GREEN BUILDINGS AS A STRATEGIC MEANS TO ACHIEVE ENVIRONMENTAL SUSTAINABILITY

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Abstract: *Green architecture, also known as environmentally friendly architecture, refers to buildings that align with natural ecosystems and utilise construction techniques that consider environmental factors, including the materials used, energy consumption and sustainability throughout the building's lifecycle. Green buildings have a significant impact on environmental, economic and social levels in countries because they are constructed using renewable or recyclable materials. They offer numerous benefits, primarily reflected in improved environmental quality and individual well-being.*

Keywords: *Green buildings, environment, sustainable development, environmental protection*

INTRODUCTION:

Most countries around the world are currently paying significant attention to the environment[1] and sustainable development[2]. There have been increasing calls for the necessity to reduce the environmental impacts resulting from various human activities, as the traditional model of economic development leads to the poor exploitation of natural resources and threatens the environment with harmful pollutants and waste. Therefore, it is essential to mitigate these effects by preserving natural resources for future generations and reducing pollutants and waste[3].

The growing awareness of the seriousness of environmental problems in the medium and long term, and the need to ensure human survival while achieving sustainable development, necessitates attention to all sectors, including the construction sector, which is a cornerstone of economic development and is no longer isolated from environmental issues.

This sector consumes large amounts of natural resources, including land, materials, water and energy. Extensive construction and building processes lead to pollution, solid waste, energy and water wastage, and noise. It is believed that buildings account for a significant proportion of our energy consumption, raw material usage, waste generation and toxic gas emissions.

Due to these and other reasons, as well as the negative environmental impacts associated with construction activities and the urban sector, it has become necessary to develop new concepts and methods for designing and implementing housing projects that allow countries to preserve the environment and embrace sustainable development.

Consequently, new concepts such as sustainable design, green architecture and sustainable buildings have emerged, reflecting specialists' concerns about achieving economic development in the construction sector while protecting the environment and its resources. This is achieved by creating green buildings that consume minimal energy, rely more on renewable energies, and make optimal use of natural resources.

So, what are green buildings? What is their significance for environmental protection and development?

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[1]- The environment is defined as the physical surroundings in which humans live, including water, air, space, soil, living organisms, and facilities built to meet their needs. For more details, refer to: Majid Ragheb Al-Haloo, Environmental Protection Law in Light of Islamic Law, Mansharet Al-Ma'arif, Alexandria, p. 31.

[2]- Sustainable development is defined as: "the process that aims to achieve continuous equity that ensures current developmental opportunities for future generations by maintaining or increasing comprehensive capital over time." For more details, refer to:Saqr Muhammad Saqr, Economic Development, Kuwait Foundation for the Advancement of Sciences, Kuwait, 2004, p. 21.

[3]- Law 03/10 dated 19/07/2003 concerning environmental protection within the framework of sustainable development, Official Gazette, Issue 43, published on July 20, 2003.

To answer this issue, we need to divide the study into two sections. In the first section, we will discuss the nature of green buildings, while in the second section, we will address investment in green buildings and the position of the Algerian legislator on this matter.

SECTION ONE: THE NATURE OF GREEN BUILDINGS

Green buildings have a significant impact on environmental, economic and social levels in countries. Constructed using renewable and recyclable resources, they offer numerous benefits that primarily enhance environmental quality and individual well-being. So, what are green buildings?

Subsection One: Definition of Green Buildings

Defining green buildings requires us to clarify their principles, importance and features.

Definition of Green Buildings:

Green buildings are constructed with environmental considerations at every stage of the building process, including design, execution, operation and maintenance. The main considerations in this context include spatial design, energy and water efficiency, efficient use of resources, indoor environmental quality, and the building's overall environmental impact[1].

Green buildings are so named by analogy with green plants that thrive in their surroundings, fully benefiting from their environment to meet their nutritional needs; the older they get, the taller they grow[2].

Legal scholars argue that green architecture is not only about constructing buildings according to specific environmental standards or increasing green spaces. It also aims to strike a balance between humans, their communities and the environment, connecting three key elements: efficient use of resources, optimal adaptation to climatic and geographical conditions and responsiveness to physical and social human needs, all while preserving the rights and needs of future generations[3].

Green architecture is a modern architectural trend that focuses on the relationship between buildings and the environment. Some consider it to be a highly efficient system that aligns with its biological surroundings with minimal side effects and advocates better interaction with the environment[4].

Furthermore, the term green architecture is often associated with another term: sustainable design. In simple terms, green buildings are healthy places for living and working that are environmentally responsible and economically viable. The use of the term "green" signifies the application of the latest sustainable development strategies for sites, water conservation, energy efficiency, material selection, and indoor environmental quality[5].

Examples of projects established using green or sustainable building systems include:

- the 'Gate' residential complex in Egypt.

1- The cost of green buildings may be slightly higher than conventional buildings due to the irregular availability of raw materials; however, conventional buildings incur very high maintenance costs, unlike green buildings, where maintenance costs are significantly lower. Additionally, recycling and using renewable energy for maintenance can reduce costs.

2- Lawrence Al-Tahan, Applying Green Architecture Standards to Existing Buildings from 1950 to 1970, a study prepared for a Master's degree in Building and Construction Sciences, Faculty of Architecture Engineering, University of Damascus, 2014, p. 7.

3- The term "Green Building" refers to a building designed and constructed to achieve sustainability and efficiency based on international standards set by specialized institutions that measure how compatible the building is with the environment and whether it can be classified among green buildings. In other words, to what extent the building is environmentally friendly and does not harm environmental resources.

4- Amina Sultan Al-Maliki,Green Buildings, article published on www.m.al-sharq.com, January 2013, accessed on 06/04/2023, time of access: 23:39.

5- Haitham Bahidra, Green Building Initiatives. retrieved from: https://www.aleqt.com/2014/02/24/article_828124.html. Accessed on 06-04-2023, time: 00:00.

- the World Trade Center in Bahrain;

- theKhalifa Al-Tajir Mosque in Dubai.

- King Abdullah University of Science and Technology

Masdar City in the United Arab Emirates[1].

Subsection Two: Principles of Green Architecture

Green architecture is based on a set of principles, which include:

1. Energy conservation: Green buildings are designed to minimise energy consumption as much as possible by relying on natural energies, such as wind and solar power, while reducing the use of fossil fuels[2].

2. Climate adaptation: This refers to the ability to adapt to the surrounding climate without adversely affecting it and to become an integral part of it[3].

3. Resource usage reduction: The design of green buildings minimises the use of non-renewable materials and employs sustainable materials through recycling, such as reusing waste and construction debris[4].

4. Site respect:

A green building should blend into its surroundings without having a negative impact on them. If the building is removed or relocated, the site should be returned to its original state prior to construction[5].

5. Good design: This refers to a design that ensures ongoing efficiency in the relationships between utilised spaces, movement paths, building shapes, mechanical systems and construction technology.

6. Sustainable design: Green buildings are characterised by sustainable design, which integrates architecture with electrical, mechanical and structural engineering, while also focusing on traditional aesthetic elements such as size, proportions, scales and textures.

When designing, attention must be paid to reducing energy consumption and safeguarding health, two of the most important principles of sustainable design[6].

Subsection Two: The Importance and Features of Green Buildings

Humans spend most of their time in workplaces or homes that may contain materials that are harmful to the environment and human health. In contrast, green buildings prioritise the use of natural materials in construction and everything that benefits the environment and human health. Their importance and features are therefore significant, as outlined below:

Subsection One: Importance of Green Buildings

Green buildings benefit the environment, society and the economy. They promote health and wellbeing, demonstrate environmental responsibility, and are economically viable. They have an extended lifespan and demonstrate energy efficiency in design and materials[7].

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[1]- Green buildings can be classified as residential, commercial, or administrative, and they can renovate government buildings to become green buildings.

[2]- Wafi Hajjah, The Role of Green Buildings in Preserving Environmental Sustainability, Journal of Construction and Building Legislation, Issue 04, December 2017, Ibn Khaldun University, Tiart, p. 182.

[3]- Green architecture, retrieved from: aqarfeed.com/green-architecture/, accessed on 16/04/2023, time: 22:11.

[4]- Resource efficiency means excluding all raw materials that are harmful or significantly detrimental to human health. Most paints and other raw materials are natural and not harmful to human health.

[5]- Wafi Hajjah, Previous Reference, p. 183.

[6]- Ali Mehran Hashim, Green Architecture and Sustainable Development, www.kanoneonline.com/users/, accessed on 17-04-2023, time: 12:00.

[7]- Mouna Tawahiriya, Green Buildings as a Strategic Entrance to a Sustainable Future*, Journal of Science Horizons, Issue 11, March 2018, Jelfa University, p. 304.

They are also important in reducing waste and employing designs that enhance natural daylight, thereby decreasing the need for electric lighting. Green buildings significantly lessen their harmful impact on the natural environment by using less energy, water and materials[1].

They contribute to energy and water abundance, which leads to reduced operational costs, improved building performance over time, increased property value and social benefits. This fosters pride in beautiful landmark buildings in cities[2].

Subsection Two: Features of Green Buildings

Green buildings possess numerous features that make them superior to conventional buildings. These features include:

A. Cost: investing in green buildings is ten times more profitable than investing in traditional buildings[3]. They are constructed using natural resources, so cosmetic and operational tasks take more time than with ordinary buildings, which constantly require maintenance, renovation, operation and even demolition.

B. Infrastructure preservation: Green buildings are highly efficient in terms of energy and water usage, which significantly enhances the capabilities of local infrastructure and prolongs its lifespan[4].

C. Efficiency: This applies to the efficiency of water, energy and resource usage. Green buildings recycle rainwater and grey water and provide more energy than buildings constructed with conventional materials because they rely on renewable energy sources[5]. They are constructed from cost-effective, natural, non-toxic and recycled materials, such as bamboo, straw and eco-friendly concrete.

D. Profitable return on investment: Due to their construction from natural resources, green buildings are considered highly profitable investments, as properties in these buildings sell for higher prices.

Subsection Three: The difference between green and conventional buildings

The negative environmental, social and health impacts of conventional buildings have led countries to adopt green building systems that are environmentally friendly.

Green buildings are characterised by the quality of the materials used, such as natural and recycled materials. They utilise solar energy for heating, ventilation and air conditioning (HVAC), as well as for thermal insulation, noise reduction, natural lighting and smart devices. They also feature good design to reduce energy consumption and conserve water, incorporating windows with heat-sensing capabilities[6]. Moreover, green buildings prioritise user comfort and create pleasant environments, making them environmentally friendly.

In contrast, conventional buildings are characterised by negative attributes[7], including resource and energy depletion, environmental pollution through the emission of gases, smoke and various types of waste, and negative health impacts due to the use of chemical materials in finishes or other pollutants.

1- One of the main benefits of green buildings is the reduction of greenhouse gas emissions, as well as a significant decrease in energy consumption in buildings. The use of modern high-efficiency technologies commercially available makes energy efficiency in buildings a primary goal of energy plans at local, regional, and international levels.

2- Haitham Bahidra, Green Building Initiatives, Previous Reference.

3- Green buildings: advantages and disadvantages, retrieved from: https://www.weetas.com/article/ar/green-buildings-advantages-and-disadvantages-arv/. Accessed on 17-04-2023, time: 13:21.

4- The optimal use of energy and water resources and recycling provides the opportunity for the state to somewhat relieve the infrastructure burden and allocate a large part of it for other purposes.

5- Green buildings do not recognize the concept of water wastage; therefore, they recycle rainwater and wastewater for irrigation.

6- Optimal design and materials used in green buildings save a lot of energy by reducing the need for air conditioning and utilizing natural lighting inside the building. Additionally, reliance on renewable solar energy leads to significant energy savings.

7- Yahya Waziri, Environmentally Friendly Architectural Design, Madbouli Library, Cairo, 2003, p. 64.

SECTION TWO: INVESTMENT IN GREEN BUILDINGS AND THE POSITION OF THE ALGERIAN LEGISLATOR

The return on investment for green buildings is favourable due to their reliance on natural resources. They are also healthy, modern and advanced, which will lead to higher demand in the future. In general, when discussing investment in green buildings, it is necessary to explore how green architecture is created and to understand the position of the Algerian legislator regarding investment in this area.

Subsection One: How to Create Green Architecture

Addressing this topic requires discussion of the materials used to construct such buildings, as well as building standards and classification systems.

Subsection One: Building Materials for Green Architecture

Since the primary goal of green architecture is sustainability and energy conservation, the materials used in constructing these buildings must be environmentally friendly[1]. They are recycled green products used in construction due to their efficiency, such as recycled cardboard, stones, and metals[2]. Green buildings are also constructed from renewable natural materials sourced sustainably, where materials are recycled in an eco-friendly manner, characterized by their renewability and availability.

Building materials should also be water- and energy-efficient. Water-efficient materials reduce the amount of water used during construction and minimise water consumption during occupation. Energy-efficient materials minimise energy usage, for example by using smart insulation[3]. Additionally, these materials should be moisture-resistant to hinder the growth of biological pollutants inside or around the building.

Furthermore, materials should be locally sourced to reduce costs and minimise the environmental impact of transportation. They must be non-toxic and free from carcinogenic elements or irritants. They should also be durable and maintain their quality over time without requiring frequent maintenance. They should also be recyclable and reusable, often being derived from waste products and improved upon, such as plastic roofing[4].

Subsection Two: Standards for Green Architecture Construction

The standards for constructing green architecture include:

- Insulation and construction: This insulation is achieved using recycled materials to reduce energy consumption and provide future savings, such as with blown fibre glass.

Home appliances: Using appliances in the home that limit energy and water usage.

- Flooring: Solid materials used for flooring should be replaced with eco-friendly, cost-effective alternatives such as bamboo and cork.

Solar Energy: Using numerous solar panels on rooftops, thick segmented windows or complex light energy systems.

Gardens and green spaces: Ensure that plants require minimal watering.

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[1]- Nada Al-Qubiani,The Impact of the Built Environment on Ecological and Urban Balance, Journal of Communication in Human and Social Sciences*, 2013, p. 139.

[2]- Samiha hKhanous, Saida Abid, Green Architecture as a Model for Applying Green Innovation, Journal of Horizons in Management and Economics, Vol. 4, No. 1, 2020, p. 174.

[3]- Mohammad Haitham Bseis,Principles of Green Architecture and Elements of Traditional Architecture, Tishree University, Syria, 2014, p. 4.

[4]- Green architecture: standards, constraints, and materials used in construction, site: aqarfeed.com/green-architecture/, accessed on 17/04/2023, time: 00:03.

Subsection Three: Classification Systems for Green Buildings

There are several systems for classifying green buildings, including global systems implemented in many countries, as well as local regulations that complement these international standards and suit the conditions of each country[1].

Among the most recognized global systems is the L.E.E.D. system, which stands for Leadership in Energy and Environmental Design. This internationally recognized system measures the design, construction, and operation of environmentally friendly[2], high-performance buildings. The classification system evaluates and measures the impact and performance of any facility, considering factors such as site selection, energy efficiency and conservation[3], water efficiency, carbon dioxide emissions efficiency, and the improvement of the indoor environment.

This system classifies buildings into three levels based on their adherence to the required standards: Platinum, Gold, and Silver.

Other local and global classification systems include:[4]

1. Home Energy Rating System (HERS) and Energy Star from the U.S. Environmental Protection Agency and the Department of Energy.

2. The National Australian Built Environment Rating System (NABERS) and Green Star.

3. Haute Qualité Environnementale (HQE) in France.

4. Estidama in the United Arab Emirates, specifically Abu Dhabi.

5. The Green Building system in Dubai, issued by the Dubai Municipality, along with the specifications for green buildings from Dubai Electricity and Water Authority (DEWA).

6. Passive house in Germany.

7. Ministry of Housing and Urban-Rural Development (MOHURD) in China.

8. Comprehensive Assessment System for Built Environment Efficiency (CASBEE) in Japan[5].

Subsection Two: Advantages and Disadvantages of Green Buildings

Green buildings have many advantages, primarily their environmental friendliness. However, despite their importance, they also have a set of disadvantages, which we will clarify in this section.

Subsection One: Benefits of Green Buildings

The advantages of green buildings include:

A. Environmental benefits:

These include reducing water and energy waste. Studies show that Green Star-certified green buildings in some countries use 51% less potable water and produce 62% fewer greenhouse gas emissions. They conserve

[1]- And the Green Globes system.

[2]- Green buildings, vision and mission of Sharjah City, Engineering and Projects Sector, Government of Sharjah, United Arab Emirates, p. 9.

[3]- Batahir Bakhta, Green Buildings as a Support for Promoting the Transition to a Green Economy, Al-Aseel Journal of Economic and Administrative Research, Vol. 3, No. 2, December 2019, p. 205.

[4]- See the Green/Buildings/International Metrics site: e-basel.com. Accessed on 20 April 2023, time: 00:12.

[5]- The most widely used classification systems in the world are the environmental assessment method of the Building Research Establishment (BREEAM), an environmental assessment method for buildings in the UK established in 1990. The other system is the Leadership in Energy and Environmental Design (LEED), a global program for sustainable buildings developed by the U.S. Green Building Council starting in 2000.

natural resources through energy efficiency[1], fuel substitution and renewable energy use, while also improving air and water quality, and protecting biodiversity and ecosystems.

B. Economic benefits:

These include reduced costs, increased property value and improved occupant productivity through healthier[2], happier and more productive living conditions. They also create a market for green products and services[3].

C. Social benefits:

These include improving the quality of life and health and comfort of residents. Indoor air quality is better due to lower concentrations of carbon dioxide and pollutants, as well as high ventilation rates[4]. This reduces pressure on local infrastructure.

Subsection Two: Disadvantages of Green Buildings

Despite being a new and beneficial system, some challenges and disadvantages have emerged during the implementation of green building systems. Developers are working to address these. These include:

1. Lack of cooling systems: green buildings are not designed for hot areas as they lack air cooling systems.

2. Site requirements: Green buildings require a prime location with access to sunlight, which sometimes means positioning them opposite other homes.

3. Resource availability: It can be difficult to obtain the necessary resources for constructing these buildings, which leads to increased transportation costs.

4. Longer construction time: green buildings generally require more time for design and construction.

5. Higher initial costs: Building green buildings is more expensive than building conventional buildings due to the reliance on many natural resources, some of which may not be readily available[5].

Subsection Three: The Algerian Legislator's Adoption of Green Building Systems

Although the Algerian legislator has not explicitly addressed the term "green buildings," some legal texts emphasize the necessity of environmental protection to achieve sustainable development. Notable mentions include:

The Algerian legislator, in the Law on the Management and Protection of Green Spaces[6], recognizes the role of these spaces in beautifying the environment and cities and improving the quality of life for residents. Article 2 of this law states that the goal of managing, protecting, and developing green spaces within the framework of sustainable development is to:

- Improve urban living conditions and maintain and enhance the quality of existing urban green spaces,

- Promote the creation of all types of green spaces,

1- Momen Bani Mustafa, Green Buildings and Their Impact on the Environment, retrieved from: www.e3arabi.com/engineering/green-buildings-and-their-impact-on-the-environment, published in September 2020.

2- Natural high-quality paints should be used, avoiding materials that contain toxic substances or volatile organic compounds (VOCs) due to their negative effects on human health, such as mercury, lead, and oxidized materials.

3- Qaid Latifa, Younes Mourad, Green Buildings: A Case Study of the Dubai Real Estate Sustainability Initiative, Journal of Construction and Building Legislation, Issue 3, IbnKhaldun University, Tiart, September 2017, p. 145.

4- Qaid Latifa, Younes Mourad,Previous Reference, p. 145.

5- For example, installing double-glazed windows with a vacuum property that reflects thermal solar radiation and allows only light rays to enter.

6- Law 06/07 dated May 13, 2007, concerning the management, protection, and development of green spaces, Official Gazette, Issue 31 of 2007.

- Encourage the expansion of green spaces in relation to built areas,

- Mandate the inclusion of green spaces in every construction project.

Additionally, Article 15 of the same law states: "No construction or establishment is allowed within 100 meters of the boundary of a green space." Any construction permit will be rejected if it does not guarantee the preservation of green spaces or if the project leads to the destruction of vegetation[1].

Article 39 of the same law imposes penalties on anyone causing the deterioration of green spaces or uprooting shrubs, with imprisonment ranging from 3 to 6 months and fines from 20,000 DZD to 50,000 DZD. Article 40 emphasizes that anyone demolishing all or part of a green space with the intent to convert it for other activities will face imprisonment from 6 to 18 months and fines from 500,000 DZD to 1,000,000 DZD.

It is evident that the Algerian legislator's emphasis on protecting green spaces stems from their significant role in reducing air pollution, moderating climate, and preserving the environment, as well as their aesthetic value and the psychological comfort they provide to individuals.

The Algerian legislator also confirmed through Executive Decree 91/175, which outlines the general rules for urban planning and construction[2], in Article 5, the possibility of rejecting construction or subdivision permits unless necessary measures for environmental protection are implemented, especially if the constructions or modifications have harmful consequences due to their location, purpose, or size[3].

Article 30 states that a construction permit may be refused if existing green spaces are of significant importance and cannot be guaranteed, or if the project would involve the demolition of a large number of trees.

Executive Decree No. 15-19, dated 25 January 2015 and amended by Executive Decree No. 20-342 on 22 November 2020, emphasises in Article 46 that compliance with legislative and regulatory provisions related to safety, hygiene, construction, aesthetics and environmental protection must be observed when preparing a construction permit application[4].

Additionally, Article 2 of the Law on Promoting Renewable Energies within the Framework of Sustainable Development emphasises the importance of environmental protection by encouraging the use of non-polluting energy sources[5]. Article 3, paragraph 2, states that renewable energies encompass all methods that allow for significant energy savings by utilising bioclimatic engineering techniques in the construction process.

These texts reflect the legislator's consideration of energy efficiency in construction, aligning with the characteristics of green buildings in terms of energy efficiency, reducing negative environmental impacts and utilising renewable energies such as wind, solar and hydropower.

CONCLUSION:

In light of widespread environmental pollution around the world, countries are striving to eliminate or reduce it by moving towards sustainability in various fields, including urban development. This has given rise to green architecture and environmentally friendly buildings in many countries, including the United States, China and the United Arab Emirates.

Our modest study of this topic has led us to draw the following conclusions:

[1]- This is confirmed by Article 16 of the law concerning green spaces.

[2]- Refer to Article 5 of Executive Decree 91/175 dated 28/05/1991 concerning the general rules for planning and construction, Official Gazette, Issue 26, 1991.

[3]- Refer to Article 30 of the aforementioned Executive Decree 91/175.

[4]- Executive Decree No. 15-19 dated January 25, 2015, which specifies the procedures for preparing and delivering construction contracts, Official Gazette, Issue 07, published on February 12, 2015, and amended by Executive Decree No. 20-342 dated November 22, 2020, Official Gazette, Issue 71 of 2020.

[5]- Law 04/09 dated August 14, 2004, concerning the promotion of renewable energies within the framework of sustainable development, Official Gazette, Issue 52, dated August 18, 2004.

1. Despite the existence of some legal texts that indirectly refer to environmentally friendly buildings, Algeria is still far from this type of urban model.

2. The shift towards green building is one of the most important goals that developing countries should strive to achieve and implement in practice.

3. Environmental preservation and achieving sustainable development is a strategic goal that can only be realised by addressing all sectors, including urban planning and construction, through the adoption of sustainable or green building practices.

4. Unlike conventional buildings, green buildings reduce energy, water and material consumption, improve general health and well-being, and protect natural resources and the environment.

5. Green buildings represent a strategic goal for modern states, aimed at benefiting future generations. Therefore, raising awareness and taking serious steps towards implementation is necessary.

The proposed solutions for countries to adopt this project, including Algeria, are as follows:

1. Run awareness and educational campaigns about the benefits of green buildings for the environment and society.

2. Employing international expertise, modern techniques and sustainable designs.

3. Providing training and incentives for green buildings and energy efficiency.

4. We offer free courses, public forums and technical training.

5. Establishing factories dedicated to producing the materials necessary for green buildings.

6. Reducing the cost of green buildings compared to conventional buildings.

7. Educating civil society about what green buildings entail.

In conclusion, green buildings represent a scientific advancement from which everyone should benefit. Even if we are not planning to rebuild our homes, we can still make eco-friendly changes. Adopting green practices also means conserving energy, so we should view green buildings as a worthwhile investment.

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[4] *Law No. 11-02 dated February 17, 2011, concerning protected areas within the framework of sustainable development, Official Gazette, No. 13, published on February 28, 2011.*

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