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DETERMINATION OF THE LEGAL FRAMEWORK FOR LOCALIZATION SCIENCE AND TECHNOLOGY VALLEYS AND TECHNOLOGY INCUBATORS IN NUCLEAR ACTIVITIES

The object of research in science and technology valleys and technology incubators, which for governments are the best investment of the scientific energies of scientists and innovators. As they are a link between research institutions and the industrial and service sectors, and as they transfer ideas and research results to different markets. This research aims to highlight the importance of Localization science and technology valleys and technological incubators related to nuclear activities, as they are one of the important tributaries to support the owners of the ideas of ambitious nuclear projects. The research also aims to shed light on the problems and obstacles that hinder the achievement of the desired goals of nuclear activities, such as:

– the lack of information in the fields related to it;

– the scarcity of expertise needed to implement it;

– the lack of funding;

– the absence of investors in this highly specific «nuclear» sector.

The research presents the extent of the possibility of Localization those nuclear activities in Egypt through establishment valleys and incubators so that through this Localization there is an integrated environment of services and support that will ensure their development, raise their growth rates, and increase their efficiency. It is will lead to an increase in the chances of their success and sustainability, especially since Nuclear technology is used in many fields of industry, medicine, and agriculture. The research highlight the provisions of Egyptian Law regarding science, technology, and innovation incentives, as well as Egyptian Law establishing the Innovators Care Fund, to determine the possibility of establishing these valleys and incubators through the provisions of Egyptian legislation.

Obtained results will have reached a great impact in encouraging investors and financiers to enter into technological partnerships with nuclear agencies in Egypt for the sake of safe investment in the elements associated with nuclear materials.

Keywords: *science and technology valleys, a technology incubator, technology and innovation incentives, nuclear activities.*

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1. Introduction

Egypt has recently adopted a package of economic reform programs that depend on scientific research and its outputs, through which it has tried to take the path of development and sustainable development along the lines of many countries.

Through it, it was concerned with entrepreneurial projects and pioneers, especially young innovators, because of their great importance in contributing to the development of products and services, as well as their contribution to nurturing talents and encouraging innovation and creativity.

To achieve these projects to expected successes, it was necessary to have to sponsor and support organizations and incubators for them. Therefore, the importance of these incubators in supporting the pioneering scientific projects. The presence of institutions interested in supporting these projects is one of the options required to develop and support these projects.

The interest in scientific research and its outputs came in line with the principles of the Egyptian constitution issued in 2014. Article 23 states: «The state guarantees the Possibility of scientific research and the encouragement of its institutions, as it is a means to achieve national sovereignty, build a knowledge economy, sponsor researchers and inventors, and allocate for it a percentage of government spending of no less than 1 % of the gross national product, which gradually increases until

it is consistent. The state also guarantees the means of effective participation by the private and civil sectors and the contribution of Egyptians abroad in the renaissance of scientific research».

Article 66 states: «The Possibility of scientific research is guaranteed, and the state is committed to sponsoring researchers and inventors, protecting their innovations and working to implement them» [1].

Egypt interest in knowledge, innovation, and scientific research also emerged through Egypt vision 2030, as the fourth goal of the vision entitled «Knowledge and Innovation: Knowledge, Innovation, and Scientific Research» state: «Egypt takes knowledge, innovation, and scientific research as basic pillars for development, through investment in people Building their creativity, stimulating innovation, spreading its culture, supporting scientific research and linking it to education and development» [2].

This interest in adopting a legislative structure to support innovation was also evident, as Law No. 23 of 2018 regarding science, technology, and innovation incentives was issued, which regulated the mechanisms for establishing science and technology friendship and technological incubators and the method for managing scientific research outputs represented in technical knowledge, intellectual property, patents, and industrial models [3].

Law No. 1 of 2019 was issued to establish the Innovators and Innovators Fund to set up a legal framework to support, finance, and sponsor researchers and innovators, finance science, technology, and innovation projects, and create mechanisms for their financing by encouraging individuals, the private and private sectors to do so [4].

In line with these creative ideas, the Academy of Scientific Research and Technology launched a program called «Staging» to be the largest umbrella for establishing and managing technology incubators in the entrepreneurship and innovation system that covers the various regions of Egypt.

So that these incubators can transform ideas, innovations, and research outputs into emerging technology companies capable of Economic and technological competition and its products with a competitive ability to achieve the goal of the knowledge economy [5].

Therefore, this research relates to the extent of benefiting of models followed by the developed countries in managing the science and technology valleys Technology incubator and the importance of realizing the real benefit from the outputs of scientific research and converting them into patents and then manufacturing them and converting them into products of economic value in the same location within the science and technology valleys, to increase local manufacturing and provide job opportunities And to achieve an economic return and to provide foreign currency in Egypt.

Thus, *the object of research* in science and technology valleys and technology incubators, which for governments are the best investment of the scientific energies of scientists and innovators. As they are a link between research institutions and the industrial and service sectors, and as they transfer ideas and research results to different markets.

*The research aim*s to determine the legal framework for localization science and technology valleys and technology incubators in nuclear activities.

2. Methods of research

To achieve this aim, scientific publications on science and technology valleys and technological incubators have been analyzed in terms of their characteristics, method of establishment, and management. And the formation of a model that can be used in establishing and managing technology incubators in nuclear fields through which nuclear elements can be extracted and used in nuclear activities, and the extraction and extraction of other accompanying elements and use in the medical, food, agricultural, engineering and other industries.

Among the methods that were used in preparing the form, the complete description of the model and the preparation of complete controls for its creation and management in all its stages.

3. Research results and discussion

Science and technology valleys and technological incubators related to nuclear activities are scientific and economic centers that seek to motivate pioneering scientists to innovate and to transform these innovations into pioneering projects on the ground, by coordinating with companies in many international practices to create an environment that simulates the work environment to promote the concept of economy Based on applied knowledge, by adopting the innovations and ideas of the pioneers, directing them towards a path that matches their qualities and capabilities, and transferring technology and experiences to be shared with new companies led by innovators [6].

3.1. Science and technology valleys and technology incubators. Science and technology valleys are areas where technology incubators and companies are established, aiming to promote innovation, technology development, transfer, and marketing in cooperation between local and international stakeholders, to support the knowledge-based economy, and to access home-made products [7].

As for technology incubators, they are the laboratories and entities that support scientific research and innovation, which are established to provide business services and technical and scientific facilities for scientific research projects, support mechanisms, and technical consultations for innovators and emerge companies through scientific research outputs, to reach prototypes that can be manufactured.

Science and Technology Valleys operate in the following areas [8]:

– Creating or developing a product to raise quality, reduce costs, or improve performance.
– Creating or developing a mechanism or a process for producing raw materials for a specific product.
– Creating or developing the use of information technology applications for existing or new services.

The scientific research outputs are:

– Technical knowledge.
– Intellectual property.
– Patents.
– Industrial models.
– Research results and services.
– Innovation-based services.

Among the premier technology incubators in the country Institute's Austin Technology Incubator of The University of Texas at Austin (Fig. 1) [9].

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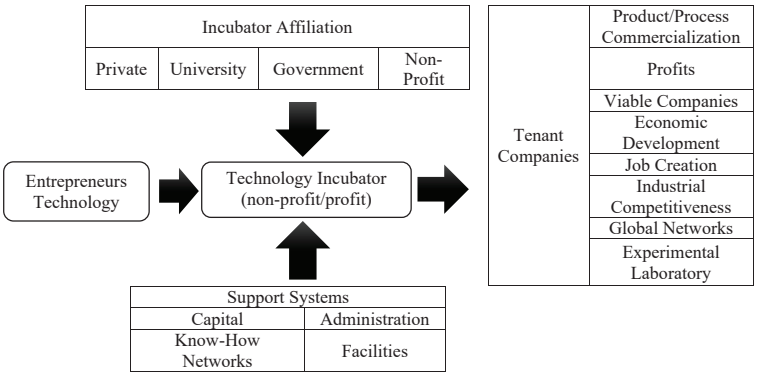

Fig. 1. Basic components of US Technology Incubators [9]

3.2. Business Incubators. The business incubator is the body that contains ideas, creativity, and initiatives and provides development and production of new everything by creating the appropriate atmosphere for these projects, and also provides all the requirements that the project needs so that this project can recover its strength and emerge from the incubator with a great competitive ability that helps it to be in the market.

It can also be defined as a place equipped for a specific emerging project that helps the owners of the project in providing them with assistance and services from the beginning of the small project to obtaining a product, and support is provided for this project so that it can compete in the labor market [10].

The support includes financial and administrative assistance as well as providing advice so that the small enterprise can develop itself, which increases its chances of success and makes it able to continue in the market.

Business incubators, which numbered more than seven thousand in the world, contribute to reducing the phenomenon of many investment projects faltering by incubating and graduating more viable entrepreneurs due to their qualification programs and various other services, as well as benefiting from continuous and direct contact with establishments Large, research centers, universities, and public and private administrative bodies to serve the goals of the incubator [11].

There are different classifications of the types of incubators, depending on the purpose for which they were established. It has developed a special classification for incubators that includes the following nine types [12]:

– *Regional Incubator:* It serves a specific geographical area with the aim of its development and works on using local resources of raw materials and services and investing the idle youth energies in this area.
– *International Incubator:* Promotes attracting foreign capital to transfer and localize technology.
– *Industrial Incubator:* It is set up inside an industrial zone after determining the needs of this area in terms of feeding industries and support services.
– *Specific Sector Incubator:* It aims to serve a specific sector or activity; Such as talented people, inventors, software, or engineering industries.
– Research Incubator: It is usually located on a university campus or research center to develop the ideas, research, and designs of faculty members, in addition to making use of the workshops and laboratories available at the university.
– *Office Incubator:* It provides only the property that houses the offices of entrepreneurs, without any devices or equipment.
– *Rural Business Incubator:* It provides small loans, simple administrative and technical training, and support in the field of promotion and marketing for rural women to enable them to highlight the innovation and creativity that they possess through their incubated businesses.
– *Virtual incubator:* It is known as an incubator without walls, as the usual incubator services are provided, except for incubation with the property that is available with the previous types.
– *Internet Incubator:* It helps emerging internet and software companies grow to maturity [13].

Incubators work to increase the success rate of small start-ups, but this goal will only be achieved by the combination of five factors: the incubator manager, who plays a fundamental role in the success of the incubator, has some skills in business planning and management, and can discover problems before they crystallize [14].

The incubator must also bless community support, as the support may come from the governorate, universities, or large companies.

It is a necessity of selecting the incubator projects strictly, so the more clear and specific the selection criteria, the greater the chances of attracting successfully applicable ideas.

Usually, incubators do not directly finance, but the extent of their success can be measured through their ability to attract funding, as the incubator can act as a link between its affiliates and the funds and financing institutions [15].

The last point for the incubator's success is continuous evaluation and improvement. Incubators need to regularly evaluate their operations and performance, not only monitoring performance in terms of the growth of affiliated facilities, but also the growth and development of companies after their graduation in the incubator, which is information that is useful for the incubator in planning and providing its services, and most importantly This includes marketing itself and attracting projects of promising quality and expected to grow unconventionally.

3.3. Nuclear Science and Technology valleys and nuclear technology incubators. Nuclear technology has made significant contributions to raising the standard of living in the fields in which it is used, the most important of which are the fields of industry, medicine, and research [16].

3.3.1. The use of nuclear technology in the industry. It is evident in many fields, through the loss of energy radiation when it passes through the material, has allowed the industry to develop sensitive gauges to measure the thickness and density of many materials and imaging devices to check finished goods to verify that they are free from defects. The automobile industry, for example, uses nuclear technology to test The quality of steel in cars, and the owners of the metal vessel industry use nuclear technology to obtain the necessary thickness of aluminum and tin, and the owners of the aircraft factories also use nuclear technology in examining jet engines to verify that they are free from defects, and construction engineers use this technology to measure the thickness of

road surfaces and the layer under their surfaces. Pipeline companies use this technology to test the strength of metal parts' welds, and oil, gas, and mining companies use nuclear technology to draw contour lines for test wells and mine cavities [17].

Consumers use daily based products to verify their effectiveness and reliability on nuclear technology. Radioisotopes, for example, help the non-static devices in copy machines not to stick, and cosmetic companies use radiation to disinfect their products and remove irritating substances that can cause severe allergies in the users' bodies.

The most important and widespread application in the home is the application in the field of smoke detection, which is credited with saving the lives of thousands of lives, as a radioactive isotope called Americanism-241 is used inside the smoke detector to sense combustion products.

Museums rely on nuclear technology to verify the authenticity of oil paintings and art pieces, and forensic investigators use this technology to examine the physical environment.

3.3.2. The use of nuclear technology in medicine. It is demonstrated in biotechnology and in experiments at the molecular level, where radioactive isotopes are the preferred method of analysis. Small amounts of radioactivity can be measured easily and accurately, so scientists can analyze a single molecule. (Other non-nuclear methods require million-fold magnification with a magnifying glass.) Nuclear technology has important applications in doing, for example, testing new drugs, as the radiological test can decide how a substance is metabolized in the body and decide that a new drug will not leave things that may be harmful to the body and at present, it is estimated that 95 % of all new drugs test by Radiation.

Besides that, many other aspects of modern medicine depend on nuclear technology, including suturing wounds, surgical gloves, and medical equipment that are disinfected by radiation for use in hospitals, and from the tens of millions of people who enter hospitals every year for treatment, it is estimated that one in every three people is treated In nuclear medicine.

Among the new diagnostic tools that depend on nuclear technology is cardiomyopathy, which maps the blood flow to the heart, allowing doctors to know whether the patient has heart disease, and to decide on the most effective types of treatment, and a thorough examination of the bones can detect the spread of cancer before the rays detect it X-ray at least six months, and in a close examination of the lung, nuclear radiation is used to explore the presence of blood clots.

These diagnostic procedures, in addition to saving lives, reduce financial costs. Cardiac imaging, which costs about a thousand dollars, can save between twenty and fifty thousand dollars in expenses in heart tubes.

There are nuclear technologies that help doctors detect and treat infectious diseases, and detect diseases such as lung and breast cancer at a very early stage [18].

3.3.3. The use of nuclear technology in agriculture. It contributes to increasing crop production through its positive impact on the environment, in general, is positive, and linking the radioactive tract with known quantities and types of fertilizers helps to determine the nutritional efficiencies associated with it, and thus this technology can significantly reduce the number of fertilizers required, reduce costs for farms as well as reduce environmental damage.

The application of radiation technologies developed new crop varieties gives the highest global economic value compared to any form of radiation use and includes metamorphic species or varieties such as rice, barley, wheat, and other grains [19].

Nuclear technology is widely used in the field of insect control, where males are sterilized by insects with radiation and then released by their millions to mate with females, this method has eliminated the screwworm that constantly invades and destroys livestock in large numbers, which stopped the spread of this pest in parts of the continent African and Middle Eastern.

3.4. The differences between valleys and technological incubators in general and nuclear valleys and incubators. Valleys and technological incubators, in general, differ from nuclear valleys and incubators in several ways, the most important of which is [20].

Valleys and technology incubators generally operate on small and medium enterprises or enterprises, that is, those that combine management and ownership, and their activities are dominated by an individual character in management, and are characterized by their structural simplicity and simplicity of technology used, while nuclear valleys and incubators operate on large projects, which work through Large financial, administrative and legal systems that rely on advanced technology and highly experienced staff.

Valleys and technological incubators generally lack the presence of large infrastructure, as they are spread in rural areas and new urban areas, while the construction of nuclear valleys and incubators requires a large infrastructure equipped with huge tools and equipment suitable for separating the nuclear and radioactive elements and extracting the associated economic elements.

Valleys and technological incubators generally focus on a specific type of product, even if they are modest in their level, to match their low prices, while nuclear valleys and incubators target strategic products, and are often scarce and have great demand, and are expensive.

Small investors Established valleys and technological incubators generally, depend on a simple investment cost and require small financing, while the establishment of nuclear valleys and incubators is based on large investors, as it needs exorbitant investments for their construction and financing [21].

3.5. The role of nuclear technology valleys and technology incubators in promoting industrial projects. Technology valleys and technological incubators play an important role in promoting industrial projects, and this is evident in many areas, including the role of earth elements in the manufacture of modern devices, as these elements are characterized by several important physical and chemical properties that qualify them to be involved in the manufacture of a large number of devices Modern and advanced electronic equipment, some of them have superconductivity at high temperatures, some are resistant to corrosion and are distinguished by their high hardness, and a number of them are used as excellent oxidizing agents in some chemical industries, such as oil refining and its derivatives, and some rare elements are used as catalysts that are

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used to accomplish some operations Chemical in a relatively short time and to the fullest [22].

Also, these elements are of particular importance in the field of manufacturing electric energy-saving lamps, optical fiber cables, magnetic resonance imaging devices, and satellites.

In the military field, rare earth elements are used in the manufacture of many military pieces of equipment, such as night-vision goggles, precision-guided missiles, radar and communication systems advanced aviation and aeronautics equipment.

Six rare earth elements are used in the manufacture of the smart mobile phone, and if it were not for those elements, the size of the mobile phone would have been the size of a personal computer, and a device such as the iPad and tablet computers would not have been produced without the use of rare earth elements in such a small compact size that is astounding in its performance [23].

The superfluous everyone who uses it. This also appears through the role of the important economic elements present in the bitter liquid that is used in the manufacture of medicines such as magnesium oxide, as well as magnesium sulfate that is used in the manufacture of fertilizers, as well as the magnesium carbonate that is used in the manufacture of ceramics.

3.5.1. The role of nuclear technology valleys and technology incubators in extracting rare earth elements from monazite ore found in black sand, Egypt. Rare earth elements enter in varying proportions in advanced industries and are found in several minerals, including monazite mineral produced by physical methods from coastal black sand, and the sandy formations carrying black sand minerals extend from the Arish region in the east to Abu Qir in the west in the sands that make up the Mediterranean seabed in the shallow area in front of the Egyptian delta in particular east Rashid branch. These large coastal deposits contain important and strategic economic minerals necessary in the manufacture of alloys and machinery such as zircon, rutile, ilmenite, and magnetite in addition to monazite [24].

Monazite mineral represents the largest available economic reservoir of rare earth elements, especially the global coastal monazite, and the term rare earth elements is applied to 17 chemically similar metallic elements, namely: the elements of scandium and yttrium in addition to the group of fifteen lanthanides starting from the element lanthanum, then cerium, praseodymium, neodymium and promethium (which does not exist naturally) Samarium, erbium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, and ytterbium are finished with lutetium.

This group is characterized by the sharp chemical similarity among its members so that it behaves as one unit and these elements exist in dispersal and weak proportions in the earth's crust and are dispersed, and therefore separating them together and separately for research or industrial use is considered one of the most important places of challenge in the world of modern technologies over the past decades.

The global markets have taken place an increase in the demand for rare earth elements as a result of the wide range of applications used in these elements in their various forms, as they are used in all stages of manufacturing production raw materials and produce raw materials, and the use of rare earth elements in modern technology has been increasing steadily in recent years. These elements are incorporated into many technological devices [25].

On the other hand, thorium and uranium are basic pillars for nuclear manufacturing processes. These elements are found together in several minerals in different geological media in nature. On top of these minerals is monazite, which represents the largest economic reservoir available for these elements, especially the global coastal monazite.

The global reserve of monazite is estimated at 12 million tons, as 0.38 million tons of this mineral are in Egypt, and that is why Egypt is the fifth-ranked country in the world that has reserves of this important mineral [25].

The mineral monazite is one of the main components of the black sand deposits that spread on the beaches where rivers and seas meet. The concentration of this mineral in these sand does not exceed 0.4 % and is produced as a by-product during the separation and physical concentration processes of economic minerals (zircon, ilmenite, rutile, garnet, and magnetite) [26].

Monazite metal is composed of about 61 % light earth elements, 27.8 % phosphate, 5.8 % thorium, and 0.5 % uranium and therefore it is radioactive. Therefore, the accumulation of this metal may cause high radiation risks [26].

Laboratory and field studies have proven that it is possible to safely dispose of monazite ore of a radioactive nature on the one hand, and on the other hand to benefit from it economically due to its economic elements such as rare earth elements that are used in many different industrial applications in addition to strategic products such as nuclear fuel such as uranium and thorium, by performing chemical treatments of the mineral to obtain high-grade concentrates from various elements.

3.5.2. The role of nuclear technology valleys and technology incubators in maximizing the added value of the bitter liquid found in Qaraun Lake, Egypt. Egypt is characterized by the abundance of lakes and depressions that are flooded with seawater, which helped in the spread and establishment of natural and artificial solar Salinas on the shores of these lakes, given that they are primary areas of concentration in the salt industry [27].

The production of salt in Egypt was limited to solar Salinas and the deposition of table salt only. As for the combined production of salts available in the water source, whether it was the shores of the seas or lakes, the country did not go to it except in one example, which is the extraction of salts from Qaraun Lake in Faiyum, southwest of Cairo, where it begins to extract Sodium sulfate salts, followed by table salt by washing and purification by innovative methods, then the production of magnesium sulfate salts for the first time in Egypt from the bitter liquid leftover from the previous salts extraction processes, which resulted from its manufacture to purify the incoming solutions to produce a new type of high-purity table salt, which is the vacuum salt [28].

The main problem for Qaraun Lake water is the reception of large quantities of agricultural and sanitary drainage water for the Faiyum Governorate, along with the continuous thermal evaporation of the lake water, which is considered from the closed lakes, which leads to the concentration of salts. In addition to the presence of some salt production companies located on Qaraun Lake that tend to bury the bitter liquid produced after extracting their basic products from table salt, sodium sulfate, and others [29].

This liquid is characterized by the presence of high concentrations of some salts, especially the harmful salts of boron, magnesium, calcium, and bromine, which affects the production of pure table salt, as this leads to an increase in sales in the land surrounding Qaraun Lake, which is transferred with the agricultural and sanitary drainage water of the governorate, as well as the rainwater to the lake. To increase the level of dissolved salts (TDS) from 34 to 44 grams/liter, which in turn affects the life of organisms and marine life in the lake [30].

Laboratory and field studies have proven that the bitter liquid whose salinity reaches 815 grams/liter can be extracted from the salts of important economic elements, especially those used in the manufacture of medicines such as magnesium oxide, as well as magnesium sulfate that is used in the manufacture of fertilizers, as well as magnesium carbonate that is included in Ceramic industry, in addition to sodium carbonate (Soda ash), which is used in many important chemical industries [27].

In addition to extracting boron «the very important element» form boric acid which is used in many industries, especially the nuclear industries, as it is used in the preparation of boron plates that are used in the Manufacture of control panels in nuclear reactors [28].

The salts of the mentioned economic elements represent more than 50 % of the bitter liquid content, there are many important elements associated with sodium chloride, such as magnesium and boron, which can be focused on extracting them due to their economic importance on the one hand and for the purification of salt to benefit from it to raise the economic value of salt and obtain from it many important salts. The study was conducted on the bitter liquid and rock salt produced from Lake Qaraun.

3.6. Legal Regulation for establishing and managing valleys and technological incubators in nuclear activities. The Egyptian Law for Science, Technology and Innovation Incentives No. 23 of 2018 defined specific rules for the establishment of science and technology valleys and technology incubators in general, which of course apply to nuclear valleys and incubators [31].

3.6.1. Rules for establishing valleys and nuclear incubators. *The valley is established through the following rules:*

1. Proposal of the nuclear scientific Authority.

2. Approval of the scientific authority of the Nuclear Authority (the Board Directors of the Authority).

3. The decision of the competent minister to which the authority is affiliated (the Minister of Electricity and Renewable Energy).

4. The decision includes:

– Indication of location, coordinates, and area.

– The nature of activity or activities that may be practiced inside the valley.

– The schedule is specified for its establishment and operation.

– Any other conditions related to practicing valley activities.

The most important services related to activities inside the valley; are:

1) Technology incubators.

2) Services for the manufacture or development of semi-industrial output.

3) Hosting companies based on research outputs with limited capabilities, such as a transitional period of no more than twenty-four months in preparation for relocation to external industrial headquarters.

4) All kinds of services needed by incubators, companies, and beneficiaries within the valley; Such as legal, financial, and marketing advice, among others.

The Egyptian law permits the scientific Authority to contract with a developer to establish, manage, develop and promote the valley or carry out any of the works according to the specified timetable.

The law specified the procedures for establishing the valley as follows:

– The scientific Authority applies to establish the valley to the «Committee for the Affairs of Science and Technology Valleys, Technology Incubators and Companies» at the Ministry of Higher Education and Scientific Research, accompanied by the required documents.

– The committee addresses the relevant authorities with a request to establish the valley.

– The committee prepares a report for presentation to the competent minister regarding the submitted application, indicating the reasons for acceptance or rejection.

– The Concerned Minister issues a decision to establish the valley [31].

The incubator is established through the following rules:

1. The proposal of the nuclear scientific Authority.

2. Approval of the scientific authority of the Nuclear Authority (the Board of Directors of the Authority).

3. The decision of the competent minister to which the authority is affiliated (the Minister of Electricity and Renewable Energy).

4. The decision includes:

– Specialization of the incubator.

– Whether it is virtual or not.

– The nature of activity or activities that may be practiced within the incubator.

– The services that provide.

– An incubator management guide.

– Any other general conditions related to practicing the activities of the incubator.

The most important services related to activities within the incubator; are:

1) Specialized laboratories or workshops in research fields related to the incubator's field of work.

2) Technical support for activities and ideas within the incubator.

3) Preparing legal and marketing studies for all ideas emerging within the incubator.

4) Marketing the outputs resulting from research and development within the incubator.

5) Hosting startups with limited capabilities, such as a transitional period of no more than twenty-four months, in preparation for relocation to external industrial headquarters.

6) All kinds of services needed by the incubator outside the valley to operate it; Such as legal, financial, and marketing advice [26].

The Egyptian law permits the scientific Authority to contract with a developer to establish, manage, develop and promote the incubator or carry out any of the works according to the specified timetable.

The law defines the procedures for establishing the incubator as follows:

– The scientific Authority applies to establish an incubator to the «Committee for the Affairs of Science and

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Technology Valleys, Technology Incubators and Companies» at the Ministry of Higher Education and Scientific Research, accompanied by the required documents.

– The committee shall address the relevant authorities with a request to establish the incubator.

– The committee prepares a report for presentation to the competent minister regarding the submitted application, indicating the reasons for acceptance or rejection.

– The competent minister issues a decision to establish the incubator [31].

3.6.2. Management rules of valleys and nuclear incubators.

3.6.2.1. The administrative structure of the valley. *The valley is managed by a board of directors formed under the chairmanship of the relevant competent authority, and the membership of each of:*

1. Representatives of the Authorities concerned with the activity or main activities licensed to practice within the valley.

2. Representatives of the authority that has jurisdiction on the ground.

3. Representatives of Authorities supporting and financing activities inside the valley.

4. A member or more of the entities licensed to develop in the Valley and the investors.

5. One or more members with experience.

6. Anybody that the competent minister deems to be represented in the council.

A decision of the competent minister shall be issued to form the board of directors and nominate its members based on the scientific authority's proposal.

The term of the council is three years, can be renewed.

The decision determines the work system of the Board of Directors and the allowances and remuneration of its members.

The board meets at least once a month or whenever needed.

The competent minister, after consulting the competent scientific authority, may dissolve the valley's board of directors if it breaches its responsibilities [32].

The Valley Board of Directors undertakes the following specializations [33]:

– Setting criteria for accepting the incubation of an idea, innovation, or emerging company, or developing a scientific research output or product, taking into account those criteria the best use of the valley areas through economic feasibility studies, and the expected material return.

– Setting the conditions, standards, and rules for the general, private, and construction planning of the valley; guarantees the availability of international standards and specifications, and supports the competitiveness of the valley.

– Setting the conditions and standards necessary for issuing approvals and licenses to practice any activity within the valley, or to suspend or cancel them.

– Setting criteria for determining intellectual property rights and incubation costs between the authority on the one hand and the principal researchers on the one hand, and any other external funding agency.

– Granting a license to practice any of the valley's activities or services, provided that the decision issued for the license includes a statement of the purposes for which it was granted and it is period.

– Determine the fees for the services provided by the executive office of the valley and the activities it is licensed to practice.

– Follow up the executive position of the valley and the activities licensed to be practiced in it.

– Approval of the decisions of the Executive Director of the Valley.

– The council may form a committee or more of its representatives who work in the valley or with experience to undertake specific tasks for the benefit of working in the valley [31].

The valley shall have an executive director with international experience in fields related to scientific research, its management, and communication with industrial or service entities.

A decision of the competent minister shall be issued to appoint the executive director and determine its financial treatment, based on the nomination of the competent scientific authority, based on what is presented by the Valley's Board of Directors.

The Executive Director shall be responsible for the Board of Directors for all the decisions it makes, and it shall submit a monthly report about them and the activities of the Valley to its Board of Directors.

The executive director may be dismissed by a decision of the competent minister based on the request of the competent scientific authority in light of what is presented by the Valley Board of Directors if it breaches its responsibilities or the duties of its job.

The executive director of the valley is responsible for managing the financial and administrative affairs of the valley, and in particular:

– Follow up on the implementation of the Valley Board of Directors' decisions and deal with all parties related to the activities carried out in it.

– Examining requests for practicing any activity inside the valley according to the applicable conditions and preparing a report to be presented to the Valley Board of Directors, including its opinion thereon, within a month of the date it received the application, fulfilling its documents.

– Follow-up and control of the activities and services established inside the valley to determine the extent of its commitment to the conditions, controls, and procedures for practicing the activity or service.

– What other functions are assigned by the Valley Board of Directors [31].

3.6.2.2. The administrative structure of the incubator. *The incubator is managed by a board of directors formed by a decision of the competent scientific authority, based on the proposal of the competent authority* [34]:

– The term of the council is three years, can be renewed.

– The decision determines the work system of the Board of Directors and the allowances and remuneration of its members.

– The board meets at least once a month or whenever needed.

– The competent scientific authority, after taking the opinion of the competent authority, may dissolve the incubator board of directors if it breaches its responsibilities or duties.

– If there is more than one technology incubator in the authority, it may be managed by a single board of directors representing all of them.
– It is permissible, by a decision of the competent scientific authority approved by the competent minister, to entrust to the Board of Directors of the Valley the competencies of the board of administration of incubators, if it determines that there is no need to form a board of directors for it.

The Board of Directors of the Technology Incubator undertakes the following specializations:

– Setting criteria for accepting the incubation of an idea, innovation, or emerging company, or developing an external or internal application, provided that these criteria take into account the best use of spaces within the incubator through economic feasibility studies and the expected financial return.
– Setting criteria for determining intellectual property rights and incubation costs between the authority on the one hand and the principal researchers on the one hand, and any other external funding agency.
– Determine the fees for the services provided by the incubator.
– Overcoming the obstacles facing the developers of the technology incubator with the concerned authorities as much as possible.
– Follow-up of the incubator's executive position and the activities it is licensed to practice in it.
– The Council may form a committee or more of the members represented by it and the employees of the incubator or with experience to undertake specific tasks for the benefit of working in the incubator [31].

The incubator shall have an executive director with international experience in fields related to scientific research, its management, and communication with industrial or service entities.

A decision by the competent authority shall be issued to appoint the executive director and determine its financial treatment after approval of the competent scientific authority and the opinion of the incubator board of directors.

The Executive Director is responsible for the Board of Directors for all decisions it makes, and it is obligated to present them to it at its first meeting to decide whether or not to approve them.

The executive director may be dismissed by a decision of the competent authority after the approval of the competent scientific authority in light of what is presented by the incubator board of directors if it violates its responsibilities or the duties of its job.

The executive director of the valley is responsible for managing the financial and administrative affairs of the technology incubator, and in particular:

– Issuing the licenses to practice any activity within the incubator by the laws, decisions, standards, and controls established by the incubator's board of directors in this regard.
– The incubator's board of directors may approve, amend or cancel the license, after presenting it in the first meeting by reasoned decision.
– Follow up on the implementation of the decisions of the incubator board of directors, and deal with all parties related to the activities carried out within the incubator.
– Follow-up and control of the activities and services established within the incubator to determine the extent of its commitment to the conditions, controls, and procedures for practicing the activity or service.
– Other specializations are assigned to it by the incubator board [31].

3.7. Discussion of the research results. The interest of science and technology valleys and technology incubators to activate the partnership with research institutions, production and service sectors, and community institutions, as an urgent necessity to form a scientific, production, and service base that is highly efficient in society, leads to the adoption of programs and activities to produce serious industries or develop existing industries or maximize Added value to some industries [35].

The technological entities of universities and research institutions are one of the most important tools for sustainable development, which are the laboratories and entities that support scientific research and innovation that are established to provide technical and scientific services and facilities for scientific research projects, support mechanisms, and technical consultations for innovators and emerge companies through the outputs of scientific research to reach prototypes that can be adapted for industrialization by transforming creative ideas and applied research into successful production and industrial projects.

Through this study, it is possible to scientific, technological, and administrative rooting for the nuclear Authorities to establish, manage and operate science and technology valleys and technology incubators for semi-industrial or complete industrial projects to provide nuclear elements needed by the Egyptian nuclear program and extract the economic elements and minerals associated with the nuclear elements, through which expansion and development Many industries, raising the added value of others, and eliminating the problems facing many vital industries.

However, the implementation of this study may be hindered by some issues represented in determining the activities through which these valleys and technological incubators should operate, the required outputs, methods of financing them, and how to market the products.

To eliminate these obstacles and develop the results of this study, the following must be followed:

– Valleys and nuclear technology incubators must keep pace with the objectives of the state's general policies, and those policies must be based on the outputs and projects of these valleys and incubators.
– Integration of policies so that they do not operate in isolation from each other, as the opportunity to establish nuclear valleys and establish nuclear incubators requires a legislative framework and a legal infrastructure to stimulate the large projects that result from these valleys and incubators.
– Emphasis on the various services provided by valleys and incubators for the various projects, especially the pioneering ones, and overcoming the difficulties facing the incubated projects to enhance and spread the spirit of leadership among those in charge of these projects.
– Establishing consortiums between nuclear Authorities, universities, and research institutes at the national level to take advantage of the available laboratories, tools, and supplies, to provide a productive and stimulating environment for the exchange of ideas and constructive proposals that benefit in establishing nuclear valleys and incubators.

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– Establishing consortiums between the nuclear authorities and the facilities concerned with nuclear technological innovation at the regional level to provide the necessary resources and exploit the advantages and infrastructure available in neighboring countries.
– Promoting the role played by valleys and nuclear technology incubators, and marketing their products in a manner that attracts major investors in related projects.
– Promulgating the leadership culture among researchers in facilities related to nuclear activities to urge them to establish valleys and incubators, and to enhance social capital in incubated projects, thanks to the existence of a supportive network of relations between members of work teams and investors.

3.8. Declaration of competing interest. The author declares that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

4. Conclusions

It is shown that many countries depend on nuclear technology for many industrial, agricultural, medical, and engineering applications. And many of the nuclear ores, such as the monazite ore found in the black sand scattered on the coasts of the Mediterranean in Egypt, contain many rare earth elements that are used in many industries on which many countries depend.

The research presents the importance of establishing science and technology valleys and technology incubators to foster innovations and inventions related to nuclear activities and establishing large and medium industries to deal with nuclear elements and their accompanying elements. And the importance of establishing and managing science and technology valleys and technological incubators related to nuclear activities under the rules contained in Egyptian legislation.

The results will have a great impact in encouraging investors and financiers to enter into technological partnerships with nuclear agencies in Egypt for the sake of safe investment in the elements associated with nuclear materials.

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