

## **Mechanisms for Enhancing Scientific Research in Algeria and Their Role in Achieving Quality Education and Sustainable Development**

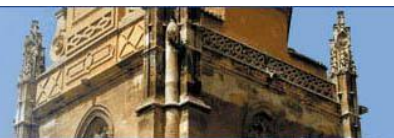
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## **Mechanisms for Enhancing Scientific Research in Algeria and Their Role in Achieving Quality Education and Sustainable Development**

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### **Abstract**

The world today witnesses rapid development and transformation amidst what is known as globalization and the era of technology. This era, also characterized by major challenges for human societies economically, politically, and technologically, is accompanied by social challenges to achieve development in all its dimensions and criteria, striving for inclusivity. As a result of this transformation, technology, knowledge, and science have become defining features of developed countries, which wield them to lead and control to achieve their own societal goals. This has allowed them to possess means of control despite some of these countries possessing natural resources that should theoretically constitute a source of strength to overcome the knowledge barriers they lack. Therefore, the issue of developing scientific research in Algeria has become a fundamental step towards achieving sustainable development amidst global challenges, aiming to harness the available potentials. This can only be achieved through scientific research and its development, originating from the reality of Algerian society and its requirements amidst future challenges.

**Keywords:** University, Higher Education, Scientific Research, Sustainable Development, Globalization.

### **Introduction:**

The higher education sector in Algeria constitutes a vital and significant sector in the political, economic, and social structure of society in all its dimensions, considering the role it plays in driving development. This sector has undergone profound developments since independence to this day, at various levels, whether human, structural, or in terms of specializations aimed at training future leaders capable of achieving the efficiency and aspirations of the Algerian state, while also keeping pace with the era and its requirements. Algeria witnessed the presence of its first university in 1909, during the French colonial period. However, after independence, it paved its way towards achieving its goals through gradual attempts to reform its system in line with training, employment, and development needs.

Therefore, the university serves as the cradle of knowledge and the link between society, its outputs, and as such, is one of the institutions that form the cornerstone of development in contemporary societies. The current challenge in Algeria is to create mechanisms to adapt to the world's developments and respond promptly to the requirements of sustainable development. Hence, the issue of developing scientific research becomes a necessary and urgent matter, which cannot originate from a vacuum but must stem from the reality towards which the Algerian state is directing itself, to achieve the outlined strategies for achieving well-being for individuals and society. Thus, in our research, we attempt to address the possible mechanisms in Algerian universities that contribute to the development of scientific research and consequently achieve sustainable development goals.

### **1- Research Problem:**

Humanity has progressed in various fields, thanks to the efforts of communities that have embraced scientific knowledge and the scientific method to understand phenomena, interpret reality, and use them for the future, with evidence and proof. Today, humanity also needs specific means to advance sustainable development. Scientific research and higher education institutions lead the progress by serving humanity, as the university's message today is the message of mankind, designated by God as the steward of the Earth. Through competent individuals, communities can provide services in this field, control society's requirements, and seriously engage in scientific research by providing the necessary resources. This enables them to address societal issues and propose solutions to be tested in all dimensions of development, including industrial, energy, and even agricultural fields.

It is evident that universities and their outputs have provided significant contributions throughout human history in various regions of the world, offering knowledge for the service of humanity. Universities such as Al-Qarawiyyin University in Morocco and Al-Azhar University in Egypt have been platforms for research, where scientific research and its results have been presented in the field of knowledge.

### **1.1- Key Features of the 21st Century:**

Today, a country's progress is not measured solely by its material wealth but also by its technological wealth. Universities and higher education institutions, with their researchers and available specializations serving science and society, have liberated countries. Algeria, after gaining independence and entering the development process, focused on the renovation and reform of various sectors, identifying the fundamental priorities required for development, including education, health, industry, and agriculture.

By focusing on these sectors, it is possible to break away from dependency in all its dimensions. Therefore, we aimed to research the mechanisms implemented in the higher education sector in Algeria for its development and its role in achieving sustainable development.

## **2- Research Concepts and Definitions:**

In various stages of their research, researchers need to use certain concepts related to the research topic closely. Identifying these concepts helps us understand the phenomenon closely and define its essential aspects, justifying the scientific basis that allows the formation and articulation of a specific discourse.

### **2.1- University:**

The word "university" is derived from the Latin word "universitas," meaning "union," which gathers influential entities in the political field to exercise authority. This word has also been used to refer to the academic community of professors and students, considering what it offers from acquaintanceship. Therefore, the university can be considered an educational institution dedicated to higher education and scientific research, authorized to award academic degrees. Moreover, education in it is optional, not mandatory.

### **2.2- Higher Education:**

This concept is also referred to as "university education." It is defined as a branch of study that is more specialized. It is also defined as the educational level immediately following secondary education, where training is completed with a certificate that enables the holder to obtain a job. Higher education can also be defined as the institution authorized to prepare the human competencies required by society. Outputs of higher education, from specialized individuals who meet society's needs, can further add, for better clarification, that higher education allows for the preparation of competencies with various academic degrees. These degrees range from the first university degree, called "license" in some countries and "bachelor's" in others, to more advanced degrees categorized as postgraduate studies, such as a master's degree in the old system, and a doctoral degree.

In summary, higher education is the education provided by universities, colleges, and institutions that offer academic degrees.

### **2.3- Concept of Scientific Research:**

Many researchers have attempted to provide a comprehensive definition of scientific research from various perspectives and directions, based on scientific beliefs and the arguments behind them. The term consists of two parts, "research" and "scientific." Regarding research, it is a source of past action, meaning to search, investigate, inquire, attempt, and discover. As for the term "scientific," it relates to science, knowledge, and the perception of facts. Thus, the concept of scientific research entails organized inquiry following scientific methods and approaches. This concept includes the idea of invention, collection, and completion of what is lacking.

Based on what has been mentioned in defining scientific research, it involves a set of introductions to reach the desired goal, which is an attempt to reveal the truth, whether it is new or to confirm an existing truth, then to expose it and investigate it. Consequently, scientific research is an organized scientific activity that seeks to uncover facts and then derive general principles and explanatory laws.

Therefore, scientific research remains as a concept that translates and embodies a fundamental function of the university, following education, to develop and advance knowledge for the benefit of society and to enable progress and advancement.

### **2.4- Concept of Development:**

The concept of development is one of the fundamental concepts in the sociological field and is essential for human and social stability and development. This concept has appeared significantly in modern times concerning the interest of states in various life fields and their impact on individuals' lives. Therefore, many countries have adopted well-studied strategies to achieve various types of development, which have become a human requirement today.

#### **2.4.1- Linguistic Definition of Development:**

In language, this concept carries the meaning of increase, growth, abundance, and multiplication. For example, we say "developing money," meaning increasing it. It also means support, elevation, and ascription. The word also means growth or a stage of progress in the English language.

#### **2.4.2- Technical Definition of Development:**

Various definitions of development have emerged, with some considering it as a process of human advancement, aiming to liberate individuals from the inability to satisfy their basic needs. Others consider it as the outcome of joint governmental and popular efforts at various levels to mobilize existing resources to meet essential needs. Another perspective defines development as the transformation and comprehensive investment of all self-resources, achieving liberation for society, the state, and the individual.

This definition is the closest to the usage in this research paper, considering that development targets the individual, then the community, then the state to achieve the goal, as it encompasses aspects of social life. Thus, it accurately expresses development when we speak of cultural and scientific development. This definition gives us an aspect of comprehensive development for society, as higher education and scientific research are parts of this whole, and the mechanisms aimed at developing scientific research are tools for development.

#### **2.5- Concept of Sustainable Development:**

Sustainable development is considered one of the pathways to eliminate and address poverty in contemporary societies, without disrupting the ecological systems and the limitations of existing resources. This concept first appeared in a publication by the International Union for the Conservation of Nature in 1980 and gained widespread attention after its use in the "Our Common Future" report, also known as the Brundtland Report, in 1987.

Therefore, the concept of sustainable development can be defined as a process of developing land, cities, communities, and business, provided that it meets present needs without compromising the ability of future generations.

This concept has given rise to other contemporary concepts such as globalization, modernity, and intergenerational conflict, targeting sustainability movements today, developing new economic and agricultural systems.

It is evident that society plays a crucial role in addressing issues related to sustainable development because it is the primary driver, possessing human, economic, and social capabilities. Thus, all sectors involved contribute to this process.

Another definition includes "development that considers the rights of future generations to natural resources and prioritizes human needs such as food, shelter, the right to work, education, and access to health services. It requires taking from the earth no more than it can give."

This indicates that sustainable development is linked to the social and political framework, requiring the improvement of living conditions for all inhabitants of the world.

The integration of sustainable development with research and higher education is more than necessary so that the latter can provide a comprehensive and integrated vision of all the necessary aspects for this development, especially concerning the skills and capabilities required for its implementation.

Therefore, this concept takes various definitions, some formal and others more informal, and even more scientific, based on analysis, argumentation, evidence, and reality.

#### **3- History of Scientific Research in Algeria:**

Discussing scientific research in Algeria, particularly within Algerian universities, involves reflecting on a journey of a ministry that has witnessed specific political, economic, and social events and determining its path within these mechanisms and conditions available during the years following independence and the remaining stages.

In terms of research, research centers inherited from the colonial era, which operated under "Algerian-French" frameworks, took center stage. These entities functioned similarly to many other institutions in various sectors. Hence, they can be considered a legacy that carries many foreign elements of scientific knowledge stemming from our environment, society, needs, and cultural specificity.

The birth of the Ministry of Education occurred relatively late compared to independence, with its establishment on July 21, 1970. The special body for scientific cooperation was abolished on January 21, 1972, and in its place, the Temporary Council for Scientific Research was established. It took on the responsibility of completing planned programs and managing existing centers until new scientific centers could be established

to supervise scientific research and align it with the advancements achieved by Algerian society and the national gains it had realized.

In the same year, in May, a preliminary project on research infrastructure was presented. As a result, a national symposium on scientific research was held, and one of its main outcomes was the establishment of new national research centers focusing on social phenomena and problems beginning to spread in society.

The efforts to research possible methods for developing society, managing existing resources, and effectively utilizing them continued in Algeria. These steps related to organizing scientific research in Algeria and framing it in line with the capabilities of Algerian universities. On July 25, 1973, the National Research Council was established by ministerial decree.

In addition to this national council, it led us to affirm the state's strategy in managing research at the national level as a whole. This means that the state determines, regulates, and organizes it. The link between higher education and scientific research in Algeria largely adheres to a traditional methodology that has not evolved to the required extent to align with future requirements.

This future was one of the main strategic priorities for the independent Algerian state. All developmental plans aimed at achieving prosperity for society in all its segments and realizing a genuine renaissance whose main foundation is higher education and scientific research as sectors that invest in human resources and achieve initiatives in innovation and invention.

**The figure represented by figure 01 depicts the landscape of scientific research for the year 1973.**



**"The source:** Researcher's design"

Regarding the National Scientific Research Authority, it consists of four directorates, with the most prominent being the Programs Directorate. This directorate focuses on executing planned programs, identifying research fields, establishing research centers, and coordinating between these centers. Ministerial directives have emphasized the integration of scientific research into development initiatives. (Universite N°2, 1975, p65)

This means that even the university as a whole, especially its research component, is actively involved in development (Universite N°2, 1975, p31). As for the National Research Council, its mission is primarily consultative. It can be considered advisory in nature, meaning that its role is mostly supervisory. Therefore, those tracking the trajectories of both scientific research entities find that research fields and directions align with the period and strategy of the Algerian state. Research efforts have been directed towards economic interests, particularly rural economics and economic issues such as establishing standards in work and related matters. There's also a focus on topics related to improving management, introducing new technologies in production units, enhancing cooperatives, and integrating them into the socio-economic environment. This is regarding the first field. As for the second field, attention has shifted towards social economics and rural sociology.

In this context, research focused on the outcomes achieved by the Agricultural Revolution within what was known as model villages, as well as the organization of farmers and an interest in self-management policies (Magazine of the University, 1977, p.66". Additionally, research extended beyond these fields during that period, particularly in 1977, to delve into mechanisms for disseminating technological advancements. The second aspect of research during this time involved agricultural training.

In this context, research attention was directed towards studies related to adapting curricula to disseminate technological advancements in rural areas. Additionally, there was a focus on improving the role of technical media, followed by analyzing the results. Consequently, research strategies aligned with the requirements and goals outlined in the national charter and constitution, almost as if delineating the boundaries within which research operates, despite drawing upon qualified expertise within the university confines for research endeavors. From another perspective, the societal reality and changes in scientific research and the university's connection with society and its needs were reflected.

Furthermore, research interests during that period also included investigating the integration of expatriate labor into the national economy as a necessary endeavor, along with addressing health and population-related issues.



Scientific research remains one of the most important functions of the higher education sector, particularly with the emergence of modern universities. Its role in human capital formation, tailored to meet the demands of development and ongoing changes, has become paramount. Today, it represents the production of new knowledge, as the synergy between education and research has led to the emergence of modern universities (Bekouche, (2009, p 33-35).

Moreover, discussing the trajectory of higher education in Algeria involves various sources, indicating several changes from Ottoman presence to French colonization and the independence era. These elements have led to the evolution of its systems and structures. Of course, this trajectory has undergone stages of reform, which can be examined through the field of research, serving as the true measure of the university's productivity, whether in its scientific activities or in fundamental and applied research areas to address immediate challenges. This, in turn, enhances the genuine role of the university, asserting its presence globally and highlighting its role in the nation-building endeavor. (Tumur, 2011, p. 31).

• **Academic Teaching Strategies in Algeria :** The Algerian university system has undergone a varied trajectory through attempts at reform in this field since independence to the present day, alongside numerous efforts to open universities and specializations that could be employed within two primary objectives. The first relates to the human element within a framework of essential outputs necessary for development, and the second involves utilizing scientific research in the development and direction of programs and innovations to achieve the required quality for sustainable development. To this end, reform has constituted an essential tool at every stage to improve this sector in line with societal and individual requirements, with each stage encompassing different achievements from one phase to another. Therefore, the stages of higher education in Algeria can be divided into: (Cited from: Zahari, 2009, pp. 25-27).

• The first stage, from 1962 to 1969, saw the state's focus on establishing universities in major cities, starting with a single university in the capital, Algiers, to the University of Oran in 1966, then the University of Constantine in 1967, followed by the University of Sciences and Technology in Houari Boumediene, Algiers, and the University of Sciences and Technology Mohammed Boudiaf in Oran, along with the University of Annaba. Education in these institutions retained remnants of French colonial influence, including language.

• The second stage, from 1970 to 1997, was characterized by the creation of a university map in 1984 to achieve objectives by the year 2000, in light of the economic needs across sectors.

• As for the third stage, from 1998 to 2003, by the year 1999, this sector comprised 17 universities, 13 university centers, six higher teacher training schools, 14 national institutes for higher education, and 12 specialized institutes and schools.

• The fourth stage begins in 2004.

This stage, known as the period of economic and global transformations, also witnessed modifications and reforms with the introduction of the new higher education system "LMDE," a measure designed to respond to the social and economic milieu at that time, as well as to address the aspirations of higher education and scientific research in Algeria. To discuss the aspirations of higher education and scientific research in Algeria, we must consider the following:

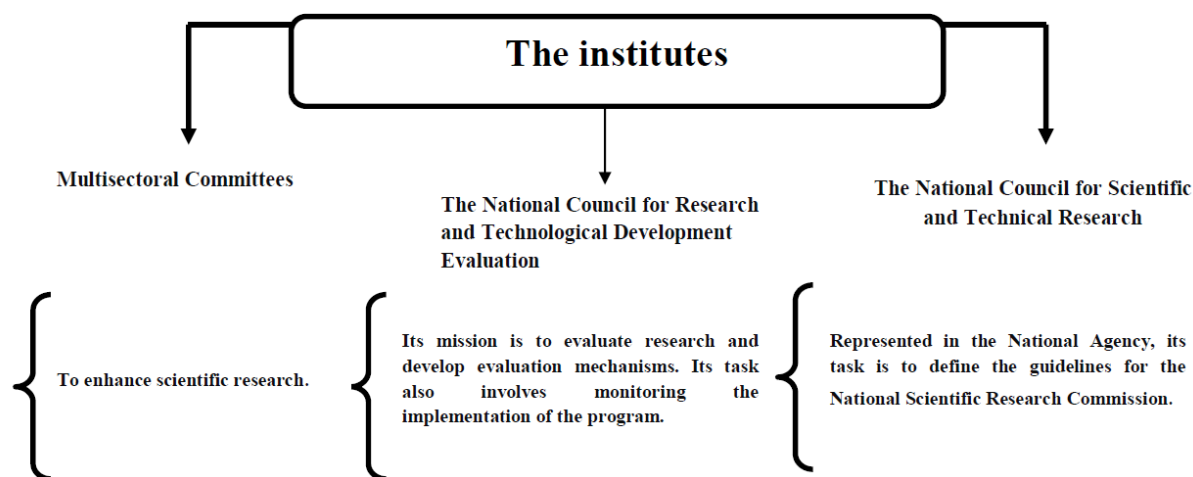
1. The societal framework and the reality of higher education in Algeria.
2. The contemporary problems facing the improvement of higher education.
3. Possible alternatives for the development of higher education.

Indeed, Algerian society, like other global communities, is currently experiencing what is termed the "knowledge society," with technological globalization as a tool for this new state of affairs. This reality compels human societies today to endeavor, through decision-makers, to devise strategies that delineate a future world. It has become inevitable today to take into account human development in light of these societal advancements.

Consequently, it is evident that we are compelled to coexist with these developments and attempt to benefit from what the university offers in terms of training competencies harnessed for the service of societies in various sectors. The university, therefore, provides the skills and capabilities demanded by the evolving job market, administrative systems, and economic practices that underpin life, as well as the relationships and values within a porous global family structure. Thus, the quality of higher education emerges in terms of improving education and directing it towards serving society, within what could be the human society's aspirations and its innovative solutions to new non-conventional problems. It is, therefore, essential for societal realities and the requirements of the era to be reflected in educational thought and systems to develop issues of higher education in directions that allow for their social utilization. Thus, efforts are directed towards changing the mindset from mechanistic and deposit-oriented culture to renewal and creativity culture (Shahata, p. 139).

Discussing the Algerian university and its aspirations in education, training, research, and contribution to development is a discourse that makes us acknowledge it as an institution striving to help break out of the cycle of underdevelopment and taking partial responsibility for Algeria's future, as an institution of change. The society is in dire need of it and its services, and therefore, this university has become a focus and a puzzle for the aspirations of peoples for growth and development, especially since the function of the university

constitutes a triad of teaching, scientific research, and knowledge production. It is sufficient for us to infer the importance of scientific research in comprehensive development and sustainability, as scientific research contributes to identifying the needs of comprehensive and sustainable development, addressing its problems, and anticipating its challenges. Hence, we need to analyze the possible mechanisms needed by this sector to contribute to the realization of development aspirations (Al-Kubaisi) :



**"The source: Researcher's design"**

The interest in this context was directed by Law No. 15-21 dated 18 Rabi' al-Awwal 1437 corresponding to 30 December 2015, which also includes directives for scientific research and technological development in order to keep pace with global developments and contribute to sustainable and comprehensive development. This was manifested in scientific bodies and institutions specifically established for this purpose. These latter entities included research centers, research units, research agencies, and research laboratories. According to the 2017 national census, there were 1,439 such establishments, distributed into 167 in social sciences, 37 in psychology, 216 in humanities and arts. This observation underscores the evolution of laboratories and research units, as the ministry has accorded significant importance to laboratories, research centers, and units to enhance the function of scientific research and valorize institutions engaged in scientific research, as well as valorizing their results to ensure the achievement of social, economic, comprehensive, and sustainable development.

The partnership between universities and economic and service institutions constitutes a significant aspect. The transformations and regulatory reforms undergone by Algerian universities have diversified and elevated the processes of scientific research and training to a level where universities aim to leverage their outputs as commodities in the supply and demand market.

Given the importance of this matter and the fact that today's economic development hinges on political will within the framework of a national project, it is imperative to acknowledge that Algeria is not compelled to merely follow global developments unless the groundwork is laid for it. Universities are pivotal in driving development in this sphere, serving as the source of intellectual capital for institutions, thereby contributing to development output and the advancement of sectors, particularly the industrial sector. Universities have been and remain the foundation for this task, as higher education and scientific research both constitute a dual-purpose commodity, both consumptive and productive.

Thus, the university has laid the groundwork for collaboration with private and public institutions to achieve development strategies in Algeria, especially sustainable development, given that economic development globally in recent decades has relied on the principle of sustainable development.

Guiding policies of scientific research towards achieving desired goals entails addressing societal problems at all levels within the laboratories of the National Research Fund. To invigorate this field, the state has enacted a series of legislative texts such as Law No. 11/98 dated 22 August 1998 concerning guidance law, the emergence of what is known as PNR, and the establishment of a National Fund for Scientific Research and Technological Development (FNR) responsible for financing research. This has led to the proliferation and diversification of research laboratories according to their activities and publications, ranging from those specializing in petrochemicals found in oil refining centers to chemical industry laboratories used to ensure pharmaceutical industrial quality. Others specialize in social, humanitarian, historical, and economic disciplines, among others, thus shaping the policy of scientific research and making universities platforms for production, knowledge, innovation, and invention.

**4- Increased focus on strategic specializations and investment in them:** Algeria, like other countries worldwide, seeks to align with the trends of globalization and the World Trade Organization. Hence, there is a keen interest in strategic specializations and the formulation of policies for skills development, especially in technical and technological fields. Ensuring high-quality graduates is essential for advancing human capital investments. By harnessing these graduates in the job market, development can be propelled forward. Consequently, the university becomes a pillar in this endeavor, as through scientific research, Algerian society can govern technology, acquire patents, link university outputs with societal needs, transform skills and ideas into industrial models, and ultimately contribute to offering thousands of opportunities for university graduates and leading researchers. Hence, investment in higher education and scientific research becomes crucial. When we talk about investing in these specializations, we mean enhancing them and utilizing what the university can offer to the community, translating university resources into real-world projects accomplished by researchers and outstanding students. Strengthening the university involves establishing research workshops that serve as a link with key strategic sectors.

**5- Establishment of the Global Forum for Scientific Research in Algeria:** This initiative aims to systematically manage scientific research and make it a forum for presentation, evaluation, and selection, thereby serving society. Furthermore, it protects researchers' efforts in all fields, valorizes them, attempts to realize them in the real world, and provides opportunities for researchers to excel in Algeria, preventing the brain drain experienced by many Algerian innovators who were embraced by Western countries. Hence, this forum includes a committee to monitor and classify scientific research, provide protection, and introduce it into practical application fields, making these measures effective in involving universities and scientific research in sustainable development.

Regarding sustainable development, it aims to improve human life quality without compromising the environment, contemplating future generations within its political, environmental, economic, social, and technological dimensions. Sustainable development relies on the transfer and adaptation of modern environmentally friendly technologies, encouraging researchers, and providing scientific work facilities. Higher education and scientific research are the fields that achieve this mechanism (Iardjane, 2002, p62).

#### **Prospects of Scientific Research in Service of Sustainable Development:**

The Ministry of Higher Education in Algeria is endeavoring to expand its strategy by bridging and connecting the university, including its activities, research, and outputs, with the economic and social environment. This is aimed at maximizing the benefits from completed scientific research and employing its results. Recently, the university has entered into several agreements across various disciplines and between research laboratories and economic institutions. The purpose is to materialize the outputs of research that were once confined to the shelves of university libraries and even some research laboratories and centers that experienced stagnation for a long time.

An example of this effort is the signing of sixteen agreements, one of which was with pharmaceutical industry institutions in January 2023, by the Ministry of Industry. This agreement aims to valorize the outcomes of scientific research and technological development. This underscores the critical and pivotal role of scientific research in sustainable development, driving it forward and leveraging various resources of the country, whether botanical, aquatic, or natural. The focus has been on natural plants and technological diversity, emphasizing the role that universities can play and what they can offer to serve the national economy.

However, despite the significant qualitative leap that scientific research has achieved, it still suffers from certain problems that hinder its ability to reach important goals, especially concerning the insufficient availability of data and information, as well as the lack of specialized resources and capabilities. This scarcity of resources is essential for researchers during the process of research, analysis, and interpretation in their quest for solutions to various problems (Frouja, 2018, p. 204). These resources are crucial for researchers to overcome obstacles and advance their studies effectively.

#### **Conclusion**

Scientific research in Algeria has made significant strides within the corridors of universities across various disciplines and over successive periods. This progress has enabled researchers to harness their efforts and expertise in innovation and invention, especially in scientific and technological fields. Based on the discussions presented in this research paper, the status of scientific research in Algerian universities has traversed important milestones, attempting to confront new challenges within the global context. Furthermore, it has contributed to sustainable development through the findings of research in all scientific fields and disciplines, empowering researchers to excel and stand out. However, this is no longer sufficient in the face of new challenges. It is imperative to develop mechanisms that respond to the requirements of research and the needs of society.



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