



# Legal Governance of Green Investment as a Mechanism for Enhancing Food Security in the Face of Climate and Digital Transitions

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## Abstract

In recent years, the world has witnessed accelerating transformations driven by climate change and the digital revolution. These developments have directly impacted global food security and the capacity of states to achieve sustainable development that ensures the right to food for all. Against this backdrop, there is a growing need to develop an integrated legal framework that coordinates environmental and investment legislation to ensure effective legal governance of green investment. This, in turn, will help to protect natural resources and encourage sustainable investment projects related to food production.

This study aims to analyse the complementary relationship between environmental and investment legislation within the framework of enhancing food security, while emphasising the role of legal governance in addressing climate and digital challenges. The study also assesses the effectiveness of legal policies in supporting green investment and achieving a balance between environmental protection requirements and economic development promotion.

The study concludes that ensuring food security is not solely dependent on increasing agricultural production, but rather hinges on the existence of a flexible and integrated legal framework that can adapt to environmental and digital transformations. Such a framework would encourage sustainable investments based on innovation and modern technology. It also emphasises the need to strengthen environmental oversight and update the legislative system to ensure legal security for investors and protect natural resources for future generations.

**Keywords:** Food Security, Legal Governance, Environmental Legislation, Investment Legislation, Green Investment, Digital Transformation, Climate Change, Sustainable Development.

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## Introduction:

In light of the intensifying impacts of climate change and the growing environmental and economic challenges that threaten the stability of global food systems, food security has become one of the most prominent strategic issues attracting the attention of the international community. Waves of drought, desertification, floods and water scarcity have indeed led to a decline in agricultural production and an increase in food vulnerability. Consequently, states are searching for new mechanisms to ensure the sustainability of resources and guarantee food security for present and future generations.

At the same time, digital transformation has brought about a genuine revolution in various economic sectors, including agriculture, by encouraging the adoption of artificial intelligence, smart farming and modern digital technologies. This shift has created opportunities for new technology- and innovation-based investment models to emerge. However, these transformations also present complex legal challenges regarding the ability of traditional legislation to keep pace with this rapid development while

striking an appropriate balance between environmental protection and investment promotion.

From this standpoint, legal governance emerges as an important framework intended to ensure harmony and integration among different policies and legislative instruments, particularly between environmental and investment legislation. This enables the creation of a stable and secure legal environment for green investments, supporting food security and achieving sustainable development.

This topic is also significant because it connects three main dimensions: the environmental, economic and digital dimensions. In this context, green investment has become one of the most important legal and economic tools for addressing the effects of climate change and ensuring the sustainability of natural resources, particularly in developing countries suffering from food insecurity and mounting development challenges.

**The importance of this study lies in highlighting the role of legal governance in achieving food security.**

- highlighting the role of legal governance in achieving food security;
- clarifying the complementary relationship between environmental and investment legislation;
- examining the impact of climate and digital transformations on the legal system;
- demonstrating the importance of green investment as a mechanism for achieving sustainable development;
- providing legal solutions to address environmental and food-related challenges.

**Objectives of the study:**

The study aims to:

- analyse the concept of legal governance and its relationship to food security;
- study the role of environmental legislation in protecting natural resources;
- highlight the role of investment legislation in promoting green investment;
- assess the effectiveness of the legal system in addressing climate and digital transformations;
- propose legal mechanisms to strengthen sustainable food security.

**Research problem:**

To what extent can the integration of environmental and investment legislation under legal governance contribute to enhancing food security and addressing the challenges arising from climate and digital transformations?

**Study plan:**

Chapter One: Conceptual and legal framework of legal governance and food security

- Chapter Two: The role of investment legislation in supporting green investment and achieving food security

**Chapter One: Conceptual and Legal Framework of Legal Governance and Food Security**

In the modern era, ensuring food security is one of the most important strategic challenges for states, especially given the accelerating pace of climate, economic and digital change. These developments have made it necessary to re-examine the traditional roles of states, as well as the effectiveness of legal systems governing natural resources, investment and food production. Furthermore, ensuring food security is not just about increasing agricultural output or making food available; it is also about having an effective legal governance system that coordinates various laws and public policies. This ensures environmental protection, promotes sustainable investment and supports fair resource allocation.

Examining the relationship between legal governance and food security therefore requires identifying the fundamental concepts that frame this subject, while also highlighting the role of environmental legislation in protecting natural resources and ensuring their sustainability considering that such sustainability is the true foundation of food security.

## **First requirement: The Concept of Legal Governance and Its Relationship to Food Security**

### **First Branch: The Concept of Legal Governance**

The concept of governance first appeared in economic and administrative literature, particularly as interest in the effectiveness of public administration and the efficient management of institutions increased. However, the evolution of state functions and the increasing complexity of economic and social relations led to the concept being transferred to the legal and political sphere. Consequently, it became associated with principles such as transparency, accountability, the rule of law, and participation in decision-making<sup>1</sup>.

Legal governance refers to the body of rules and legal and institutional mechanisms aimed at ensuring the good management of public affairs and achieving a balance among various economic, social and environmental interests within a framework of respect for legality and the rule of law. It therefore represents an integrated system based on coordination between legislation, institutions and stakeholders to promote sustainable development and ensure legal stability<sup>2</sup>.

Legal governance is characterised by several core features:

- legal transparency in the enactment and application of laws;
- effective participation of various stakeholders;
- legal oversight and accountability;
- effectiveness in implementing public policies;
- achieving a balance between economic freedom and the protection of the public interest.

In the context of food security, legal governance is important because it ensures coherence between environmental, investment and agricultural legislation. This makes it possible to develop a sustainable food policy capable of confronting climate crises and economic and digital transformations<sup>3</sup>.

Furthermore, legal governance strengthens the legal security of investors in the agricultural and food sectors by providing a stable and transparent legal environment that encourages investment in green projects and modern agricultural technologies. At the same time, it ensures compliance with environmental standards and safeguards natural resources.

Additionally, environmental governance has become one of the most prominent applications of modern legal governance. This involves integrating environmental considerations into economic and investment policies to ensure the long-term sustainability of natural resources and prevent their depletion for the benefit of current generations<sup>4</sup>.

### **Second branch: The Concept of Food Security and Its Dimensions**

Food security is an evolving concept that has undergone significant transformation in response to economic, political and environmental changes worldwide. Whereas the concept was previously limited to merely providing food, today it encompasses ensuring that all individuals have access to sufficient, safe, healthy and sustainable food at all times<sup>5</sup>.

The Food and Agriculture Organization of the United Nations (FAO) defines food security as follows:

‘a situation in which all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life’<sup>6</sup>.

Food security is based on four main dimensions:

1. The availability dimension (food availability): This refers to the availability of food in adequate quantities through domestic production, imports, or strategic reserves.
2. The access dimension (food access): This refers to individuals' economic and social ability to obtain food without facing financial or social barriers.
3. The stability dimension (food stability): This refers to ensuring the continuous availability of food and protecting it from the adverse effects of natural disasters, economic crises and political upheavals.
4. The food safety and quality dimension: This involves providing food that is safe and healthy and complies with health and environmental standards.

However, climate change poses a real threat to these dimensions, particularly as desertification increases, water becomes scarce and temperatures rise — developments that have had a negative impact on global agricultural production<sup>7</sup>.

Meanwhile, digital transformations have reshaped the concept of food security through smart agriculture, artificial intelligence and big data. While these tools can improve productivity and promote the efficient use of natural resources, they have also given rise to new legal challenges related to data protection, cybersecurity, and digital monopolisation<sup>8</sup>.

Therefore, achieving food security in light of these changes requires modern legislative frameworks that can regulate the relationship between economic development, environmental protection and digital transformation within a comprehensive, sustainable legal governance framework.

### **Second requirement: The Role of Environmental Legislation in Achieving Food Security**

Food security is one of the most significant challenges that states face in the modern era due to its close connection with economic and social stability, as well as the protection of individuals' fundamental rights. In light of growing environmental pressures resulting from the excessive exploitation of natural resources, climate change and various forms of pollution, there is a need to adopt an effective legislative framework to protect the environment. This framework must preserve the natural resources essential for food production, foremost among them being agricultural land, water and biodiversity.

Accordingly, environmental legislation plays a central role in achieving food security by establishing legal rules that protect the environment and ensure the sustainability of natural resources. This strengthens the productive capacity of the agricultural sector and advances sustainable development.

This paper will therefore address the role of environmental legislation in achieving food security, and the mechanisms through which it helps to ensure the sustainability of the resources required to provide food for both present and future generations.

### **First Branch: Protecting Natural Resources Under Environmental Legislation**

Environmental legislation constitutes one of the most important modern legal instruments aimed at protecting natural resources and ensuring their sustainability, as they form the foundation of the food and agricultural system. Agricultural land, water resources, forests, and biodiversity are essential elements for achieving food security; accordingly, any depletion or degradation of these resources inevitably threatens states' ability to provide food in a sustainable manner<sup>9</sup>.

Environmental legislation has witnessed significant development at both the international and national levels, particularly following the increased environmental risks caused by industrial pollution, climate change, and the excessive exploitation of natural resources. Environmental laws are no longer limited to protecting the environment for its own sake; rather, they have expanded to encompass achieving sustainable development and safeguarding the rights of future generations<sup>10</sup>.

In Algeria, the principle of environmental protection has been enshrined in Law No. 03-10 on the protection of the environment in the context of sustainable development. This law emphasises the need to balance economic development with the conservation of natural resources<sup>11</sup>.

Furthermore, many modern environmental legislative frameworks have adopted key legal principles, the most important of which are:

- the principle of sustainable development;
- the principle of prevention and precaution;
- the 'polluter pays' principle;
- the principle of environmental liability.

These principles play a crucial role in protecting agricultural and water resources from pollution and depletion, particularly given the increasing number of investment projects with significant environmental impacts.

Additionally, environmental legislation regulates the use of modern technology in agriculture by imposing environmental standards relating to the use of pesticides, fertilisers and water resources. This helps to ensure food product safety and protect consumer health.

### **Second branch: Climate Challenges and Their Impact on Food Security**

Climate change is one of the most serious challenges to global food security due to its direct impact on natural resources and agricultural production. Rising temperatures, reduced precipitation and an increased frequency of natural disasters have led to lower agricultural productivity and higher food prices<sup>12</sup>.

Desertification and water scarcity also pose a real threat to developing countries that rely heavily on traditional agriculture. This necessitates urgent legislative intervention in the form of environmental and investment policies capable of adapting to these changes.

In this context, the concept of "climate justice" has emerged, based on states and institutions taking responsibility for reducing pollution and supporting sustainable projects that protect the environment and strengthen food security<sup>13</sup>.

Climate challenges have also made it necessary to increase investment in renewable energy, smart agriculture and the green economy. This requires the development of a legal framework to encourage such investments and provide the necessary incentives.

Digitisation has also contributed to offering innovative solutions to mitigate the impacts of climate change, such as early warning systems, remote sensing technologies and artificial intelligence. However, the absence of an organised legal framework for these technologies may limit their effectiveness and raise legal issues related to data protection and digital sovereignty.

Therefore, confronting climate challenges and achieving food security requires integrated legal governance, with coordination between environmental, investment and digital legislation. This would enable sustainable development based on innovation while protecting natural resources.

### **Chapter Two: The Role of Investment Legislation in Supporting Green Investment and Achieving Food Security**

In light of climate and digital transformations, green investment has become a key modern mechanism for states to achieve sustainable development and enhance food security, particularly given the ongoing threat to the stability of global food systems posed by environmental and economic risks. Consequently, investment legislation must now balance the requirements of economic development, environmental protection and the sustainability of natural resources, as well as attracting capital and promoting economic growth.

Based on this, there is a need to develop a modern legal framework that encourages sustainable environmental investment and supports innovation and digitisation in the agricultural and food sectors. This would enable us to confront climate-related challenges and achieve food security within a

framework of sound, effective legal governance.

### **First requirement: Green Investment as a Mechanism for Achieving Sustainable Development**

In the face of mounting environmental challenges stemming from pollution, the depletion of natural resources and climate change, green investment has emerged as a key modern mechanism adopted by states to achieve sustainable development. This type of investment involves directing capital towards environmentally friendly projects and economic activities that promote economic growth while preserving natural resources and safeguarding the rights of future generations. Furthermore, green investment promotes the transition to a green economy by encouraging the use of renewable energies, developing clean technologies and enhancing the efficiency of resource utilisation, thereby achieving a balance between the economic, social and environmental aspects of development.

Therefore, green investment is a significant and effective tool for achieving sustainable development goals and strengthening comprehensive development. It is therefore necessary to examine its concept, its most important mechanisms, and its role in achieving these objectives.

### **Section One: The Concept of Green Investment and Its Characteristics**

Green investment is a modern concept that has emerged in response to growing global awareness of the need to protect the environment and achieve sustainable development. This has become particularly urgent in light of the intensifying impacts of climate change and the depletion of natural resources. It involves directing capital towards economic projects that consider the environmental impact and contribute to reducing pollution, preserving natural resources and improving energy efficiency<sup>14</sup>.

Green investment encompasses several fields, including:

- Renewable energy projects.
- Smart and sustainable agriculture.
- Water resource management.
- Recycling and waste treatment.

Environmental technology and agricultural digitalisation.

Green investment is characterised by a set of core features, the most important of which are:

- Achieving a balance between economic profit and environmental protection.
- Relying on clean technology.
- Contributing to reducing carbon emissions.
- Ensuring the sustainability of natural resources.

Supporting innovation and digital transformation<sup>15</sup>

Moreover, green investment has become one of the most important legal and economic means of enhancing food security, given its role in developing agricultural production, improving food quality and making the use of natural resources, especially water, energy and agricultural land, more efficient.

In the context of digital transformation, agricultural projects have developed significantly through their reliance on artificial intelligence, remote sensing technologies and drones, contributing to increased agricultural productivity and reduced environmental impact<sup>16</sup>.

However, the success of green investment remains dependent on a stable legal environment that provides legal security for investors and the necessary incentives and facilities to encourage these types of projects, particularly in developing countries facing increasing environmental and food-related challenges.

## **Section Two: Legal Incentives for Environmental Investment**

Legal incentives play a vital role in directing investment towards priority sectors, particularly environmental and food projects, which contribute to achieving sustainable development. Accordingly, many countries have adopted new legislative policies that grant privileges and facilities to investors in the green economy<sup>17</sup>.

These incentives vary and include:

- Fiscal and tax incentives.
- Customs exemptions.
- Real estate facilities.
- Green financing.
- Legal guarantees for investment.

In Algeria, the government has tried to improve the investment climate by passing Law No. 22-18 on investment. This law includes a set of legal guarantees designed to encourage both domestic and foreign investment, as well as to achieve legislative stability<sup>18</sup>.

In addition, the Algerian Agency for the Promotion of Investment was established to support investors, simplify administrative procedures and adopt incentives for environmentally and technologically focused projects.

However, the effectiveness of these incentives is hindered by several obstacles, the most important of which are:

- The complexity of administrative procedures.
- Lack of stability in legal provisions.
- Inadequate green financing.
- Insufficient administrative digitalisation.

The absence of judicial specialisation in disputes relating to environmental investment<sup>19</sup>.

Furthermore, inadequate coordination between environmental and investment legislation can lead to conflicting interests between environmental protection and economic development requirements. This necessitates an integrated legislative approach based on legal governance.

Conversely, green financing has become one of the most important modern means of supporting environmental investment. Banks and financial institutions fund sustainable projects with a positive environmental impact, such as solar energy projects, smart agriculture and water management initiatives<sup>20</sup>.

### **Second requirement: Digital Transformations and Their Role in Enhancing Food Security**

Rapid digital transformation has brought about fundamental changes across various economic and social sectors. The agricultural and food sector is one of the areas that has most benefited from technological development. Digitalisation has improved agricultural production methods and enhanced the management of natural resources by applying artificial intelligence technologies, the Internet of Things, big data and remote sensing systems. This has strengthened production efficiency and increased returns.

Furthermore, digital transformations have improved food supply chains, facilitating the marketing, distribution and quality control of food products. This supports the achievement of food security and reduces the risk of shortages and waste. Consequently, digitalisation has become a strategic tool for establishing food systems that are more efficient, sustainable and resilient, and capable of confronting

contemporary challenges.

Consequently, the focus of this requirement will be on the role of digital transformations in enhancing food security, clarifying the most important digital mechanisms that contribute to achieving this goal.

### **First section: Digitalisation and smart agriculture**

The digital revolution has brought about a radical transformation of the agricultural and food sectors, leading to the development of new concepts such as smart and digital agriculture. These approaches rely on modern technologies and artificial intelligence to enhance agricultural production and optimise the use of natural resources<sup>21</sup>.

The most important applications of digitalisation in agriculture include:

- smart irrigation systems;
- Remote sensing technologies.
- The use of drones.
- Agricultural data analytics.
- Using artificial intelligence to forecast climate-related risks.

These technologies have contributed to:

- increased agricultural production.
- Reducing water and energy consumption.
- limiting environmental pollution.
- Improving the quality of food products.
- Enhancing the capacity to cope with climate change.

Additionally, digitalisation has played a significant role in optimising food supply chains by streamlining storage, transportation, distribution and health-related monitoring processes. This has helped to reduce food waste and stabilise food markets<sup>22</sup>.

However, digital transformation in agriculture also raises new legal challenges related to the protection of agricultural data, intellectual property rights and cybersecurity, especially given the increasing reliance on digital platforms and intelligent systems.

Therefore, it has become necessary to develop a legal framework that regulates the use of modern technology in the agricultural and food sectors while ensuring the protection of digital data, and achieving digital and food security simultaneously.

### **Second section: The Legal Challenges of Digital Transformation in the Food Sector**

Despite the significant advantages that digitalisation provides for food security, it has generated numerous legal challenges that require legislative intervention to ensure they do not pose economic, environmental or social risks<sup>23</sup>.

The most prominent of these challenges are:

#### **First: Protection of data and digital information**

Smart agriculture relies on collecting and analysing vast quantities of data related to agricultural production, climate and natural resources. This raises legal issues concerning data protection and digital privacy.

**Secondly, cybersecurity:** agricultural and food systems are increasingly linked to digital technologies, making them vulnerable to cyberattacks that could threaten national food security.

**Thirdly, digital monopolies:** the monopoly of technology and digital platforms by large companies may lead to a form of digital dependency for developing countries, thereby threatening their food and technological sovereignty.

#### **Fourth: Weakness of digital infrastructure**

Many developing countries suffer from a shortage of digital and technological infrastructure, which limits the effectiveness of the digitalisation of agriculture.

In this context, it has become necessary to adopt modern digital legislation that considers the specific needs of the agricultural and food sectors while ensuring a balance between promoting innovation and safeguarding food security and digital sovereignty<sup>24</sup>.

Furthermore, international cooperation is crucial in facilitating technology transfer and financing sustainable digital projects, particularly given the global nature of climate and food-related challenges.

Therefore, achieving food security in the digital era requires integrated legal governance that combines environmental, investment and digital legislation. This would enable the creation of a sustainable development system based on innovation and the protection of natural resources.

#### **Conclusion:**

This study makes it clear that achieving food security is not just an economic or agricultural matter. Rather, it depends on an integrated legal system that can balance environmental protection with encouraging sustainable investment. Climate change and digital transformation have introduced new challenges that necessitate a re-evaluation of traditional legislative policies and the development of a flexible legal framework that can adapt to modern developments while ensuring the sustainability of natural resources.

Furthermore, the study shows that green investment is an effective tool for achieving sustainable development and enhancing food security, provided a stable legal environment based on sound governance and coordination between related legislation is established. Therefore, the success of legal policies in this area depends on the extent to which the state can update its legislative system and activate mechanisms for environmental and digital oversight.

#### **Results:**

The existence of an integrative relationship between environmental and investment legislation in achieving food security has been demonstrated.

Green investment is one of the most important modern mechanisms for addressing the impacts of climate change.

Digital transformation has contributed to the development of the agricultural sector and improved food production.

- The current legal framework needs to be updated to keep pace with environmental and digital developments.

Food security is linked to achieving legal security for investors and protecting natural resources.

#### **Recommendations:**

- Update environmental and investment legislation to align with modern transformations.

Strengthen legal incentives for green investment and sustainable projects.

Support digitalisation in the agricultural and food sector.

- Establish effective oversight mechanisms to ensure compliance with environmental standards.

Enhance cooperation between environmental and investment bodies to achieve legislative integration.

Encourage scientific research and innovation in food security and agricultural technology.

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