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HANOI UNIVERSITY OF ARCHITECTURE

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ADAPTIVE CONVERSION OF OLD INDUSTRIAL WORKS IN URBAN SPACE STRUCTURE IN THE INNER CITY OF HANOI

SPECIALIZATION: ARCHITECTURE

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SUMMARY OF DOCTORAL THESIS

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Thesis can be found at:

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BEGIN

1. Reasons to choose a topic

The change in the course of human civilization has been marked, especially industrial civilization through the ages (scientific and technical revolutions). Industrialization at the same time as urbanization, industrial works have a change in both scale and nature in urban areas, especially the location of industrial works for urban space, when urban areas are constantly expanding, requiring the transformation of industrial works appropriately and with measures to save. hold historical markers as historical and cultural heritage sites of human civilization. Hanoi has also gone through historical periods, there are also many industrial works of different periods, which are no longer in use and need to be converted, but in recent years, the transformation has not been well studied and managed, causing a lot of frustration in society, so it is necessary to have scientific research for this field. The topic "**Adaptive conversion of old industrial works in urban space structure of in the inner city of Hanoi**", has scientific and practical value.

2. Subjects and scope of study

Subjects of study: are old industrial works (CTCNC) in the urban spatial structure (CTKGĐT) in the inner city of Hanoi (KVNTHN).

Scope of study:

- *Spatial scope*: Hanoi inner city area according to the General Plan for construction of Hanoi Capital approved by the Prime Minister in DeCTCNCion 1259/QD-TTG dated 26/7/2011.

- *Time range:* Research thesis to 2050 according to the General Plan for construction of Hanoi Capital.

1. Purpose of study

The study proposes the adaptive transformation of industrial works in the IA in order to: maintain and further transform environmental protection values into modern urban flows; create public and creative spaces to enhance community interests; promote socio-economic development and sustainable development; optimizing inter-agency management plans in the process of urban construction planning and reconstruction.

2. Research Methodology

The thesis uses historical and logical methods; methods of investigation and survey; methods of analysis, synthesis, systematization; methods of diagrams, maps; expert methods; forecasting methods.

3. Scientific and practical significance of the topic

Scientific significance: Present scientific arguments on the transformation of industrial works in IA with adaptive conservation and reuse solutions. Proposing new solutions, in accordance with the nature of CTKGĐT and sustainable development trends.

Practical significance: The research results supplement the rationality in the contents of the relocation and transformation of industrial facilities according to current regulations, guidelines and policies; impact on the planning, urban design and architecture of converted industrial works in KVNTHN.

4. New contributions of the thesis

- Identify the value characteristics of industrial works in KVNTHN. There is a classification according to the value to preserve the heritage and the reuse value of the building.

- Formulate objectives, indicators, and criteria for the assessment of industrial heritage, thereby standardizing and developing models for conservation and adaptive reuse.
- Proposing solutions for adaptive transformation of industrial works in KVNTHN. Propose specific solutions for Gia Lam – HN railway factory.
- Some recommendations on policy development and policy implementation management.

5. Concepts and terms used in the thesis

Di industrial production and "transformation", " Adaptive reuse".

6. Thesis structure:

The thesis consists of 3 parts: Introduction (10 pages), Content (135 pages), Conclusion and recommendations (05 pages). In which, the research content includes 3 chapters: Chapter I (36 pages); Chapter II (39 pages); Chapter III (60 pages).

CONTENT

CHAPTER I: OVERVIEW OF ADAPTIVE TRANSFORMATION OF OLD INDUSTRIAL WORKS IN THE URBAN SPACE STRUCTURE OF HANOI INNER CITY

1.1. The trend of transforming companies in the world

Recently, research, forums and major competitions have also devoted a lot of attention around the topic of "adaptive transformation" of DSCN, or part of DSCN into cultural space, with meaningful activities to help promote the development of cultural industry and attract tourists. The study adapts the CTCNC in a sustainable way to provide tailored solutions for city governments, stakeholders and surrounding areas. Architects and planners are mobilized to consider

sustainable design, reducing the energy of buildings (self-energy, operating energy) and the historical significance of industrial buildings. Instead of demolishing the transformation with adaptive conservation and reuse solutions that can provide an opportunity for the public to feel the value of historic buildings and be attracted to new spaces. These are theoretical and practical issues that are worth learning and drawing from experience to avoid mistakes for developing countries like Vietnam, when the trend of dismantling factories and enterprises,... old to build high-rise buildings is still a popular trend.

1.2. The trend of transforming companies in Vietnam

Due to historical characteristics, industrial civilization appeared in Vietnam later than many countries, starting with the French invading Vietnam (late nineteenth century) and building a number of factories, factories, docks, mines ...

In fact, the French have brought modern elements into the Vietnamese economy, but overall the Vietnamese economy is still in a pre-capitalist, semi-medieval state. Although highly appreciated for its industrial cultural values (historical, technological, social, architectural), industrial works and factories in Vietnam are often associated with the image of old, shabby, unattractive due to economic downturn and long-term abandonment.

Due to the inadequacy of the perception of the value of DSCN, many of them have been unfortunately wiped out, such as Tran Hung Dao Mechanical Factory (Hanoi), 8-3 Textile Factory (Hanoi), Nam Dinh Textile Factory (Nam Dinh), Ba Son Shipyard (Ho Chi Minh City). It is these inappropriate interventions that show that the DSCN in Vietnam has not been identified as a resource of historical, cultural and economic value of the region.

1.3. The situation of converting old industrial works in the urban space structure in the inner city of Hanoi

The thesis reviewed the statistics of **185 industrial works** in the industrial park in 2019 (95 existing works and 90 have been destroyed, relocated and converted).

CTCNC have a fairly diverse status in terms of location, land size, type of enterprise, production and business status, status of facilities, factories, as well as their architectural and historical values. In combination with previous related studies, the thesis assesses the architectural status of 25/90 industrial works still present in the KVNTHN and proposes to divide into 3 groups to choose in-depth survey works:

- The group of industrial works has developed continuously since the colonial era, retaining the original architectural mark *(historical atmosphere; attractive colonial architecture, unique combination of civil and industrial architecture);*

- Group of industrial companies originating from the colony but completely transformed, fundamentally rebuilt after the war *(heroic production atmosphere to build the country in the post-war period; synchronous unified architecture; strong mechanical beauty);*

- Group of socialist industrial companies developed after 1954 *(large family atmosphere under the model of "collective ownership"; diverse architecture is both international and indigenous, adapted to Vietnam's climate; rich and attractive space in the typical "arbitrary" style of Vietnam).*

Considering the distribution of the industrial park system in Hanoi planning maps over the periods, specifically, according to the planning in DeCTCNCion No. 1259, there is almost very little purple (industrial

land) in the historical inner city and the expanded inner city. This means that the companies will be relocated and converted according to the planning direction. In fact, the models of industrial heritage regeneration in Hanoi or some provinces and cities are still fragmented, which is caused by the lack of master planning, foresight, lack of legal corridors,... Preserving and promoting the value of DSCN by recreating value is a new direction, which will certainly face many difficulties but the benefits have long-term value, so it is necessary to pay due attention.

1.4. Related research works

Studies have paid attention to the issue of functional transformation of industrial works in urban areas as well as assessing their value. However, in many cases it has not been analyzed from a systematic perspective, through a complete value scale. The scientific institutions that transform and adapt to the CTCNC with adaptive conservation and reuse solutions are still scattered, lack of systematicity, lack of evidence from the lessons learned have been illuminated. In terms of models, design solutions for interventions have not been given a specific way for transformative industrial works, mainly stopping at the level of design orientation and general management for urban works.

1.5. What needs research

- ***Heritage value identification*** should be based on diverse data and a convincing scientific basis to assess the meaning and cultural value...

- ***Grouping the system of works*** as a basis for proposing appropriate approaches. There should be a method to assess the conservation potential and adaptive reuse potential of CTCNC using an

objective value scale with diverse criteria suitable for the research object.

- ***Adaptive transformation of industrial companies*** to ensure consistency with the provisions of the management system and planning at relevant levels.

- ***Conducting research on the scope of KVNTHN***, associated with the current situation of relocation and conversion of polluting industrial production facilities out of the inner city.

CHAPTER II: SCIENTIFIC BASIS FOR ADAPTIVE TRANSFORMATION OF OLD INDUSTRIAL WORKS IN THE URBAN SPATIAL STRUCTURE OF HANOI INNER CITY

2.1. Theoretical basis

The dissertation examines theories of heritage value recognition of CTCNCs; identify DSCN conservation design principles; and, adaptive reuse of CTCNC in transformational practice. Thereby, proposing a new methodological framework based on theory and practice, on the following basis: The criteria for valuing the authenticity of DSCN must include both tangible and intangible characteristics of monuments; The goal of DSCN conservation should be to preserve specific values, socially recognized, in a way that allows its contemporary use; The DSCN conservation success index will reflect the sustainability of the project and the level of community development.

- ***Nara Document on authenticity****:* emphasizing various aspects of the heritage properties, specifically in Article 13 of the Document.

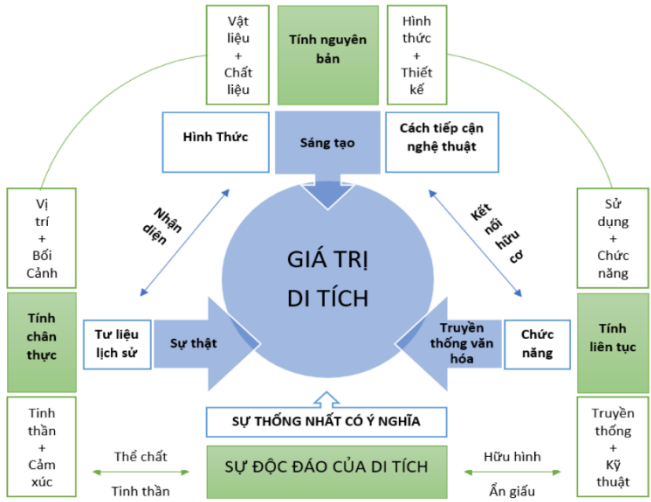


Diagram 2.1: Characteristics of monuments – Meaningful unity1

- ***Bura Charter***: divided into three basic stages: Understanding Meaning, Policy Development and Policy Management. Each stage is structured to allow for up-to-date information about the heritage in the sense of considering new conditions on the sites, requiring adaptation in management.

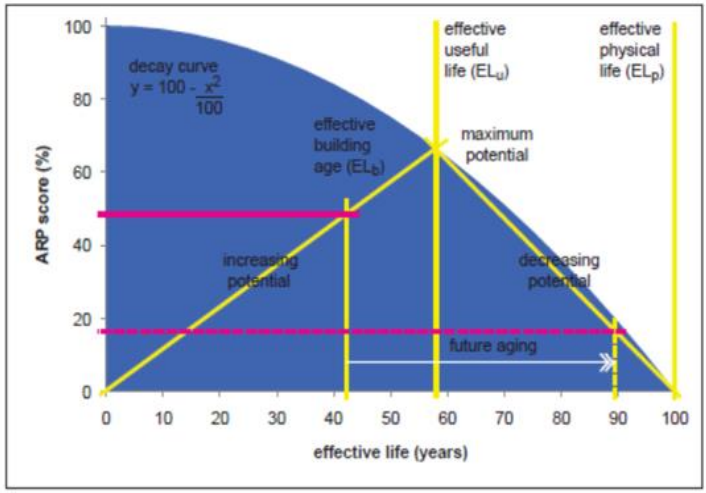
- ***Campbell adaptive reuse strategy triangle:*** set out the concept of 3E (Economic: Economic Development, Environmental: Environmental Protection and Equity: Equity) and analyze and propose adaptive reuse strategies should be evaluated based on the above 3 factors.

- ***Analysis of Steward Brand's building layers:*** Through the division of the building's components using Brand's "change tomography" diagram, it can be realized that there are different rates of change of components by illustrating its components with six "S": *The site* indicates the geographical context and has an eternal character;

Structure is the foundation and bearing elements, it has a structural life of 30 to 300 years; *Cover (Skin)* is the outer surface, which changes every 20 years or so; *Ancillary* (*Services)* are the operational parts of a building (including: HVAC, plumbing, wiring, elevators and escalators. It has a lifespan of 7 to 15 years, so many buildings are demolished because of outdated systems); Space (*Space)* in relation to the layout of the interior, has a different service life depending on the intended use (commercial space - 3 years, residential - 30 years); Stuffs are all things that can be changed on a daily basis such as furniture.

- Evaluate the effectiveness of Bullen and Love's adaptive reuse strategy: investigate and collect data on positive and negative factors from interviews and surveys. They collect data and create categories of factors that influence the design process of adaptive reuse projects.

Scheme 2.2: Reference model - Adaptive reuse potential



$$\text{ARP (tăng)} = \frac{100 - \frac{EL_u^2}{100}}{EL_u} \cdot EL_b \qquad \text{ARP (giảm)} = \frac{100 - \frac{EL_u^2}{100}}{100 - EL_u} \cdot (100 - EL_b)$$

- Adaptive Reuse Potential Assessment (ARP) model: useful life prediction is a function of determining the added value for material life, the reduced value for the obsolescence of the building, and allows the calculation of the adaptive reusability of the construction life cycle so that it can be applied at the right time of intervention.

The values for EL_u (efficient useful life), ELb (effective building age), and ELp (efficient physical life) are determined by multiplying Lu, Lb, and Lp by 100 and dividing by Lp respectively, which allows the maximum ratio for the x and y axes to be 100.

- Intervention design method on architectural form for buildings on the basis of the theory of Bollack (2013), Donghwan Kim (2018) has proposed 08 types of designs: *Insert; Parasitic; Parasitic – layer stack; Parasitic – adjacent; Bundle; Weave; Peel; Transplantation/grafting.*

2.2. Legal basis

Basically, Hanoi has a full legal framework to implement the management of industrial companies as well as the relocation of industrial companies in Hanoi. Hanoi has many bright spots and opportunities after being recognized by UNESCO as a Creative City: "Hanoi has great human resources and creative energy.

2.3. Factors affecting the conversion of old industrial buildings in the spatial structure of Hanoi's inner city

Besides natural factors; economic - political - social; Infrastructure; engineering, labor and industrial activities ..... The thesis analyzes specifically 10 factors that directly affect the adaptive transformation of industrial works in the spatial structure of Hanoi's inner city: *Culture; Society; Economic; Environment; Legal; Location; New use; Research & Development; Government; Time.*

1. Practical experience

On the basis of the analysis of examples and models of adaptive transformation of domestic and foreign industrial works, it can be seen that in order to successfully transform and adapt industrial works in the CTKGĐT: *Necessary conditions*: Positive aesthetic contribution to the street landscape; Maintain the look and feel of the old building; Preserving the structural clarity of the building and the old space; Preservation and incorporation of a number of important artifacts; Provide a rewarding and unique environment; Create and/or deliver unique visitor experiences; Designed using carefully prepared scale and proportions, juxtaposed by materials, light and shade and elements old and new – inside and out; Reside in an ideal location; and, Contribute to a sustainable future. *Eligibility*: Maintaining the economic viability of the heritage place; Achieving economic efficiency; Accounting for capital costs of construction works; Take into account the future operating costs of the proposed use, including maintenance costs; Occupy the potential market for the proposed reuse; Accounting for the location of assets; and, Account for the financial resources necessary to implement the project.

CHAPTER III: SOLUTIONS FOR ADAPTIVE TRANSFORMATION OF OLD INDUSTRIAL WORKS IN THE URBAN SPACE STRUCTURE OF HANOI INNER CITY

3.1. Perspectives and objectives

The adaptive transformation of CTCNC in CTKGĐT is based on 05 main perspectives and 02 main objectives:

Objective 1: Prevent and correct the loss of DSCN value in the process of urban reconstruction from industrial works subject to relocation and conversion.

Objective 2: Create a new socio-cultural space for the people of KVNTHN, on the basis of exploiting industrial resources to ensure all 3 factors: Preserving cultural values; Generating economic benefits; and, towards sustainable value.

3.2. Principles and processes

Industrial works in KVNTHN are very diverse in size, number as well as location and are strongly influenced by the ĐTH process, types of urban reconstruction planning and programs from relocated production facilities. Therefore, in order for the adaptive transformation of industrial companies, it is necessary to follow a certain process consisting of the following 03 steps:

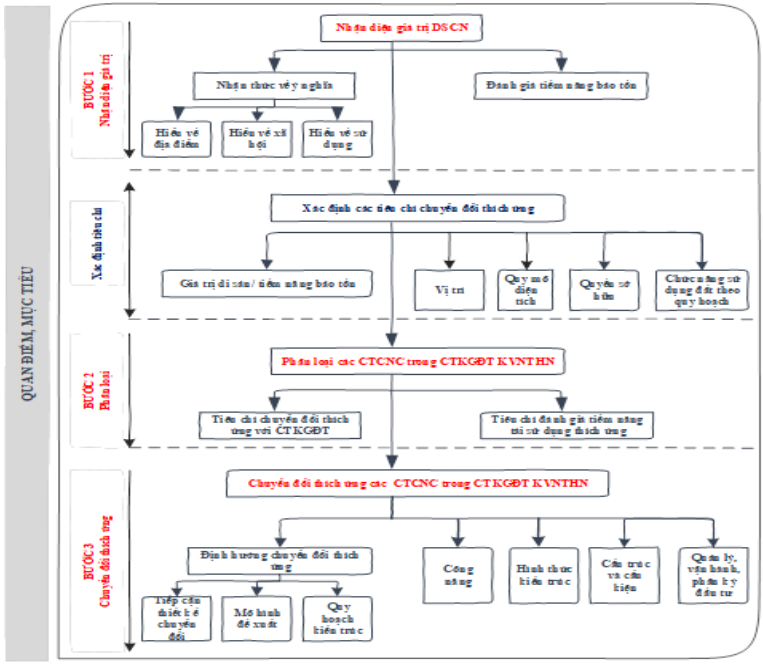


Diagram 3.1: Adaptive transformation process of CTCNC in CTKGĐT

3.3. Identifying the value of old industrial works in urban space bridges in Hanoi's inner city

Based on the Burra Charter Process, the thesis proposes a conservation plan for CTCNC in KVNTHN through a process that begins with an understanding of the meaning of CTCNC, namely: understanding the place; understanding of society; understand use.

Next, the thesis proposes to assess the conservation potential of DSCN by establishing criteria for each grid of the mental schema based on the theoretical bases of authenticity and place spirit in chapter 2.

Table 3. 1: Set of criteria for assessing the conservation potential

ASPECT	**DIMENSION**				**Score**
	Art (25)	**History** (25)	**Society** (25)	**Science** (25)	
Form and design (16)	Unity in original design ideas	Access to art during the construction period	The level of influence of the investor and the design consultant	Typical features, the original form of the construction	**4 x 4**
Materials and materials (16)	The suitability of the material to the category of works	Characteristics and features of the material at the time of construction	There have been impacts from projects of reconstruction, renovation, transformation ...	The uniqueness and rationality of the construction method	**4 x 4**
Uses and functions (16)	Forms of architectural combinations, architectural objects for typical functional spaces	Functional model showing the characteristic production method in a given period	Newly arising social functions integrated with production functions	Original devices are proof of technological development	**4 x 4**

Traditions and techniques (16)	Harnessing traditional material architecture for art	Preserving traditional production techniques and promoting them in the future production function	Judgment on the change in production methods as well as relationships	Ability to research and exploit traditional techniques	**4 x 4**
Location and Background (16)	Geographically significant with close connection to physical space and social space both past and present	Create development specific to the area at the time of the establishment of production facilities	Location role in urban spatial structure	Compliance with the principles of the industrial positioning process	**4 x 4**
Spirits and emotions (20)	The subject's experience of architectural style, human values and unique natural scenery – original characteristics	Recognized for historical significance through a deep understanding of fundamental elements such as the purpose and context of the project's birth	Creating the identity of the place through human perception and human activity – both the inner production group and the external consumption group	The impact of change and development of science and technology on the experience, positive relationships as well as long-term and regular experiences of employees in factories	**4 x 5**

In particular, the criteria at each grid are evaluated equally important - each criterion is 4 points, separately the criteria are created by the Mental and emotional aspect - each criterion 5 points. This scale

allows to evaluate the level of each criterion in a relatively qualitative way, but when summing up the score achieved (out of a total of 100) will reflect the general status of the CTCNC below the percentage in a relatively quantitative way. When the total score reaches >50, the CTCNC has significant heritage potential for conservation, and the higher the total score, the greater the conservation potential.

3.4. Classification of industrial works in the structure of urban space in the inner city of Hanoi

The thesis uses 5 criteria for classification including: heritage value; location/population density; area size; ownership; land use functions according to planning. The classification of CTCNC in the IA is based on the calculation of MAX and MIN scores for each CTCNC. The five criteria, each divided into four parts, evaluated on a scale of 1-4, thus: MAX is: 5x4 =20; MIN is 5x1 = 5; A = (MAX–MIN)/3 = (20-5)/3 = 5. Accordingly, classified CTCNCs have high adaptive conversion potential if they have a greater score of MIN + 2A = 15 points. Rated CTCNCs have low adaptive conversion potential if they have a smaller score of MIN + A = 10 points. Ranked CTCNCs have average conversion potential if they have a score of 10-15 points.

Table 3.2: Classification of companies according to adaptive conversion criteria

Criteria	Characteristics, properties	Scale
Heritage values	CTCNC has high heritage value with a conservation potential assessment score **of less than 50**	**1**
	CTCNC has high heritage value with a conservation potential assessment score **of 50-65**	**2**
	CTCNC has high heritage value with a conservation potential assessment score **of 65-80**	**3**
	CTCNC has high heritage value with a conservation potential rating score **greater than 80**	**4**
Location	CTCNC belongs to an area with a population density of less than **10,000 people/km^2**.	**1**

	CTCNC belongs to an area with a population density of 10,000 - **20,000 people/km2**.	**2**
	CTCNC belongs to an area with a population density of 20,000 - **30,000 people /km^2**.	**3**
	CTCNC belongs to an area with a population density greater than **30,000 people/km2**.	**4**
Area size	CTCNC has an area of more than **5 hectares**	**1**
	CTCNC covers an area of **3-5 hectares**	**2**
	CTCNC covers an area of **1 - 3 hectares**	**3**
	CTCNC has an area of less than **1 ha**	**4**
Ownership	CTCNC is **100% privately** owned	**1**
	CTCNC has equitized**employees greater than 50%**	**2**
	CTCNC has equitized **the State by more than 50%**	**3**
	100% state-owned company	**4**
Land use functions according to planning	**High-rise apartment** development	**1**
	Development of **high-rise TMDV mixed-use** buildings	**2**
	Development of ***cooperatives***	**3**
	Development of ***community and creative*** works	**4**

- Classification by criteria for evaluating adaptive reuse potential: The thesis proposes to apply the adaptive reuse potential assessment (ARP) model in section 2.1 to evaluate references for typical study subjects when adequately informed, specific survey research parameters and data.

In the current situation of industrial works in KVNTHN, the thesis proposes to partially apply the adaptive reuse potential assessment model "ARP" through the quality assessment table of industrial companies based on a detailed analysis of 07 aspects corresponding to 07 types of obsolescence. The potential for reuse of the building is calculated as a percentage of the total score of 07 aspects / 700 points. The project has high reuse potential when there are assessment results of > 80% and TB from 50% -80% and low < 50%.

Table 3.3: Quality assessment of industrial companies in CTKGĐT

Aspect	Detail	Weighting
Physics (Lifespan)	Structural integrity; Material strength; Workmanship; Maintainability; Complex design; Climatic conditions; Foundation.	7 x 15
Economic (Location)	Population density; Market gap; Transportation infrastructure; Access to the land; Prospects/promotions; Limitations in planning; Lot size.	7 x 15
Function (Level of flexibility)	Flexibility; Possibility of separation; Space organization; Convertibility; Vent; Column grid; Ventilation systems and corridors.	7 x 15
Technology (Energy)	Direction of works; Glass; Insulation and gloss; Natural light; Natural ventilation; Building management system; Access to solar energy.	7 x 15
Sense of place (Social)	Image/identity; Cosmetology; Landscape/urban landscape; History/authenticity; Comfort; Human scale; Communities, neighbors.	7 x 15
Quality standards (Legal)	Finishing standards; Fire protection; The quality of the indoor environment; Occupational Health and Safety; Comfortable environment; Disability access; Sound.	7 x 15
Backdrop (Politics)	Adjoining structures; Ecological characteristics; Conserve; Community interest/involvement; Urban master plan; Land use planning; Ownership.	7 x 15

3.5. Proposing solutions for adaptive transformation of old industrial works in urban space structures

- ***Transformational design approach:*** The thesis approaches the strategy of *adapting old architecture with modern use*, aiming to restore the old structural layers of the city, brighten the black spots, restore the memories of Hanoi people of a bygone time – gradually bringing Hanoi city from a creative city, gradually becoming the creative center of the region and the world.

- ***Transformation model:*** Old factory - Socialization capital calling - Independent management model - new space (NS); Old factory - Private investment - Private management model - NS; Old factory - Cooperative investment - Cooperative management model – NS.

- Functionally, world experiences show a *superior combination of economy and culture*. The proposed functions are appropriate, the change brings economic benefits and the transformation retains the spirit of the place with specific solutions for: *usability; architectural form; structure and components; technical solutions; management solutions,operating and divergence investments.* All aspects of adaptive reuse projects should be carefully considered in advance to ensure that the overall end use goal is in fact feasible: ***Short-term feasibility:*** *Environmental characteristics*; *Market characteristics*; *Local characteristics*; *Legislative* characteristics; Financial characteristics; ***Long-Term Feasibility***: *Cultural Characteristics Constructed Heritage and Collective Memory.*

3.6. Case study of Gia Lam Railway Factory

Compared in the classification according to the adaptive conversion criteria as shown in the table below, with a total score of 15 – Gia Lam railway plant belongs to the group of projects ***with high adaptive conversion potential.***

Table 3.4: Classification by adaptive conversion criteria

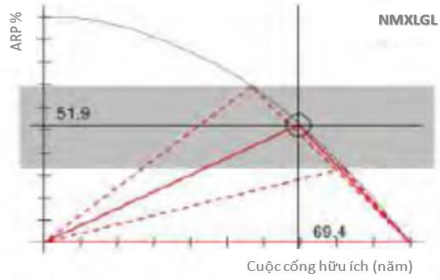
Criteria	Characteristics, properties	Scale
Heritage values	NMXLGL has high heritage value with a conservation potential assessment score of **81** points *(greater than 80 points)*	4
Location	NMXLG in Long Bien district has a population density of 4,510 people/km2 *(less than 10,000 people/km^2)*	1
Area size	NMXLG covers an area of 5 hectares *(from 3 to 5 hectares)*	2
Ownership	NMXLG is owned by Gia Lam Railway Joint Stock Company ***(100% State)***	4
Land use functions according to planning	Under QHPKN10: Public land of Pho *(Development of community works, creativity)*	4
Total score		**15**

On the basis of information and survey data about Gia Lam Railway Plant along with the analysis contents in Section 3.4.2, the thesis tested the calculation model to assess the adaptive reuse potential as in Section 2.1.3/d and produced the results as table + figure below, Conclusion: NMXLGL has ***a high adaptive reuse potential***, with an ARP score of ***51.9%***

Table 3.5: Compile the results of adaptive reuse potential assessment data

A	B	C	D	E	F	G	H	I	J	K	L
2	Gia Lam Railway Factory	1905	1988	2003	2000	0.30	110	130	-15.38	51.9	**Tall**

Where, *A: Project ID; B: Project name; C: Year of construction; D: Year of the first amendment; E: Year of change of production model, contract; F: Prediction of material life (year); G: Annual rate of obsolescence (%); Q: Useful Life Project (year); I: Practical useful life (year); J: Percentage difference (columns F and G); K: ARP score (%); L: Conclusive assessment of adaptive reuse potential.*



Scheme 3.2: NMXLGL - adaptive reuse potential assessment model

The thesis inherits the proposed research results of the architect. Pham Trung Hieu and the author team for the project "*Reconstruction* of industrial heritage" launched by EUNIC in 2021, with the theme: Current status of industrial spaces in Hanoi and international experience on industrial heritage. "Community Cultural - Creative Space" is the

proposed model, which will include specific works corresponding to the elements of the model as follows: Railway Museum (Preservation of heritage values); Community creative spaces (Creating community creative spaces), and Art Works (Green park spaces).

The main architectural solution of the project is to promote the rhythmic structure of the old factory structural frame system, change and supplement the surface structure, change the finishing materials to create a new modern, dynamic form but also preserve the memory of the place by the characteristic shape and serrated roof system of the factory.

Museum *Creative hubs* *Green Park*

Figure 3.1: Transformational architectural form organization solution

3.7. Discussion of research results

The thesis discusses the following issues: The role and position of old industrial works in the urban space structure; Regarding the process of adaptive transformation of old industrial works in the urban space structure in the inner city of Hanoi; Volume, quality and management of old industrial works in the urban space structure of Hanoi's inner city; Regarding the heritage properties of old industrial buildings in the inner city of Hanoi; On the application of adaptive transformation criteria to the urban spatial structure; Compare the thesis proposal with the urban reconstruction strategy from displaced production facilities; and, The

results achieved. The research findings provide a number of specialized theoretical bases for researchers, students and policy makers:

Firstly, with the case study in KVNTHN, this study can be the starting point for the investigation of industrial heritage conservation in major cities of Vietnam. Further investigation of the generality of empirical findings can be achieved by conducting a study of various urban cases. But this is beyond the scope of thesis research. In addition, conducting more interviews with authorities and key stakeholders contributes to more comprehensive and reliable interview data, as well as a more thorough understanding of urban reconstruction projects from displaced CTCNC.

Secondly, drawing from the experience of KVNTHN, the study clarifies the relationship between the design process and its final design results in industrial transformation projects. It reveals that a project outcome is not only shaped by the initial concept of an influential individual and organization, but is instead largely influenced by constraints according to local conditions and contexts.

Third, for policymakers, it is important that an open approach can inspire new thinking in future reconstruction programs and projects. This thesis adopted an approach that fully considers the relationships and impacts of stakeholders: authorities, developers, design consultants, as well as local artist and creative communities. This analysis helps to understand the key to the success or failure of heritage conservation projects, which is the basis for strategic planning as well as the city's solutions to the transformation of industrial works in KVNTHN.

CONCLUSIONS AND RECOMMENDATIONS

Conclusion: the adaptive transformation of industrial works in KVNTHN will face many difficulties and challenges that require evaluation studies (identifying the value, role, position and potential of conservation and adaptive reuse); specific organizational plans and policies; community support, the attention of local authorities and good coordination between ministries, departments and agencies; as well as the consensus of investors, developers and the companionship of social organizations, professionals, artists . . .

In order to adapt the CTCNC in the KVNTHN, the thesis used a consistent approach. Specifically: the thesis collects and analyzes scientific and practical documents in the world, thereby, synthesizing and linking information to find necessary lessons learned. These lessons learned are compared and contrasted with the situation in Hanoi to find out research problems. After that, the thesis collects scientific bases related to research, comparison and comparison in order to draw out the basis, criteria, reference criteria and application. Next, it is necessary to determine the views, objectives and principles of the transformation of the ctcnc in the IA to propose solutions suitable to the thesis purpose and adaptive transformation goals.

After implementing the adaptive transformation process, each company will have a comprehensive assessment as a basis for proposing appropriate management plans, different from the roadmap and measures to relocate production facilities out of the inner city of Hanoi due to pollution and / or not in accordance with the current planning. Accordingly, CTCNCs are assessed as having conservation potential and/or adaptive reuse potential when adopting adaptive transformation solutions that allow their historical significance to be

preserved and provide new experiential spaces that ensure continuity of original intent and function; form follows change; materiality or authenticity of the material; sustainability, in harmony with the intention to preserve DSCN; and, overall goal feasibility including short-term feasibility (environmental, market, local, legislative, financial) and long-term feasibility (cultural characteristics – DSCN and collective memory/place spirit).

Recommendation: The State and specifically the Hanoi People's Committee should promulgate a mechanism to strictly control the relocation of polluting and/or unsuitable industrial works out of the inner city; Develop specific sanctions specifying the responsibilities of local authorities, people and investors in evaluating, managing, using and converting heritage-valued industrial companies. It is necessary to soon make statistics, classify and publish the heritage value of industrial works, first of all, it can be recognized as valuable industrial companies at the city level. Then, step by step legalize the concept of DSCN to include in legal documents, namely the Heritage Law.

Currently, Hanoi is adjusting the master plan for the construction of Hanoi Capital to 2030 and vision to 2050, according to Plan No. 129/KH-UBND dated May 25, 2021 and DeCTCNCion No. 4199/QD-UBND dated September 17, 2021 of the City People's Committee. Including plots and land plots of production facilities that are still in operation or have stopped operating due to being displaced outside the industrial park. In order to meet the development requirements of society, it is necessary to ensure the harmonization of conservation requirements with development, it is necessary to include the conservation of DSCN in the Adjustment of this Capital; At the same time, places (heritage-valued industrial works) should be converted to

"non-residential" land use functions, strictly implementing the policy of prioritizing public service, cultural and creative space as infrastructure for cultural industry development; Supervise the implementation of plannings, QHPK, QHCT to ensure that industrial works with heritage values are properly preserved and exploited. Therefore, it is proposed to soon have management regulations, develop policies and strategies for valuable industrial companies. Management regulations are proposed in two basic stages: policy development and policy management. Each stage is structured to allow updating information according to the importance of the CTCNC and considering new conditions on the sites in the CTKGĐT, ensuring adaptation in management. /

LIST OF WORKS BY THE AUTHOR

Published scientific articles related to the thesis:

1. Dinh Thi Hai Yen, *Japan – The ability to make the impossible possible*, Construction Magazine, No. 08, 2012 – ISSN 0866-0762.
2. Dinh Thi Hai Yen, *Bankside Power Plant Transformation – Past and Present coexist in a unified whole*. Architecture Magazine, Vietnam Association of Architects, No. 01, 2022 – ISSN 0866-8617.
3. Dinh Thi Hai Yen, *Converting old industrial buildings in Hanoi's inner city – Assessment and management strategy*. Journal of Construction, No. 04, 2022 – ISSN 0866-0762.

The participating scientific research topics are members of the research team:

1. Vietnam Association of Architects, scientific *basis to develop regulations on management of architectural colors in urban areas in specific big cities in Vietnam*. Ministry of Construction, 2008.
2. Vietnam Association of Architects, *The study proposes a model regulation on the management of the values of Vietnam's urban architectural identity*. Ministry of Construction, 2009.
3. Vietnam Association of Architects, *Research proposes the process of evaluating and classifying apartment buildings*. Ministry of Construction, 2010.
4. Institute of Architecture – Vietnam Association of Architects, *Research and survey of traditional architecture, Vietnamese craft villages*. Vietnam Association of Architects, 2012.
5. Institute of Architecture – Vietnam Association of Architects, *Survey and evaluation of architectural funds in the renovation period 1945 – 1986*. Vietnam Association of Architects, 2014.
6. Institute of Architecture – Vietnam Association of Architects, *Social Housing – socio-cultural aspects of the renovation period*. Vietnam Association of Architects, 2014.