2011) to US$133.8 billion (2021) (World Bank, 2020).

However, economic growth based on industrialization and the launch of mega projects was also a source of environmental degradation. Indeed, Tunisia's CO_2 emissions rose from 2.09 to 2.48 metric tons between 2000 and 2019, remaining below the world average of 4.69 metric tons (Mahmood et al., 2019).

Climate change and economic problems make sustainability a primary concern for the country's development, requiring ambitious development strategies and regulations (Amouri et al., 2021; Attig-Bahar et al., 2021). Also, Tunisia's greenhouse gas (GHG) emissions in 2019 was 41,590.00, a 1.56 % increase from 2016, as shown in **Figure 2**.

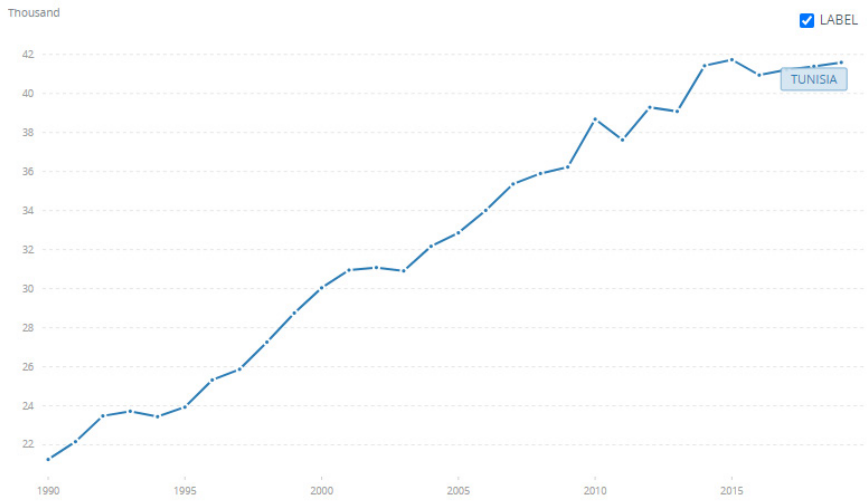

Figure 2. Total greenhouse gas emissions (percentage change from 1990).
Source: ClimateWatch, 2020.

Tunisia suffers from environmental pollution and the impacts of climate change but is ranked 112th in the 2021 CO_2 emissions ranking of 184 countries, in which countries are ranked from least to most polluting.

Climate change has already increased the intensity of droughts and rising temperatures, and these disasters will become more frequent and severe in the coming years (Abdelmalek and Nouiri, 2020). According to the World Bank report (2018), Tunisia is vulnerable to climate change. It is expected to suffer the adverse effects of rising temperatures (from 1.9 °C to 5.3 °C by 2080), declining rainfall, rising sea levels, ecosystem degradation, and pressure on agriculture.

Moreover, the coastal region is the mainstay of the Tunisian economy, with important tourist, agricultural and industrial activities.

Located in the heart of the Mediterranean, one of the regions most exposed to the harmful effects of climate change, Tunisia suffers from the vulnerability of the coastal zone due to the associated

impacts on agriculture, water quality, and the services provided by coastal ecosystems. Predicted climate change will exacerbate beach erosion and flooding of low-lying coastal wetlands (United Nations Development Programme). Millions of people in Tunisia are already highly exposed to these environmental risks, premature deaths, and the onset of debilitating non-communicable diseases (Ayari et al., 2023; Besser et al., 2021).

In terms of financial damage, natural disasters, especially floods, cause losses of more than 12,822,959.86 euros/year, according to the CEO of Tunis-RE in 2018. A study by the British consultancy TETRATECH and Vivid Economics in 2021 showed that losses in the agricultural sector, which accounts for 10% of GDP, are estimated at 5% to 10% of sectorial GDP by 2030. This situation is due to the combined impacts of water resources and groundwater degradation, increased fire risk, etc. The study predicts that the cost of damage caused by increased flooding and drought could reach US$11.52 million per year in the forestry sector alone by 2030. Employment in agriculture will be heavily affected, with losses ranging from 8250 to 16,500 jobs and up to 37,000 jobs in the case of a significant drought.

The Tunisian financial sector is mainly a banking system. According to the Ministry of Finance, the Tunisian financial system includes the Central Bank of Tunisia, 23 resident banks, 7 offshore banks, 13 financial establishments: 2 of which are merchant banks, 8 leasing establishments, and 2 factoring companies.

The financial landscape also includes the National Post Office, the Financial Market Council, the Tunis Stock Exchange, Tunisie Clearing, investment companies and collective investment schemes.

The banking system has succeeded in setting up an important network of representations and branches. There are currently more than 1905 branches, i.e., approximately one branch for every 5775 inhabitants.

However, the banking sector has experienced several difficulties in recent years due to the post-revolution period, the COVID-19 and post-health crisis, and the national and international economic situation (Khiari and Ben Sassi, 2019). The Tunisian banking sector presents risks and vulnerabilities due to the lack of liquidity in Tunisian dinars or foreign currencies, the weakness of consignments and speculation, in addition to the instability that characterizes the monetary policy and the increase in the key interest rate (from 5% in December 2017 to 7.25% in December 2022) (Bank Central of Tunisia).

3.3. Policy initiatives taken by the central bank of Tunisia

In recent years, Tunisia has confirmed a consistent, high-level, and long-term commitment to environmental protection, support for a green economy, and the fight against climate change. The Development Plan (2016–2020) provides the strategic direction for these issues, which stresses the importance of a new development model based on efficiency and sustainability (World Bank, 2021).

In this context, the Central Bank of Tunisia (BCT) has led as a precursor in formulating policies and facilitating innovative programs to promote green finance.

Speech by Mr. Marouane El Abassi, governor, at the opening of the 4th edition “FITA 2021” is as follows:

"The combined efforts of the various stakeholders in order to create the conditions for the resumption of economic growth, employment, and inclusive and sustainable development, cannot achieve the desired objectives without the implementation of standard structural policies which require the conjunction of efforts at a bilateral and regional level, and which fall within the framework of the promotion of the digital economy and sustainable development (green economy), and this, within the framework of a global post-COVID recovery policy.

In particular, priority should give to strengthening investments in sectors aimed at financial inclusion, namely fintech, and e-commerce. We are addressing the energy deficit by developing the traditional and renewable energy sectors. We are strengthening air, land, and sea links. Development of banking presence as a factor in promoting business."

In October 2022, the Central Bank of Tunisia (BCT) began developing an institutional framework to facilitate Tunisia's access to financing from the Green Climate Fund (GCF), a United Nations (UN) financial mechanism. Also, the BCT is negotiating with donors (WB, AFD, EIB) a credit of about 300 million euros (about 975 million dinars), which will be dedicated to the financing of Tunisian SMEs, with the requirement that a share should allocate to the financing of projects in the green economy.

3.4. Green banking activities of Tunisian banks

At this level, several organizations have supported Tunisia in this direction. Indeed, during the United Nations Climate Change Conference (COP27), which just ended in Egypt, at the end of November 2022, the African Development Bank stimulated the promotion of resilient, green, and sustainable growth with the launch of the African Green Bank Initiative, a model for the deployment of green financing on the continent (African Development Bank, 2022).

The African Green Bank Initiative, which will be endowed with a US$1.5 billion trust fund, was designed as part of measures to increase access to international finance from the current 3% to 10% per year by 2030. The initiative is based on an assessment by the African Development Bank and climate investment funds of the potential of green banks in six African countries: Benin, Ghana, Mozambique, Tunisia, Uganda, and Zambia. The official stressed that the initiative would enhance the capacity of local financial institutions to build a strong pipeline of bankable green projects while de-risking investments and building long-term investor confidence in low-carbon and climate-resilient projects in Africa (Salem et al., 2023). Today, the African Development Bank green bonds appear among the 25 most recent bonds, sorted by settlement date (Environmental Finance Data, 2023). **Table 2** shows the different characteristics of these bonds.

Table 2. The African Development Bank green bonds.

Issuer	Category	Value (M)	Currency	Dollar Value (M)	Pricing date	Settlement date	Maturity date
African Development Bank	Green bond	50	AUD	34.38	22 February 2023	8 March 2023	8 March 2038

The Tunisian Professional Association of Banks and Financial Institutions (APTBEF) has been organizing events "to develop a new, more sustainable, greener and more committed finance" in recent years.

In 2021, the United Nations in Tunisia allocated a budget of 56 billion dinars for 2020–2030 to implement all the mechanisms for sustainable finance and further develop public-private dialogue while building on the banking sector's commitment to financial solidarity. Similarly, this organization has set up technical assistance to Tunisia to deploy sustainable financing aid and concretize projects.

In October 2021, in collaboration with the International Finance Corporation, the Tunis Stock Exchange launched a guide to issuing green, socially responsible, and sustainable bonds in Tunisia. It defined the issuance of GSS bonds and the objectives of sustainable development. In 2015, the BVMT joined the Sustainable Stock Exchanges Initiative (Conseil du Marché Financier, 2019).

The banking sector's commitment is fundamental to achieving sustainable development objectives. Indeed, the Tunisian banking sector is witnessing a fundamental dynamic to establish a CSR approach. **Table 3** presents the various initiatives and activities of the banks involved in the field of sustainable development.

Table 3. The initiatives of Tunisian banks in the field of sustainable development.

Bank names	Initiatives
UIB (Groupe Société Générale)	In partnership with the French Development Agency (AFD), UIB (Groupe Société Générale, n.d.) offers the "Green Loan" for financing renewable energy and pollution control projects. Energy efficiency (EE) projects: Any project subject to a prior audit that provides for a reduction in energy consumption of at least 20%, such as projects for cogeneration, more efficient equipment, and regulation systems. The amount of the "Green Loan" can go up to the equivalent of 1 million euros. Renewable energy projects (RE): All renewable energy projects in the industrial and tertiary sector, with an installed capacity of less than 10 MW, such as grid-connected or off-grid photovoltaic, solar water heating, and wind power. The amount of the "Green Loan" can be up to the equivalent of 2 million euros.
Banque de Tunisie (BT)	The Bank of Tunisia (Banque de Tunisie, n.d.) is making two new products available to customers, BT ECOLO and BT ENERGIO, which combine energy saving and environmental protection. BT ECOLO: It helps finance projects with environmental protection components: • De-pollution installations required by law, aimed at reducing or eliminating pollution from companies (wastewater pre-treatment, filters and equipment for atmospheric and/or soil pollution control, etc.) • Solid and liquid waste management • Waste recovery through reuse, recycling, or others • Use of clean and non-polluting technologies • Any other project with an ecological component. BT ENRGIO: It helps finance material and immaterial projects with an energy-saving component: • Energy audit • Production of electricity from ecologically clean and renewable energies (solar, wind, etc.) • Substitution of energy by natural gas in the industrial, residential, and public transport sectors • Use of energy-efficient machines for air conditioning, heating, lighting • Thermal insulation of buildings • Installation of benches for the diagnosis of vehicle engines • Any other project with an energy-saving component.

Table 3. (*Continued*)

Bank names	Initiatives
Groupe BNP Paribas (UBCI)	For several years, UBCI (2021) has been strengthening its commitment to the concept of green or sustainable finance: this means to develop financial activities with an environmental objective, especially in supporting the energy transition. • Promoting partnerships with supranational organisations, such as the one initiated between UBCI and the EBRD: this is an agreement for a loan of 25 million euros for 8 years to finance SMEs operating in the energy transition sector • Identifying High Value Impact Deals as part of the bank's contribution to the UN Sustainable Development Goals • A EUR 15 million SUNREF credit line, agreement between UBCI and the AFD (French Development Agency) has been set up by the bank. Its objective is to support investments by Tunisian companies in the field of energy management and pollution reduction, and to strengthen the competitiveness of the industrial sector involved in energy efficiency or waste recovery.
Amen Bank	The bank collaborates with its local technical partners, especially the Ministry of Energy and Mines, the National Agency for Energy Management, the National Agency for Environmental Protection (ANPE), and the National Agency for Waste Management. It is also worth noting the role of the "Project Finance" structure within Amen Bank's Corporate Banking Division. Indeed, two-thirds of the projects handled by this dedicated department belong to the energy efficiency project category, resulting in energy savings of 26,402 tons and a reduction of greenhouse gas emissions of 65,874 teqCO_2.
Société Tunisienne de Banque (STB)	STB (Société Tunisienne de Banque, n.d.) encourages respect for the environment through: the Eco-Car credit and the Eco-Home loan. The Eco-Car loan is intended to finance the acquisition of a new or second-hand car of an ecological nature (electric or hybrid) up to: • 80% for cars with a fiscal power of four horsepower • 30% for cars with a fiscal power of nine horsepower or more • 60% for other cars. The Eco-Home loan to finance the construction of a sustainable home.
Banque de l'Habitat (BH)	The bank supports green buildings (Green Building). In a green building, the processes for creating structures are environmentally friendly and resources are used efficiently. This ecological orientation develops and complements the traditional design concerns of more energy-efficient, sustainable, and comfortable buildings. A green building implies a healthy, sustainable building designed with natural materials, low energy consumption, renewable energy, easy maintenance, and reasonable cost (BH Bank, n.d.).

Several Tunisian banks, financial institutions, and other organizations are interested in financing green projects. However, all these initiatives remain voluntary without a well-defined legal and regulatory framework.

3.5. Discussion

Tunisia is going through a transitional period at different economic, political, and social levels (Weilandt, 2018). However, after years of revolution, the country has made significant progress in political and regulatory terms. This study shows that the implementation of green banking regulations by the Central Bank of Tunisia is in the final phase. Indeed, introducing environmental and social risk management guidelines for banks and financial institutions in Tunisia since 2017 has positively changed green financial performance. Also, the Central Bank of Tunisia has aligned itself with the Board of Governors of Arab Central Banks and Monetary Institutions since 2016 regarding financial inclusion and green finance. The concept of green banking has developed in recent years

in terms of financing green projects and managing environmental risks. Most Tunisian banks are engaged in sustainable finance and have developed green banking strategies.

In parallel, the Central Bank of Tunisia has developed partnerships with different international organizations and associations to establish green banking strategies. For example, the EBRD is well positioned to help mobilize the private investment needed for the country, contribute to the implementation of Tunisia's Development Plan, and support reform efforts for job creation and inclusive growth through financial services (European Bank for Reconstruction and Development).

However, according to Khairunnessa et al. (2021), for the maturity of regulation and policy, assessed by analyzing the requirements of governments and central banks and the quality of legislation, no country is at the maturity stage, and only 8 out of 35 emerging countries are at the establishment and measurement stage (Bangladesh, Brazil, China, Colombia, Morocco, Nigeria, South Africa, and Vietnam).

The Bank will pursue the following strategic priorities in Tunisia over the period 2018–2023:

- Support the competitiveness of the Tunisian economy through more open markets, strengthened governance, and reduced barriers to competition
- Promote economic inclusion for women, youth, and people living in remote areas through private sector participation
- Strengthen the resilience of the financial sector and increase access to finance.

However, according to the World Bank report published on 20 October 2022 (World Bank, 2022), Tunisia's economic performance marked a decade of lost growth in a context further aggravated, in 2020, by the COVID-19 pandemic. Between 2011 and 2019, gross domestic product (GDP) growth fell to an average of 1.7%. Over-regulation of economic activity, a reduced focus on foreign trade, low investment, and a lack of innovation have weighed heavily on productivity growth.

There has been a considerable increase in inflationary pressures, mainly from global markets and increased administered prices. In August 2022, the inflation rate rose for the twelfth consecutive month to 8.6% (up from 6.7% in January 2022 and 6.16% in August 2021). This is the highest rate since September 1991. The rise in inflation prompted the central bank to raise its policy rate by 0.75 basis points in May 2022 (World Bank, 2022).

In terms of renewable energy, Tunisia achieved only 4% of renewable energy in the energy mix in 2022, while its objective was to produce 35% of renewable energy in the energy mix by 2030.

Furthermore, according to Dikau and Volz (2021), some emerging country central banks have made good progress towards achieving the Sustainable Development Goals, such as Cambodia, which became a member of the NGFS in 2020. Hence, there is the need to focus on the barriers that prevent Tunisia from accelerating its energy transition. Given the difficult economic environment, the Central Bank of Tunisia will seek to focus on reform opportunities in the short term because of their potential to attract investment and sustain growth, as well as to build institutional capacity for longer-term structural reforms.

- Encourage the involvement of local banks in the financing of renewable energy
- The implementation of most NDCs depends on three aspects related to access to climate

finance, estimated at US$19.3 billion over 2021–2030, technology transfer, technical cooperation, and capacity building
- Development of green financial products (green bonds and green loans)
- Boosting investment in sustainable development through financial and fiscal incentives.

Also, technology, which has also played a significant role in the banking sector, especially in the COVID-19 and post-COVID periods, represents a pillar for strengthening sustainable investment. The Tunisian banking sector has undergone several changes in recent years, but this is insufficient to keep up with the global technological revolution. Hence, accelerating digital transformation and innovation is an obligation for all economic actors in the country. Therefore, the Central Bank of Tunisia is called upon to establish clear regulations that push toward innovation.

4. Conclusion

The study shows that the banking sector is the backbone of the financial sector in Tunisia. It reveals that the Central Bank of Tunisia has played a significant role in greening the banking system. Regulation is in the final phase, with a political orientation. This research shows the involvement of banks, international and national organizations, and associations in establishing green finance. There is also a strong alignment between green banking regulation and the green growth vision that underpins government policy initiatives.

Environmental law in the contemporary sense of legal protection of spaces, environments, and ecosystems against all forms of pollution made its appearance in 1988 in Tunisia via Law No. 88–91 of 2 August 1988, creating a National Agency responsible for ensuring environmental protection (ANPE), while introducing the general principles of this new law, which is why this text is considered, pending the adoption of an Environmental Code, as an environmental framework law. Hence, the Tunisian government was a pioneer in the field of sustainable development.

However, Tunisia still suffers from several regulatory barriers. So, we want to finance the transition. In that case, the only solution is to redirect existing financial flows from fossil fuels to new, greener investments and apply financial incentives to encourage investment in green finance. In other words, today's green projects only exist because of the will of the actors and entrepreneurs who create them. The environmental disaster is accelerating, and more and more people are concerned about what is happening. It is, therefore, clear that green finance alone will not save the planet.

Indeed, if greening is to be encouraged, the public and financial authorities must become more involved in the financial sphere. Several financial actors and non-governmental organizations have raised the issue of the lack of a benchmark for what is a "green" project.

5. Limits of the study

This study uses descriptive analysis only. Further comparative research should examine the performance of green banking in Tunisia by collecting and analyzing in-depth qualitative and quantitative data on individual banking instruments in other emerging and especially North African countries.

6. Recommendations for future studies

Further research can be conducted to determine how combining digitalization and green services can mitigate environmentally harmful activities and, consequently, overall environmental risks.

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References

Abdelmalek MB, Nouiri I (2020). Study of trends and mapping of drought events in Tunisia and their impacts on agricultural production. *Science of the Total Environment* 734: 139311. doi: 10.1016/j.scitotenv.2020.139311

African Development Bank (2022). The African Development Bank launches a model for deploying green finance across the continent (French). Available online: https://www.afdb.org/fr/news-and-events/la-banque-africaine-de-developpement-lance-un-modele-de-deploiement-des-financements-verts-travers-le-continent-56904 (accessed on 24 February 2023).

Amen Bank. Available online: https://www.amenbank.com.tn (accessed on 25 February 2023).

Amouri A, Festa G, Shams SR, et al. (2021). Technological propensity, financial constraints, and entrepreneurial limits in young entrepreneurs' social business enterprises: The tunisian experience. *Technological Forecasting and Social Change* 173: 121126. doi: 10.1016/j.techfore.2021.121126

Aslam W, Jawaid ST (2022). Green banking adoption practices: Improving environmental, financial, and operational performance. *International Journal of Ethics and Systems*; ahead of print. doi: 10.1108/IJOES-06-2022-0125

Attig-Bahar F, Ritschel U, Akari P, et al. (2021). Wind energy deployment in Tunisia: Status, drivers, barriers and research gaps—A comprehensive review. *Energy Reports* 7: 7374–7389. doi: 10.1016/j.egyr.2021.10.087

Ayari J, Barbieri M, Barhoumi A, et al. (2023). Trace metal element pollution in media from the abandoned Pb and Zn mine of Lakhouat, Northern Tunisia. *Journal of Geochemical Exploration* 247: 107180. doi: 10.1016/j.gexplo.2023.107180

Azad MAK, Islam MA, Sobhani FA, et al. (2022). Revisiting the current status of green finance and sustainable finance disbursement: A policy insights. *Sustainability* 14(14): 8911. doi: 10.3390/su14148911

Banque de Tunisie (n.d.). Ecolo energy (French). Available online: https://www.bt.com.tn/ecolo-energio-entreprises (accessed on 25 February 2023).

Besser H, Dhaouadi L, Hadji R, et al. (2021). Ecologic and economic perspectives for sustainable irrigated agriculture under arid climate conditions: An analysis based on environmental indicators for southern Tunisia. *Journal of African Earth Sciences* 177: 104134. doi: 10.1016/j.jafrearsci.2021.104134

BH Bank (n.d.). Sustainable development (French). Available online: https://www.bhbank.tn/article/developpement%20durable (accessed on 25 February 2023).

Caldecott B, Clark A, Koskelo K, et al. (2021). Stranded assets: Environmental drivers, societal challenges, and supervisory responses. *Annual Review of Environment and Resources* 46: 417–447. doi: 10.1146/annurev-environ-012220-101430

Chen H, Liu C, Xie F, et al. (2019). Green credit and company R&D level: Empirical research based on threshold effects. *Sustainability* 11(7): 1918. doi: 10.3390/su11071918

Chen J, Siddik AB, Zheng GW, et al. (2022). The effect of green banking practices on banks' environmental performance and green financing: An empirical study. *Energies* 15(4): 1292. doi: 10.3390/en15041292

Chen Z, Mirza N, Huang L, Umar M (2022). Green banking—Can financial institutions support green recovery? *Economic Analysis and Policy* 75: 389–395. doi: 10.1016/j.eap.2022.05.017

Chenguel MB, Mansour N (2023). Green finance: Between commitment and illusion. *Competitiveness Review: An International Business Journal*; ahead of print. doi: 10.1108/CR-10-2022-0162

CICC Research, CICC Global Institute (2022). Green finance: Clarifying functions and capacity. In: *Guidebook to Carbon Neutrality in China*. Springer. doi: 10.1007/978-981-16-9024-2_4

ClimateWatch (2020). Historical GHG emissions. Available online: https://www.climatewatchdata.org/ghg-emissions (accessed on 24 February 2023).

Conseil du Marché Financier (2019). Guide to issuing green, socially responsible and sustainable bonds in Tunisia (French). Available online: https://www.cmf.tn/sites/default/files/pdfs/reglementation/consultations/guide_draft_consultation.pdf (accessed on 24 February 2023).

Cortellini G, Panetta IC (2021). Green bond: A systematic literature review for future research agendas. *Journal of Risk and Financial Management* 14(12): 589. doi: 10.3390/jrfm14120589

Delardas O, Giannos P (2023). Towards energy transition: Use of blockchain in renewable certificates to support sustainability commitments. *Sustainability* 15(1): 258. doi: 10.3390/su15010258

Denyer D, Tranfield D (2006). Using qualitative research synthesis to build an actionable knowledge base. *Management Decision* 44(2): 213–227. doi: 10.1108/00251740610650201

Devas H (1994). Green finance. *European Energy & Environmental Law Review* 3(8): 220–222. doi: 10.54648/eelr1994037

Dikau S, Volz U (2021). Central bank mandates, sustainability objectives and the promotion of green finance. *Ecological Economics* 184: 107022. doi: 10.1016/j.ecolecon.2021.107022

Du Pisani JA (2006). Sustainable development—Historical roots of the concept. *Environmental Sciences* 3(2): 83–96. doi: 10.1080/15693430600688831

Dziwok E, Jäger J (2021). A classification of different approaches to green finance and green monetary policy. *Sustainability* 13(21): 11902. doi: 10.3390/su132111902

Elahi E, Khalid Z, Zhang Z (2022). Understanding farmers' intention and willingness to install renewable energy technology: A solution to reduce the environmental emissions of agriculture. *Applied Energy* 309: 118459. doi: 10.1016/j.apenergy.2021.118459

Elisa A, Juan-José NS, Francisco JF (2021). Sustainable banking: A literature review and integrative framework. *Finance Research Letters* 42: 101932. doi: 10.1016/j.frl.2021.101932

Environmental Finance Data (2023). Available online: https://efdata.org/ (accessed on 24 February 2023).

European Bank for Reconstruction and Development. Country strategy for Tunisia 2018–2023 (French). Available online: https://www.ebrd.com/documents/strategy-and-policy-coordination/tunisia-country-strategy-in-french.pdf (accessed on 25 February 2023).

European Banking Federation (2017). Briefing note: Greening the financial system: Exploring the ways forward. Available online: https://www.ebf.eu/ebf-media-centre/briefing-note-greening-the-financial-system-october-2017/ (accessed on 18 February 2023).

German Development Institute (DIE) (2016). Green finance: Actors, challenges and policy recommendations. Available online: https://www.idos-research.de/en/briefing-paper/article/green-finance-actors-challenges-and-policy-recommendations/ (accessed on 1 August 2023).

Green Finance Study Group (2016). *G20 Green Finance Synthesis Report*. Available online: http://www.g20.utoronto.ca/2016/green-finance-synthesis.pdf (accessed on 18 February 2023).

Groupe Société Générale (n.d.). Green financing (French). Available online: https://www.uib.com.tn/entreprises/finacement-de-vos-projets/financement-vert (accessed on 25 February 2023).

Hadaś-Dyduch M, Puszer B, Czech M, et al. (2022). Green bonds as an instrument for financing ecological investments in the V4 countries. *Sustainability* 14: 12188. doi: 10.3390/ su141912188

Hailiang Z, Iqbal W, Chau KY, et al. (2023). Green finance, renewable energy investment, and environmental protection: Empirical evidence from BRICS countries. *Economic Research-Ekonomska Istraživanja* 36(2): 2125032. doi: 10.1080/1331677X.2022.2125032

Holechek JL, Geli HM, Sawalhah MN, et al. (2022). A global assessment: Can renewable energy replace fossil fuels by 2050? *Sustainability* 14(8): 4792. doi: 10.3390/su14084792

International Development Finance Club (IDFC) (2012). Green finance mapping. Available online: https://www.idfc.org/green-finance-mapping/ (accessed on 1 August 2023).

International Finance Corporation (IFC) (2016). Available online: https://www.greenclimate.fund/ae/ifc (accessed on 1 August 2023).

Khairunnessa F, Vazquez-Brust DA, Yakovleva N (2021). A review of the recent developments of green banking in Bangladesh. *Sustainability* 13(4): 1904. doi: 10.3390/su13041904

Khiari W, Ben Sassi S (2019). On identifying the systemically important Tunisian banks: An empirical approach based on the ΔCoVaR measures. *Risks* 7(4): 122. doi: 10.3390/risks7040122

Korzeb Z, Niedziółka P, Zegadło M (2022). Assessment of the impact of commercial banks' operating activities on the natural environment by use of cluster analysis. *Risks* 10(6): 119. doi: 10.3390/risks10060119

Kotb A, Elbardan H, Halabi H (2020). Mapping of internal audit research: A post-Enron structured literature review. *Accounting, Auditing & Accountability Journal* 33(8): 1969–1996. doi: 10.1108/aaaj-07-2018-3581

Mahmood H, Maalel N, Zarrad O (2019). Trade openness and CO_2 emissions: Evidence from Tunisia. *Sustainability* 11(12): 3295. doi: 10.3390/su11123295

Mansour N (2023). Green technology innovation and financial services system: Evidence from China. *Businesses* 3(1): 98–113. doi: 10.3390/businesses3010008

Marzougui N, Ounalli N, Sabbahi S, et al. (2022). How can sewage sludge use in sustainable Tunisian agriculture be increased? *Sustainability* 14(21): 13722. doi: 10.3390/su142113722

Mir AA, Bhat AA (2022). Green banking and sustainability—A review. *Arab Gulf Journal of Scientific Research* 40(3): 247–263. doi: 10.1108/AGJSR-04-2022-0017

Noh HJ (2018). Financial strategy to accelerate green growth. ADBI Working Paper No. 866, Asian Development Bank Institute (ADBI), Tokyo. Available online: https://www.econstor.eu/handle/10419/190287 (accessed on 25 July 2023).

Nordhaus WD (2007). A review of the Stern review on the economics of climate change. *Journal of Economic Literature* 45(3): 686–702.

Petticrew M, Roberts H (2008). Systematic reviews in the social sciences: A practical guide. Wiley-Blackwell.

Robinson WC (1973). Review symposium. *Demography* 10(2): 289–299. doi: 10.2307/2060819

Sabine D, Christian S (2018). Green financing, interrupted. Potential directions for sustainable finance in Luxembourg. *Local Environment* 23(7): 717–733. doi: 10.1080/13549839.2018.1428792

Sakaya AJ (2023). Fear of COVID-19 and green bank service purchase intention: The mediating effect of customer empowerment and customers' perceived value of digital service transactions. *Arab Gulf Journal of Scientific Research*; ahead of print. doi: 10.1108/AGJSR-08-2022-0137

Salem HH, Mansour N, Salem SB (2023). Climate risks in Tunisia. In: Alareeni B, Hamdan A (editors). *Sustainable Finance, Digitalization and the Role of Technology*. Springer. pp. 763–782. doi: 10.1007/978-3-031-08084-5_55

Société Tunisienne de Banque (n.d.). Availble online: https://www.stb.com.tn/fr/ (accessed on 25 February 2023).

Statista (2022). Value of green bond issuance of the largest banks worldwide in 2022. Available online: https://www.statista.com/statistics/1291144/green-bond-issuance-value-of-largest-banks/ (accessed on 25 July 2023).

Stern N (2007). *The Economics of Climate Change: The Stern Review*. Cambridge University Press. doi: 10.1017/CBO9780511817434

Supriyanto E, Sentanuhady J, Hasan WH, et al. (2022). Policy and strategies of tariff incentives related to renewable energy: Comparison between Indonesia and other developing and developed countries.

Sustainability 14: 13442. doi: 10.3390/su142013442

UBCI (2021). UBCI, a responsible bank for a sustainable economy (French). Available online: https://www.ubci.tn/wp-content/blogs.dir/2021/03/UBCI-Rapport-RSE.pdf (accessed on 25 February 2023).

United Nations Environment Programme (UNEP) (2011). *UNEP FI Guide to Banking & Sustainability. Understanding and Implementing Sustainability in Your Bank Based on the UNEP Statement of Commitment by Financial Institutions on Sustainable Development*. Available online: https://wedocs.unep.org/20.500.11822/32163 (accessed on 1 August 2023).

United Nations Environment Programme (UNEP) (2009). Fiduciary responsibility—Legal and practical aspects of integrating environmental, social and governance issues into institutional investment. Available online: https://www.unepfi.org/industries/investment/fiduciary-responsibility-legal-and-practical-aspects-of-integrating-environmental-social-and-governance-issues-into-institutional-investment/ (accessed on 25 July 2023).

United Nations Conference on Environment and Development: Rio Declaration on Environment and Development (1992). *International Legal Materials* 31(4): 874–880.

Uzawa H (2003). *Economic Theory and Global Warming*. Cambridge University Press.

Valls Martínez MdC, Martín-Cervantes PA, Peña Rodríguez S (2021). Ethical banking and poverty alleviation banking: The two sides of the same solidary coin. *Sustainability* 13: 11977. doi: 10.3390/su132111977

van Veelen B (2021). Cash cows? Assembling low-carbon agriculture through green finance. *Geoforum* 118: 130–139. doi: 10.1016/j.geoforum.2020.12.008

Weilandt R (2018). Socio-economic challenges to Tunisia's democratic transition. *European View* 17(2): 210–217. doi: 10.1177/1781685818805681

White MA (1996). Environmental finance: Value and risk in an age of ecology. *Business Strategy and Environment* 5(3): 198–206. doi: 10.1002/(SICI)1099-0836(199609)5:3<198::AID-BSE66>3.0.CO;2-4

World Bank (2018). The World Bank in Tunisia. The situation in Tunisia remains mixed: While significant progress has been made in the process of political transition towards an open and democratic system of governance, the economic transition has not kept pace (French). Available online: https://www.banquemondiale.org/fr/country/tunisia (accessed on 26 February 2023).

World Bank (2020). World Bank news release: Loan and credit summary. Availabnle online: https://www.worldbank.org/en/news/loans-credits/2020/06/12/tunisia-first-resilience-and-recovery-emergency-development-policy-financing (accessed on 24 February 2023).

World Bank (2021). *Tunisia First Resilience and Recovery Emergency Development Policy Financing*. Available online: https://documents1.worldbank.org/curated/en/650751592619063714/pdf/Tunisia-First-Resilience-and-Recovery-Emergency-Development-Policy-Financing.pdf (accessed on 24 February 2023).

World Bank (2022). Risk of global recession in 2023 rises amid simultaneous rate hikes. Available online: https://www.worldbank.org/en/news/press-release/2022/09/15/risk-of-global-recession-in-2023-rises-amid-simultaneous-rate-hikes#:~:text=WASHINGTON%2C%20September%2015%2C%202022%E2%80%94,lasting%20harm%2C%20according%20to%20a (accessed on 25 July 2023).

Zadek S, Flynn C (2013). South-originating Green Finance: Exploring the potential. Available online: https://www.iisd.org/system/files/publications/south-originated_green_finance_en.pdf (accessed on 24 February 2023).

Zhang F, Pant D, Logan BE (2011). Long-term performance of activated carbon air cathodes with different diffusion layer porosities in microbial fuel cells. *Biosensors and Bioelectronics* 30(1): 49–55. doi: 10.1016/j.bios.2011.08.025

Zhang X, Wang Z, Zhong X, et al. (2022). Do green banking activities improve the banks' environmental performance? The mediating effect of green financing. *Sustainability* 14(2): 989. doi: 10.3390/su14020989

Zimmermann S (2019). Same but different: How and why banks approach sustainability. *Sustainability* 11: 2267. doi: 10.3390/su11082267