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HANOI ARCHITECTURAL UNIVERSITY

LE THI AI THO

**MANAGEMENT OF SPACE, ARCHITECTURE,
LANDSCAPE OF INDUSTRIAL ZONE IN HANOI CITY**

SPECIALIZATION: URBAN AND CONSTRUCTION MANAGEMENT
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INTRODUCTION

1. Rationale

Hanoi is the heart of the Vietnam, the center of politics, culture, science and technology, Hanoi has invested in construction and development of industrial zones (IZs) quickly, attracting many investment projects in and abroad investors. As of 2019 Hanoi, there are 18 IZs have been authorized by the Prime Minister to establish and approve the planning portfolio with a total area of nearly 5,200ha and have brought many benefits to the development of Hanoi.

However, IZs contributions are not commensurate with the goal of the proposal, in fact there are many problems in the development process such as the use of industrial land is not yet effective, the status of using land in wrong way is still happening. The architecture is built with 1 floor, spreading almost in area, monotonous images, simple materials, poor aesthetic and non-specific space. The landscape is not invested reasonably, lack of green areas, sub-scene and public utilities to serve the workers. One of the causes of the above problems that is the management of space, architecture, landscape of IZs in HaNoi has many problems as follows: The management of the organization implementing the planning, management of land resource utilization has not good, do not really understand about the long-term goal of the use of urban space, organization of landscape and architecture in IZs in the city; comfort conditions and facilities for workers, green environment has not been care with the point of economic growth benefit must be parallel with environmental protection, landscaping and conditions for employees; Legal documents, regulations on space, architecture, landscape for IZs have been missing. The State management structure is not strong and flexible enough. Advances in Science and technology are rarely applied. Beside that lack of sharing of responsibilities and rights of stakeholders in the development of IZs including the Government-Investor-Community- Consultants.

Currently the world has been undergoing a phase against the epidemic Covid 19 along with it is the pull of many changes in economic development and the global production chain. Create a trend to move the production chain into Vietnam especially in the big city such as Hanoi or Ho Chi Minh, where is consider favorable, safe, attractive area and full of functions for the post-Covid of foreign investors. Therefore, it is necessary to have timely studies to ensure the effective state management of IZs in general and space, architecture, landscape in IZs in Hanoi in particular. From the perception that this is a scientific task of importance in the management of urban Development, the selection of the research topic "***Management of space, architecture, landscape in industrial zones in Hanoi City***" is necessary with the purpose that the sustainable development for Hanoi Capital.

2. Purposes of research

The study proposed the solutions to improve effectiveness in management of space, architecture, landscape in IZs in Hanoi with the aim of increasing the efficiency of land use, beautiful and uniform in the construction of buildings, good environment and comfortable facilities for IZs, towards Hanoi is the city of Green, Cultural, Civilization, Modern and Sustainable.

3. Subject and scope of research:

- ***Subject of research:*** Subject of the study is state management of space, architecture, landscape IZs in Hanoi

- ***Scope of research***

+ Space/location: Industrial zone in Hanoi city.

+ Time: The thesis carries out the research in the period to 2030, with the vision of 2050 according to the general planning of Hanoi Construction Master.

4. Research Methodology

The thesis uses research methodologies including: Data collection and Site survey; Sociological investigation; Statistic and Comparison; Expert consultation; Forecasting; Interview.

5. Scientific and practical significance of the topic

- ***Scientific significance***

+ Overview of theory and practical about space, architecture, landscape in IZs and management of space, architecture, landscape in IZs in Hanoi city.

+ The thesis will help completing and developing management science content about space, architecture, landscape in IZs in general and management of space, architecture, landscape in IZs in Hanoi city in particular.

+ The study results can be used as reference materials in scientific research, and It is the basic condition to correct the legal documents on management of space, architecture, landscape in IZs.

- ***Practical significance***

Identify main issues on management of space, architecture, landscape in IZs in Hanoi; Completing on management regulations of space, architecture, landscape in Vietnam and Hanoi; Contributing to establish the management regulations, construction planning, renovation in IZs current and in the future.

6. New contributions of the thesis

(1.) Overview and assessing the current situation of the space, architecture, landscape of the industrial zones and the management of the space, architecture and landscape of the industrial zones in Vietnam and Hanoi capital.

(2.) Give the general calculation and at the same time about 03 objects are space, architecture, landscape in IZs. That is give the suitable floors for building and adjustment index in construction building and landscape area to manage effectively of space in IZs, especially in Hanoi city.

(3.) Proposed management criteria and solutions to manage the space, architecture, landscape in IZs in Hanoi.

7) Concepts and glossary interpretation in the thesis

- *Space of IZs*: is limited by the three dimensions of the zone covering the surface of the land; the space is empty and the underground.

- *Architecture of IZs*: These objects occupy the space that has been built according to the requirements of the production process such as public buildings, production buildings, warehouses, auxiliary houses, engine areas, underground works, etc.

- *Landscape of IZs*: The rest of the space is composed of natural elements such as natural areas, lakes, water areas... or created and built by humans in order to have the comfortable conditions and good areas for workers.

- *Managing of space, architecture, landscape in IZs* is the process of impact of state management agencies on the space, architecture, landscape in IZs to achieve unity, harmony and efficiency

8) Thesis Structure:

The thesis consists of 3 parts: Introduction; Main content; Conclusions and Recommendation. In particular, the content consists of 3 chapters:

- Chapter 1: Overview of space, architecture, landscape management in industrial zone in Hanoi. (50 pages)

- Chapter 2: The scientific basis of space, architecture, landscape management in industrial zone in Hanoi. (46 pages)

- Chapter 3: Solutions for space, architecture, landscape management in industrial zone in Hanoi. (48 pages)

CONTENT

CHAPTER 1: OVERVIEW OF SPACE, ARCHITECTURE, LANDSCAPE MANAGEMENT OF INDUSTRIAL ZONES IN HANOI

1.1. Development and management of IZs in the world and Vietnam

The thesis has overviewed of the situation, the development stages as well as the development model of IZs in the world and Vietnam. Especially the the management issues of IZs in domestic and abroad such as planning management, construction and environment management; Organization of management structure; the policy ..etc..

1.2. Situation of space, architecture, landscape of IZs in Hanoi

- *The situation of developing IZs in Hanoi*: There are 18 IZs in city in which 08

IZs have operated, 05 IZs are building and 05 IZs already in IZs planning list in Hanoi. The major industries allowed to develop in Hanoi are light, clean and less polluting industries including: Electronics, mechanical engineering, chemical, pharmaceutical and cosmetic, agriculture products, food, textile, footwear, construction materials, interior decoration.

- *Situation of space*: Distribution planning of IZs in Hanoi with an average scale of 290ha, almost located next to national highways such as Hanoi- Dai Tu IZ, near the airport such as Noi Bai IZ, near the national railway such as Sai Dong IZ or at the gate location of the Capital such as Bac Thang Long, Quang Minh IZ... are convenient for development and also make an important contribution to create the image and unique space for the capital.

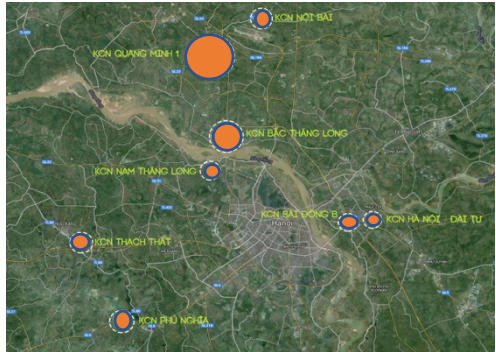


Figure 1.1: 08 operating IZs in Hanoi

However, it is possible to see the current situation of space in IZs faces many problems such as lack of uniform planning, lacks peculiarity space. Public space and green landscape are not respected.

- *Land use*: The use of land in IZs has not been effective, many areas have been used in wrong purpose, construction spread with high density, lack of land area for the green landscape.

- *Architecture of IZs*: The buildings are almost the low-rise factories which constructed in the square plots. Monotonous form, the simple materials, pre-made steel buildings are the main architecture of IZs. The public functional areas, administrative and auxiliary buildings and technical works are degraded.

- *Landscape of IZs*: greenery, water surface, grass cover is the biggest factor landscaping in the IZs but is limited. Landscape architecture is not properly concerned, landscape space is not organized in a synchronized way... resulting in aesthetic imagery and the quality of the landscape environment are not guaranteed.

1.3 Situation of space, architecture, landscape management in IZs in Hanoi

- *Space management*: The development and planning works of IZs is still weak; The development forecast of the capital has not foreseen the speed of urban development resulting that many IZs have not followed for development as well as ensuring the conditions of environment and comfortable condition in the process of development

of IZs. The planning work, construction and land management work in IZs has not taken seriously. It is possible to see that IZs lack of linkage, do not have peculiarities, less aesthetic imagery and not consistent with the trend of sustainable development.

- **Architecture management:** The construction management work still have many problems and not ensuring the regulations. The system of legal regulations in construction management and the development orientation in IZ are lacking and weak in scientific basis. Not close to the requirements of reality, the management power of IZs is not strong and effective. Many factories are built illegal, renovated and expanded factories lack of regulation; many land areas are encroached according have many messy images in the IZs, not ensuring of fire safety requirements as well as environmental sanitation of the factories.

-**Landscape Management:** Landscape management has not been taken seriously from the beginning of the project to the IZs operate. IZs only have factories and warehouses without landscape architecture and greenery.

In addition, the inspection, supervision, implementation and maintenance of landscape works have not been strictly and carefully. The sanctions are not enough to discourage, still depends on many agencies leading to the compliance of enterprises with regard to creating landscape and environment for IZs is not good. Therefore, the landscape and environmental quality of IZs are lacking in aesthetics

- **Legal basis:** The previous regulations do not really care the impact of the management of space, architecture, landscape of IZs. Specifically, do not show the concept and requirements of management of space, architecture, landscape of IZs in legal documents such as:

- + Capital Law has not determined the positions, functions, requirements, environmental conditions, aesthetics of the IZs in Hanoi with the vision to 2050.
- + Urban Planning Law 2009 has not mentioned the IZs planning in special cities such as Ha Noi or Ho chi Minh City.
- + Decree No. 38/2010/ND-CP on Urban Management of space, architecture, landscape but has not regulated and has individual regulations on management of space, architecture, landscape of IZs.
- + Decree No. 29/2008/ND-CP on IZs and now Decree No. 82/2018/ND/CP regulations on management of IZs does not mention the management of space, architecture, landscape in IZ.
- + Vietnam's construction codes and standards have not specified the planning on the land use of IZs in special urban with the requirements of saving resources and using efficiency.
- + National standard TCVN 4514:2012 on Factory- Master Plan- Standard design

which lacks the specified standards for the elements of public buildings, service-houses, supporting buildings for Factory and IZs.

+ Decree No. 82/2018/ND-CP dated May 22, 2018 on the management of IZ has not yet regulated bidding rules; adjusted old standards and codes; increased land tax... For IZs are operating, it is necessary to have new regulations to solve the not good previous problems. At the same time, it is necessary to consider the scale areas for IZ in detail to suit the urban construction land management special as Hanoi City.

+ Circular 19/ BXD/2010 does not have a sample regulation on the management of space, architecture and landscape of the IZs.

+ According to the Joint Circular 06/2015 / TTLT-BKHDT-BNV dated September 3, 2015 guiding the functions, tasks, powers and structure of the management Board of IZs there is not inspection function. Therefore, the inspection, examination and supervision of IZs violations directly managed by the management Board are ineffective.

+ The Prime Minister's Decree 29/2007/ND-CP dated February 27, 2007 on Urban Architecture Management shows out the architectural requirements and regulations for the management of urban architecture and landscape but without mentioning the regulation of architecture and landscape management of IZ.

+ Decision 70/2014/QĐ-UBND dated September 12, 2014 on regulations on management of planning and general architecture of Hanoi City that mentioned IZ in Article 27.28. However, there are no specific regulations on architectural management for IZs in the city.

+ Management methods by new technologies, information technology and smart industrial factories ... are still rarely applied in Vietnam. The regulations in this field are very lacking and weak and unable to follow the development and integration requirements of the IZ in the future.

- Problems in the operation and organization of the IZs management apparatus

+ Management Board of Hanoi IZs and EPZs: The Management Board mainly performs administrative and professional management tasks under the authorization of the departments, not directly assigned by the specialized ministry or directly authorized by the City People's Committee. This leads to an overlap and confuse in IZ management.

+ The Management Board of Hanoi IZs does not have the function of inspecting, examining, monitoring and handling violations, so it also greatly limits the management.

+ The coordination and assignment between the Management Board of the IZs of Hanoi City and relevant agencies as well as with localities is not close and enough.

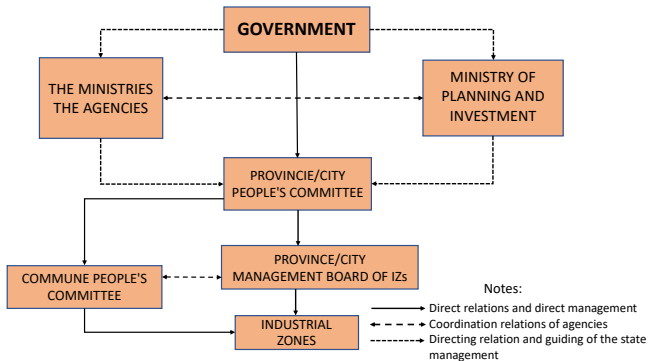
+ The contingent of full-time management staffs is lacking and weak in specialized knowledge.

+ Members of the management apparatus are mainly appointed from the government, not paying attention to the multidimensional nature and related entities in the management of the IZs including: Government - Investor - Community – Consultant.

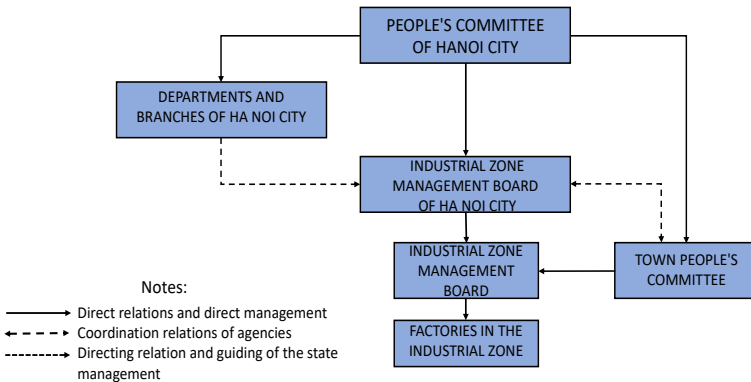
+ Modern machinery and information technology applications are limited. The data is less digitized and empty. This has greatly limited the efficiency of IZs management.

- **Management Structure:** According to Decree 82/2018/ND/CP structure as follows:

*Diagram 1.1:
Structure of state
management of
industrial zones in
Vietnam*



*Diagram 1.2:
Industrial zone
management
structure in
Hanoi*



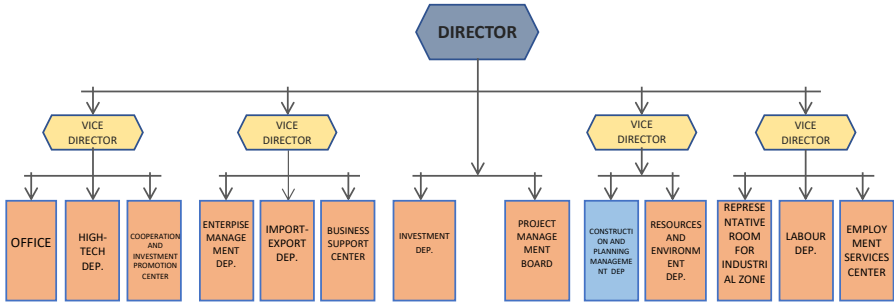


Diagram 1.3: The organization of the industrial zone management Board in Hanoi

1.4. Scientific research projects, relevant doctoral thesis and master thesis.

The published researches include 16 doctoral thesis and 02 master's thesis and many books, scientific research topics and domestic and international seminars. The authors have proposed many models and solutions for planning, landscape as well as solutions to improve the management capacity of IZs in different fields. However, there has not been a research project that specifically analyzes the management of space, architecture, landscape for IZs in Hanoi city, nor has proposed solutions, uniform consistency in the management apparatus and new solutions in the current period of strong and modern industrial development.

1.5. Major issues to be solved

Base on analysis and general assessment of the current situation of the IZs management of space, architecture, landscape in foreign countries, Vietnam as well as in Hanoi city. The main issues to be solved in the thesis are follows:

- Develop principles and criteria for management of space, architecture, landscape of IZs in Hanoi
- Prepare solutions to manage space, architecture, landscape of IZs in Hanoi city as follow: Increase the efficiency of land use; Management of minimum construction density; providing evaluation criteria to be achieved in the management of architecture and landscape of the IZ.
- Supplement and complete the legal basis for the management of space, architecture, landscape of IZs in Hanoi
- Proposing a new management apparatus model to improve the efficiency of management of space, architecture, landscape of IZs in Hanoi
- Enhance the role and responsibility of the community and resolve the relationship between stakeholders in the management of space, architecture, landscape of IZs in Hanoi.
- Completing the inspection and supervision of the IZs in the city.

- Apply information technology, advanced equipment in the management of space, architecture, landscape for IZs in Hanoi.

CHAPTER 2: SCIENCE BASIS OF SPACE MANAGEMENT, ARCHITECTURE, LANDSCAPE OF INDUSTRIAL ZONE IN HANOI

2.1 Theoretical basis

- Industrial park in urban structure
 - The role of the industrial park in the urban area
- Classification and classification criteria
 - + According to management characteristics
 - + By scale
 - + According to management level
 - + Investment form
 - + By product type
 - + According to the level of constructio

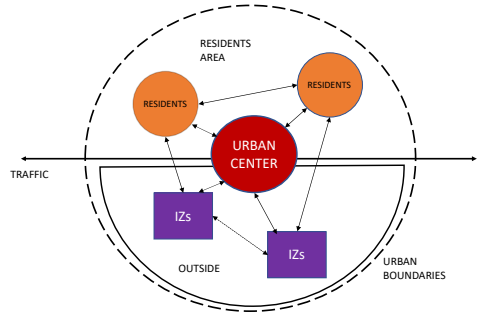


Diagram 2.1: Industrial zones in urban structures

- The theory of planning and organizational principles of landscape in IZs.
- Theories of state management in urban; Urban management; State management for IZ development; IZ management basis; Theory of state management of space, architecture, landscape in urban; Management role of space, architecture, landscape of the IZ; Theoretical trends of IZ development.
- Contents of management of space, architecture, landscape of the IZ
 - + For industrial zone space: The overall space and specific space in the IZ are managed according to the planning of the IZ; The regulations on management of the IZ; The urban design; Manage the space of the IZ according to the basic areas: The IZs has been built, has being built and will be built; the adjacent areas of the IZ; Ensuring the relationship, strict consistency of sapce, architecture, landscape between inside and outside the IZ; Combining the existing topography, specific areas, greenery system, water surface, and traffic system creates a space for connecting, unifying, protecting and improving the IZ environment.
 - + For industrial zone architecture: The architectural building in the IZs include public buildings, services buildings; factories, warehouses, technical and auxiliary buildings that are built, renovated, modified must be follow the planning of the IZ and construction permit and IZ management regulations and the local architecture throughout the operation of factory

+ For industrial zone landscape: The landscape management of the industrial zone it means considering the content and the effectiveness of the correlation between the landscape of trees, water surface, and general architectural buildings such as: monuments, advertising boards, signing boards and resting facilities; The industrial park landscape is also directly managed by the IZ Management Board and the owners of enterprises are responsible for building, protecting, and maintaining during the operation of project; The construction, renovation and embellishment of architectural buildings, mini-landscape works in the landscape areas in the IZ must be follow the regulations on the management of the IZ, minimize the change of terrain and other environmental conditions. In addition, it also manages the environmental quality of the IZ landscape.

2.2. Legal basis for management of space, architecture and landscape of industrial zones in Hanoi.

- Major guidelines, orientations and policies according to decentralization: legal documents are issued according to the decentralization related to IZs and the management of IZs through Laws, Decrees, Decisions, Circulars ...

- The legal documents: The legal framework related to the planning, construction and management of IZs issued by the competent authorities is a tool to manage the IZ. The legal documents on construction management and management of space, architecture, landscape is summarized in the diagram 2.2

- Technical standards and regulations

National regulation QCXDVN 01:2019 on Construction and Planning has not stated specific regulations for IZs.

National standard TCVN 4514:2012 on industrial enterprises – Master plan - Design standards. The regulations on basic design content for industrial enterprises still lack standards for public buildings, services and ancillary buildings in the IZ

- Planning project and regulations on the management of IZs:

The general planning project to build Hanoi capital to 2030, with a vision to 2050 was approved by the Prime Minister in Decision No. 1259/QĐ-TTg dated July 26, 2011; Accordingly, the development orientation of clean industries, less pollution and high-tech zones.

Circular 19/2010/TT-BXD dated 22/10/2010 of the Ministry of Construction guiding the formulation of regulations on the management of urban planning and architecture, thereby giving the principles of urban sapce, architecture and landscape management.

Decision No. 70/2014/QĐ-UBND dated September 12, 2014 promulgating the Regulation on the management of general planning and architecture of Hanoi City,

in which Articles 27 and 28 have delineated and limited the management area of IZs and planning and space management of industrial areas.

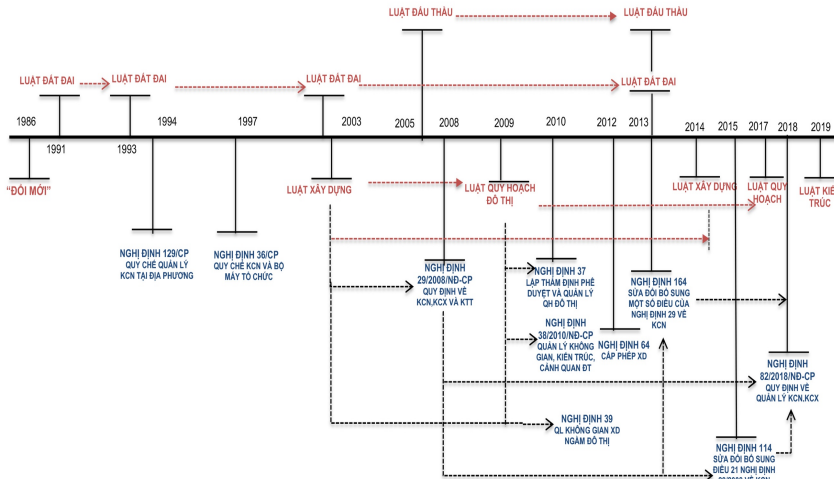


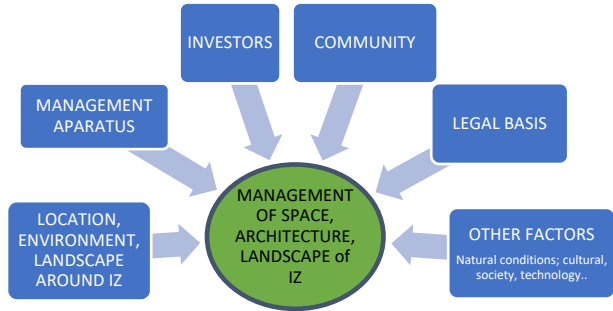
Diagram 2.2. The process of completing legal institutions in the construction and management of industrial zones in Vietnam

2.3. The factors affecting the management of the space, architecture and landscape of the industrial zone in Hanoi City

- *Factors of location, environment and landscape around the IZ:* The location of the IZ has a great impact on the management of space, architecture and landscape because it is influenced by conditions such as the location near the main traffic routes, main gate of the city, near special locations such as airports, military zones, residential areas ..; The surrounding environment and landscape conditions are components that affect the organizational solutions of space, architecture, and landscape, leading to an impact on management solutions for the IZ.

- *The legal basis:* The legal basis has many effective in the management. If the legal basis is not suitable or does not accept the development needs in the future that the state management of IZs will be ineffective and inhibit the development of IZs

Diagram 2.3:
Factors affecting the management of the space, architecture and landscape of the industrial park



- *The industrial zone management apparatus*: the management apparatus is the department performs the management of the IZ based on the management tools. Therefore, the organization of activities, capacity, qualifications and vision of the city as well as local authorities greatly affect the management of the IZ.
- *Investor factor*: Investors in IZ in Hanoi are diverse and play a huge role because they representing the state agencies supervise, implement and operate IZs. Therefore, if the investor does not strictly comply with the regulations and cooperate with enterprises in the IZ for economic benefits so the state management process will also face many difficulties and cause many problems for the state and community.
- *Community participation (workers and residents living around the IZs)*: The role of the community to supervise the activities of the government in implementing the provisions of the law on various fields. In addition, the participation of the community in the management also balances the benefits, contributes to the sharing of interests and obligations during the operation of the IZ.
- *Other factors*: Technology; Natural conditions; Society each factor has a significant impact on the management of space, architecture, landscape of IZs in Hanoi.

2.4. Results of site and sociological surveys

- *Site and sociological survey (socialization)*: The thesis has investigated, surveyed, measured, statistically, synthesized and analyzed 08 IZs operating in Hanoi City about problems related to the management of space, architecture, landscape of the IZs. Besides that the thesis investigates the socialization of 4 IZs with three subjects: Managers, Workers and People living next to the IZs. With 489 questionnaire papers, the thesis has collected summaries and analyzed the results as a practical basis for solutions in Chapter 3.

2.5. Lessons Learned

- ✓ Lesson 1: Planning and IZ development and efficient land use.
- ✓ Lesson 2: Reviewing, adjusting and build the legal basis

- ✓ Lesson 3: The management apparatus ensures consistency by clearly defining the functions, tasks and powers of the management Board. The management system must be compact and efficient
- ✓ Lesson 4: Promote the role of the community in the management, supervision and sharing in the management of the IZ.
- ✓ Lesson 5: Updating digital technologies and applications in IZ management

CHAPTER 3: SOLUTIONS TO MANAGING SPACE. ARCHITECTURE, LANDSCAPE OF INDUSTRIAL ZONE IN HANOI

3.1. Viewpoints and objectives

3.1.1. Viewpoints

1.) Space, architecture, landscape of IZ is an integral part of the space development strategy within the city boundary, contributing to building images of the capital increasingly civilized, become the most modern city of Vietnam.

2.) Management of space, architecture, landscape of IZ in Hanoi ensures the content and general requirements of developing in the direction of Green - Sustainable growth, contributing to environmental protection, saving resources and adapting to climate change.

3.) Management of space, architecture, landscape of IZ in Hanoi ensures the linkage with urban management in general, distributes general responsibilities of relevant agencies at ministerial, branch, government level within in and common boundaries with Hanoi City.

4.) Management of space, architecture, landscape of IZ in Hanoi is the general rule for all types of production, investors and forms of joint venture, forms of capital contribution; The environmental protection, convenience and community benefits, urban beauty are used as the research foundation.

5.) Management of space, architecture, landscape of IZ must ensure the consistency and consensus of relevant entities including the Government, Enterprises, Community and Consultants.

6.) Management of space, architecture, landscape of IZ in accordance with the scientific development level of the times; Application of advanced technology, new invention of architecture, planning, conservation of indigenous culture, construction, materials, waste treatment technology, interior and exterior greenery and natural features, the socio-economic position of the Capital

3.1.2. Objectives

- Create a unified space, orderly construction, beautiful landscape, safe and comfortable working environment. Promoting the specificity of the IZ in terms of

space, architecture and landscape.

- Use land effectively: In the condition that amount of land limited and it is economic value like in Hanoi, using land to build IZs effectively is an important goal in state management.

- Completing and supplementing legal basis contents for the management of space, architecture, landscape of IZs typical of Hanoi City

3.2. Principles and management criteria

3.2.1. Principles

1.) Comply with the legal basis of the management of space, architecture, landscape of the IZ.

2.) Reviewing, examining and managing in phases about the contents: environment, architecture, landscape and space adjustment for the IZ that is already in operation, is being filled up and the IZ will be invested.

3.) The complex, multi-sector IZ with dust, noise and harmful effects must be zoned for management control according to the priority that is environment, comfort and landscape.

4.) Ensuring the relationship, cooperation and coordination in the state management of space, architecture, landscape of IZs. Strengthening consensus in management between government, business, consultant and community.

5.) Ensuring the coordination, cohesion and harmonization of interests between the IZs and the safety region without distinguishing between the administrative boundaries between localities near Hanoi in the management of space, architecture, landscape of IZs.

6.) Apply modern science and technology to the management, inspection and supervision in the management of space, architecture, landscape of IZ.

7.) Managing on the basis of inheriting results and innovating in order to save human, financial and intellectual resources of each IZ and thereby improving the management basis, supplementing regulations and recommending amendments change the missing legal contents

3.2.2. Management criterias of space, architecture, landscape of IZs in Hanoi city

a. Space management criteria:

1.) Overall architectural space of the IZs: Determining the overall architectural space of the IZ according to the development orientation of the general planning of Hanoi Capital and the characteristics of manufacturing industries

2.) Land use: Have the land use plan and planning for each area and each stage in the IZ towards the correct, sufficient and economical use.

3.) The traffic routes in the IZs and in the factories: Roadbeds, sidewalks, parking

lots, separators, utilities ... are formed synchronously.

4.) Activities and means of transport: have full and clear regulations on the exploitation and operation of traffic routes, import and export goods and workers in the IZs and each industrial enterprises.

b. Architecture management criterias

1.) Buildings: Specifies functions of architectural buildings, production characteristics as well as technical infrastructure. Land plot boundaries, building functions, entrance, foundation elevation, building density, height, land use coefficient,... are statistically stated and made unified and synchronized to manage.

2.) Underground projects: Publicized and strictly controlled, designed synchronously with other projects on ground and the general technical system of the whole industrial zone.

3.) Fence: There are uniform, clear, safe management regulations and have to had the aesthetic design from the industrial zone to each industrial enterprise.

4.) Boundary: Publicized, set up red-line boundary, construction boundaries, setback space, building height ... for each factories and other functions in IZs.

5.) Technical infrastructure: Ensuring safety and correct technique for water supply and drainage, waste collection and treatment, fire protection; Lighting: brightness, color, illumination time; energy saving.

6.) Preserved areas, historical cultural relics, religions and beliefs: for areas that need to be preserved, must be preserved and promote the inherent cultural of architectural and landscape values of that area.

c. Landscape management criteria

1.) Landscape, greenery: Ensuring the density of green trees, natural and man-made landscape according to planning. Select plants suitable for regional climate as well as production characteristics in the IZ. And have take care solutions.

2.) Trees on roads: selecting trees for the right purposes, adapting to the climate and not affecting the production process in the IZ. At the same time, have the regulation to take care and maintenance.

3.) Equipment and facilities for the landscape: The equipment must be fully equipped with facilities to ensure safety and aesthetics for small to large spaces in the IZ. And have the plan to maintenance.

4.) Lighting: There are regulations on brightness, color, lighting time to ensure safety and energy saving.

5.) Advertising boards: There are specific regulations and suggestion designs for size, color, language ... as well as requirements for the safety of the structure of the boards.

6). Ensuring the quality of landscape environment: air, water, soil ...: there are specific environmental impact assessments of the environmental quality of the landscape in the IZ by indicators and updated regularly.

Other criterias for space, architecture, landscape of the IZs: Satisfaction of people who living next to the IZs and employees working in the IZs: This criterion is evaluated according to the detail point levels. Including contents of assessment such as: The participation of residents and employees with the Management Board; the consensus; the coordination ... From there we can evaluate the quality as well as the management level of space, architecture and landscape of IZs.

3.3. Solutions to manage space, architecture, landscape of IZs in Hanoi

3.3.1. Space management solution:

Land is a valuable and limited resources, especially in a specific urban like Hanoi Capital. Land management is an important component in the space management of IZs. In fact, land use in IZs still have many problems and wasting use. Therefore, the thesis proposes the solutions to manage land of IZs in Hanoi.

a. Increasing the efficiency of land use by building the number of high stories and changing the adjustment index properly. The thesis proposes a general calculation of space applicable to Hanoi City where saving and reasonable land using, as following:

$$\mathbf{A} = \mathbf{v1}$$

In which: • \mathbf{A} is the planned land lot area of the IZs in Hanoi.

• \mathbf{a} is the area of the land plot according to the IZ construction regulations in Vietnam

$\mathbf{v1}$ is an index to adjust the efficiency of land use for construction of IZs in Hanoi. Requirement $\mathbf{v1} \leq 1$ due to the specificity of Hanoi needs to save land, so it will aim to have a smaller land area than specified. To solve the problem of calculating land savings for construction while ensuring the area used for the factory as well as improving the landscape environment for the IZs. The thesis proposes the calculation for Hanoi City as follow:

$$\mathbf{v1. a} = \frac{\mathbf{v2}}{\mathbf{n}} . \mathbf{b} + \mathbf{v3. c}$$

In which:

- Land use adjustment index for urban $\mathbf{v1} \leq 1$ (special urban like Hanoi city)
 - $\mathbf{v2}$ is the index to adjust the project, it depends on the nature of production, manufacturing industries such as light industry, clean industry, toxic levels ... In Hanoi the industries that allow construction are mainly light, clean, and less polluted industry, so the required adjustment index is $\mathbf{v2} \leq 1$

- v_3 is the index for adjusting the area of the landscape
- b is the standardized land area for buildings in the IZ
- $\frac{v_2}{n}$ is the index to adjust the land area of the building, required $\frac{v_2}{n} \leq 1$
- n : Number of floors of the buildings ($n \geq 1$).
- c is the index to adjust the land area for landscapes, trees ...

Indicators v_1 , v_2 , v_3 and n will be given by the managers at the same time based on the building functions, soil types, land prices, toxicity levels... in each IZs to suit local conditions and flexible timing.

The calculation above will help managers have an overview and at the same time about the relationships and mutual effects of the components that are

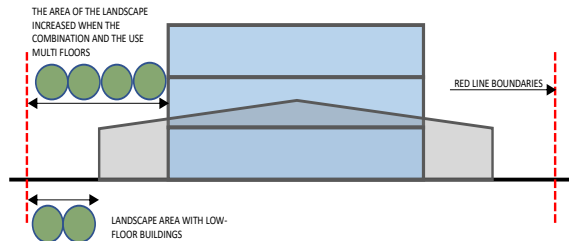


Figure 3.1 The space and landscape will be better when build

space, architecture, landscape and the number of floors to be able to calculate and give. the regulations are more reasonable for each IZ as well as the factories, suitable with long-term development strategy. These indicators and regulations can be give in the regulations on the management of IZs in Hanoi,

b. Solution to increase minimum average building density for plants

According to Appendix B in TCVN 4514: 2012 on the minimum building density of factories. The thesis has filtered out the types of industries that allow investment in construction in IZs in Hanoi City.

Thereby summarizing and analyzing the minimum construction density of 6 types of industries with 53 factories with different capacities and number of floors that can be built in Hanoi city: *Highest density 61%; Lowest secret 21%; Relative average density 46.5%*. The thesis suggests the minimum construction density for Hanoi factory from 46,5 to 51%.

*** Besides that there are practical bases such as:**

- The standard of science and technology changes in advanced. Construction and finishing materials are increasingly advanced, more durability allows shrinking structures in factory construction. The space is smaller is the way to save materials, constructions areas, electricity, lighting and energy.

- The land fund of Hanoi City is very important, the optimal and economical land use is especially the land that is converted from agricultural land to industrial land.
- Through the survey and the results of the socialization survey, it shows that the need to ensure the environment, landscape and amenities for workers and for residents in the surrounding area of the IZs requires more improvement.

For the reasons above, the thesis proposes the solutions:

Increase the minimum average building density of standard factories to apply to IZs in Hanoi from 46.5% to 51% (to 4.5%), to be able to increase land use efficiency for industries and technologies that allow construction in Hanoi. Combining all solutions above will bring many benefits to the management of the IZs, specifically saving land for construction and still ensuring the area used for production and increasing the area for the landscape. At the same time, it creates a more beautiful form and architectural layout for the IZs.

3.3.2. Architectural management solution:

a. Generalize the management of buildings by giving evaluation targets for construction works in the IZ.

Proposing solutions to provide evaluation targets as follows: Including 7 targets quantified for points based on actual conditions, the importance of works as well as the land acquisition area of each function. In the IZ (according to QCVN 01: 2019) therefore, the criteria for evaluating construction works in the IZ are approved as follows

Table 3.2: Indicators for evaluating the quality of works in IZs

No	Buildings/ items in the IZs Targets	Administrative and service works	Factories Enterprises	Stores	Engine works	Points
1	Plan shapes	7	8	3	2	20
2	Building height	5	5	2	3	15
3	Layout	7	8	3	2	20
4	Distance between buildings	5	8	1	1	15
5	Main colour	3	3	2	2	10
6	Number of floors allowed	5	5	5	5	20
	Total					100
7	Comfort, aesthetics	40%	40%	10%	10%	100%

- The targets from 1 to 6 are calculated on a scale of 100, if the project gets 75 points or more to meet the requirements for approval, and each criterion must achieve a minimum of 5 points, meaning there is no score "failed". *(These indicators are used to determine the management of the IZs that will be built in the future and are also the evaluation targets for renovation and embellishment of the IZs have operated)*

- Particularly, the 7th assessment criteria for comfort and aesthetics is determined after the investigation results with related objects are obtained, if 75% of satisfaction is reached or higher, the IZ meets the requirement and if it is lower than 75% Number of respondents, the IZ needs to consider the level of comfort and aesthetics. (*This index is used to manage IZs in operating*). The level of satisfaction and aesthetic comfort will be determined through the target and summary of the socialization survey.

b. Control the layout and image of your buildings in IZs

- Industrial architecture is typical and uniform, easily causing simple and boring. Therefore, the need to combine buildings with different heights will increase the efficiency of land use as well as avoid monotony in the space and architecture of the IZs.

- *Regarding images of industrial buildings*: Must have regulations on the side, backside walls of buildings or designing of the warehouse because these often facing the street.

3.3.3. Landscape management solution:

a. By the evaluation targets: The objects of landscape management of the IZs include: trees, lawns, water surface, small landscape, signboards, connecting houses, lighting, landscape environment quality at positions features in the IZ. Specifically, it will be quantified and evaluated as follows:

No	Function works Targets	Center areas	Open space	Roads	Service areas	Future areas	Point
1	Trees	7	7	6	3	2	25
2	Lawns	2	2	2	2	2	10
3	Water, fountain	4	2	0	2	2	10
4	Monuments	5	3	0	1	1	10
5	Sign and Adv boards	2	2	3	2	1	10
6	Items of landscape (seats...)	2	3	3	1	1	10
7	Conection lobby	3	5	2	0	0	10
8	Lighting	4	4	4	2	1	15
	Total						100
9	Quality of the landscape environment						100
	- Soil	8	8	5	5	1	25
	- Water	7	7	0	10	0	25
	- Air	5	5	5	5	5	25
	- Trees	5	8	5	5	2	25

- If the 8 above-mentioned targets total 75 points or more and there is no "failed" point, means the minimum achieved score of each indicator is 5 points, the project will be appraised and approved. (*This condition applies to the IZs will invest in the future*).

- The 9th indicator of landscape environmental quality (*this parameter is determined and assessed by the environmental impact assessment tools and environmental monitoring stations.*) This indicator, after being checked, evaluate and quantify on a scale. If the total score reaches 75 points or more, the industrial park or factory will meet the requirements of operation and ensuring the quality of landscape environment. (*This indicator No. 9 is applied to IZs that have been and are operating for renovation embellishing environmental landscape quality*)

b. Landscape environmental quality management solutions

- Pay compulsory fees for investors to build, manage, maintain and take care of landscape of IZs and Factories.

- The rate of land for green trees is 15-20%, isolated trees are not included in this index.

- Reserve land areas: There are regulations, measures and sanctions against this area for each IZ and industrial enterprise when the factory begins to operate.

- Landscape environmental quality management: controlling the quality of landscape environment, proposing to set up monitoring points according to geometrical grid with suitable distance across the whole IZ instead of current some discrete measuring stations.

3.4. Supplement and complete the legal basis for the management of space, architecture, landscape of the industrial zone.

- Review, supplement and complete legal basis related to the management of space, architecture, landscape of IZs

No	Legal documents	Current situation	Propose solutions
1	Urban Planning Law 2009	Lack of circulars specifically guiding the content of planning of IZs for special cities like Hanoi	It is necessary to have guiding documents on the contents of the IZs planning for special cities.
2	Capital Law	Only requirements for space, architecture, and landscape for the urban	Additional content requirements about management of space, architecture, landscape of the IZs
3	Inspection Law	There is no inspection function at the IZs Management Board in Hanoi	Adding the IZ inspector to the list of specialized inspection. The IZs Management Board

			has the function of inspection, supervision and punishment
4	Decree 38/2010-ND/CP dated 7/4/2010	No regulations on management content of space, architecture, landscape for IZs	Additional content management of space, architecture, landscape for the IZs
5	Decree 29/2008 / ND-CP dated 14/3/2008 Now is Decree 82/2018 / ND-CP	- Divide the scale of the industrial park into 3 types :> 300ha; 100-300ha and <100ha	Divide the scale of the industrial park into 4 types <50ha; 50-200ha; 200-500ha and> 500ha
6	Circular 19/2008 / TT-BXD dated 20/11/2008	There is no form of regulations of space, architecture, landscape for industrial zones	-Implement regulations on management of space, architecture, landscape for industrial zones
7	Vietnam Nation Standard TCVN 4449-1987	Industrial land area is calculated based on the standard 15-20m ² / person for Hanoi	Reducing the standard lower to match the current population and needs of Hanoi.
8	TCVN 4514: 2012 on industrial enterprises standards-Master plan	There are no design standards for public buildings, ancillary services, restroom... for industrial enterprises	Implement this design standards for IZs and industrial enterprises.
9	Decision No. 70/2014 /QD-UBND dated September 12, 2014	Only have general regulations and zoning of IZs in the city are in Articles 27 and 28 of the Decision	Need more specific regulations for industrial zones of Hanoi City.

3.5. Proposing a new organizational model of management apparatus to manage space, architecture, landscape of industrial zones in Hanoi

3.5.1. Complete the apparatus according to the decentralized management

- Complete the apparatus of the IZs and EZs Management Department under the Ministry of Planning and Investment to ensure the management's scale and professional ability.
- Proposing to organize the management apparatus of Hanoi Industrial Park Management Board into a "***specialized state management agency***" under the People's Committee of Hanoi, specializing in managing issues within the IZs, not merely organizing the implementation of the supply function service and public administration.

3.5.2. Proposed Structure of Hanoi Industrial Zone Management Board

- Combine and merge some of centers into the department to manage and perform similar work to reduce the management clue.
- Restoration of the inspection department in the Management Board

- Enhance the role of the High Technology Department by being a support center to provide data, site work, monitoring and supervision ... to the departments of the Management Board.

- Strengthening the content of management of space, architecture, landscape of industrial zones for the Department of Construction and Planning Management. And this department will coordinate closely with the Inspection Department, the Technology Department, the Department of Natural Resources and Environment to fully manage the contents of space, architecture and landscape of the IZs in the city in a complete and comprehensive manner.

- Proposed structure of the Management Board of multitasking, multi-components including: Government- Investor - Consultant and Community representatives.

- Community participatory management in the Management Board of IZs: there are regulations for employees to participate in the IZs management apparatus and a legal representative board for people living next to the IZs.

3.6. Solution of applying digital technology and modern equipment in management: With many advantages of modern machinery and information technology that can be applied to the management of space, architecture, landscape for the IZs. The thesis has given specific solutions and proposes how to choose suitable software in management (specifically, 6 types of applications), these will be the clear and exactly basis solutions to manage space, architecture, landscape, special IZs. The diagram below is the proposal to complete the management apparatus of space, architecture, landscape of IZs in Hanoi.

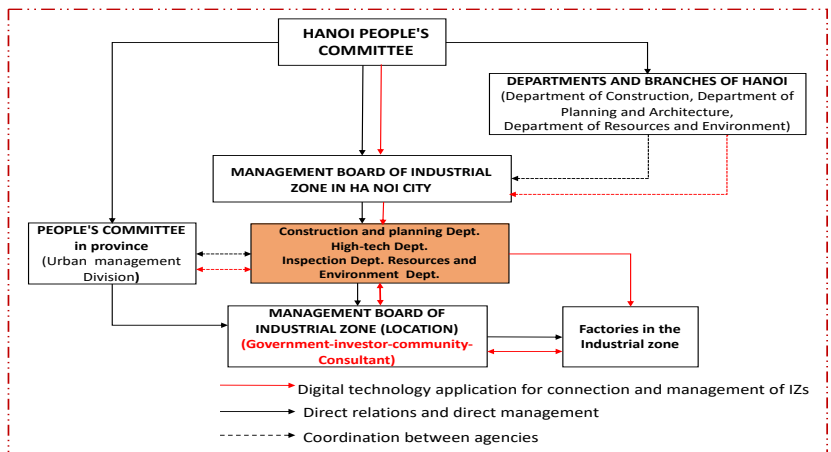


Figure 3.2: Model of new organizational apparatus for the management of space, architecture, landscape of industrial zones in Hanoi city

3.7. Discussion

1.) *New management thinking about space, resources and people*: Change the perception, management thinking of the government, investors and consultants about saving land resources with solutions in the future. In addition, management depends on the qualifications and behavior of the person who performing the task, so it is necessary to improve the qualifications, personal responsibility and the ability to work professionally from leaders to staffs to taken more seriously and accurately

2.) *Improving institutions, policies and a future vision*: Law in general is always backward compare with reality, so legal and institutional reform always requires a team of advisors to the Government and City about long-term forecasts and strategies for IZs development. At the same time, strengthening monitoring and detecting inadequacies and loopholes of laws on space, architecture and landscape in all IZs to edit and complete the contents of current laws.

3.) *New challenges in science and the digital technology application*: The fourth industrial revolution is formed on the basis of the digital revolution to all things with artificial intelligence, thousands objects are connected and interacted through the internet. The management of space, architecture, landscape of IZs cannot stand out from this revolution because of its effective. Therefore, bringing digital platforms into management will and is an inevitable trend in the development and integration process of industrial zones.

4.) *The factor of cooperation and sharing among stakeholders*: The key for sustainable development in each industrial zone is not the compulsory regulations in each participant or the division of tasks but cooperation and sharing, obligations and responsibilities among stakeholders with common interests in the IZs that are the Government - Owner - Community and Consultant will be an effective and optimal solution that needs research and development. Because only understanding the responsibilities, benefits and the same purpose is economic development but does not affect the environment, quality of working facilities as well as preserve valuable resources for the future. This is the highest purpose for all management and operation of the IZ.

5.) *The position of the Capital with the requirement of developing a set of criteria for the management of space, architecture, landscape of IZs*: In the results of the thesis only give the main groups of criteria for the management of space, architecture and landscape of IZs so the the basic criteria are not yet the legal bases for a full and compulsory application. Therefore, after this study, it is necessary to have a research organization can draft and promulgate in detail and complete the set of criteria to be able to enter legal documents and apply in reality.

CONCLUSIONS AND RECOMMENDATIONS

1. Conclusion

1.) Space, architecture, landscape of IZs is an integral part of the spatial development strategy within the boundaries of Hanoi city, contributing to building the image of the capital to become the most modern city of Vietnam. Therefore, the proposal of management solutions for space, architecture, landscape of IZs is very necessary and suitable with the current and future requirements.

2.) The management of space, architecture, landscape of IZs with the goal of encouraging investment in construction according to the planning, effectively using the IZs land, increasing working facilities for workers as well as creating a landscape, environment for the IZ. At the same time, improving the policy mechanism to harmonize benefits between the parties participating in the management.

3.) The thesis analyzes the legal bases related to the management of space, architecture, landscape of IZs in Hanoi city. Thereby, seeing the inadequacies, shortages, need to be adjusted and updated the legal bases to improve management efficiency in the IZ.

4.) Research and propose solutions to the management of space, architecture, landscape of IZs zones in Hanoi city

2. Recommendations

- *For the Government:* It is necessary to supplement the Decrees accompanying the Urban Planning Law No. 30/2009/ QH12, including the content on the planning of IZs in special cities such as Hanoi and Ho Chi Minh City; The content of the law of the Capital needs to clearly define the position, functions, requirements of space, landscape, landscape environment of IZs in Hanoi to a vision to 2050.

- *For the Ministry of Construction:* To issue a Circular guiding the formulation of regulations on urban architecture and planning management for IZs. It is necessary to adjust and supplement the system of Construction Standards and Codes suitable to the socio-economic development orientation to integrate with the regional and international development.

- *For Hanoi city:* It is necessary to synchronously complete the general planning, subdivision planning, and detailed planning of IZs in Hanoi. Promulgating regulations on management of space, architecture, landscape of IZs; It is necessary to synchronously apply digital technology, modern machinery and equipment in management from the city to the IZs in the locality.

- *Management Board of IZs in Hanoi city:* Review the planning of industrial zones in the area on the current land use, construction and landscape organization;

Re-evaluate the environmental impact in the industrial zones and apply digital technology in environmental and landscape quality management.

- *Investor:* Investing and harmoniously sharing benefits with the community in industrial zone development, in line with the orientation of developing a green, clean and beautiful IZs.

**LIST OF PUBLISHED SCIENTIFIC WORKS
OF THE AUTHOR RELATED TO THE THESIS**

Scientific article

- 1./ Le Thi Ai Tho (2020) *Digital technology in the management of space, architecture and landscape of industrial zones in Hanoi (Công nghệ số trong quản lý không gian, kiến trúc, cảnh quan khu công nghiệp tại Hà Nội)*. Architecture Magazine of Vietnam Association of Architects, Ministry of Construction No 297, 1/2020- ISSN 0866-8617
- 2./ Le Thi Ai Tho, Le Dinh Tri (2013), *Awareness innovation in Urban Construction Management (Đổi mới về nhận thức trong quản lý xây dựng đô thị)* - Construction and Urban Journal, Ministry of Construction, No. 33 (2013)- ISSN 1859-3119
- 3./ Le Thi Ai Tho, Tran Nhu Thach (2012), *Combination building of the factory in Vietnam (Hợp khối trong nhà máy ở Việt Nam)* - Science Journal of Architecture and Construction, Hanoi Architectural University, No. 10/2012- ISSN 1859-350X.
- 4./ Le Thi Ai Tho, Tran Nhu Thach (2011), *Plan subdivision the factory in Vietnam (Phân khu nhà máy ở Việt Nam)* - Science Journal of Architecture and Construction, Hanoi Architectural University, No. 5/2011- ISSN 1859-350X.
- 5./ Le Thi Ai Tho, Tran Nhu Thach (2011), *Overview of shipbuilding factory development in Vietnam (Tổng quan sự phát triển nhà máy đóng tàu biển ở Việt Nam)* - Science Journal of Architecture and Construction, Hanoi Architectural University, No. 4 / 2011.

Scientific seminar and Scientific research works

- 1 / Le Thi Ai Tho (2019), *Innovation method of industrial zones the management from problems of space, architectural and landscape*. International conference on Architecture and Civil Engineering 2019 ICACE at Hanoi Architectural University, September 2019.
- 2./ Le Thi Ai Tho (2014), Participating in the topic of composing lecture "*Principles of designing industrial enterprises*" 2014

