

HOW SUSTAINABLE ARE INDUSTRIAL BUILDINGS? A Study In Golden Horn District

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Abstract

After the industrial revolution, as in all areas, cities and buildings are also faced with a rapidly changing renewal. The changing within social structure by immigration and population growth, with bad living conditions and environmental degradation, urban fabric begins to tear and the concept of sustainability become a necessity in all sectors such as construction, architecture and urbanism. Therefore subject of "re-evaluation and transformation" of industrial buildings which come up with their specific properties especially in old / historical urban areas should be analyzed in terms of physical and social sustainability. In this context, the causes and effects on the change and transformation of three industrial buildings which have been chosen from Golden Horn district –which has potentials about getting back the old value of its own with lots of new project- with sustainability criterion will be analyzed. In the light of sustainability criteria formed by combining the findings from this evaluation and findings from comprehensive literature research, the aim of the study is to examine how sustainable is the conversion of old industrial buildings located in the Golden Horn.

Keywords: Sustainability; sustainability criteria; industrial buildings; re-use; Golden Horn.

INTRODUCTION

With change and transformation, industrial buildings that are located in industrial areas face some regeneration actions. In regard of these actions, whether these buildings considered within sustainability concept constitutes the main problem of this study. It is aimed to inspect the selected buildings that have certain characteristics in the phase of re-evaluation and transformation with the context of economical, social and ecological attributes of sustainability. It is also aimed that complete evaluation of selected buildings in the context of sustainability.

In this study that evaluates how much sustainable are regenerated industrial buildings in the end of regeneration period; Golden Horn is chosen as one of the old, lost its functions and having high regeneration potential areas of country. Three completed projects selected in order to evaluate end results. Another reason that all three buildings are selected from Golden Horn area is that the ability to observe if any different approaches made during regeneration despite the fact that they are all located at the same area.

Comprehensive literature study has been made about sustainability before the evaluation of how much these selected buildings are sustainable after regeneration work. With this literature study, it is aimed to reveal what are the social, economic and ecologic indicators of sustainability. After the literature study that helped to specify certain criterion about sustainability, a case study has been conducted on Santral İstanbul, Rahmi Koç Museum, Kadir Has University.

The reason of using a case study in the content of this study is; case study method based on inspecting one individual, group, example or incident deeply in order to understand basic principles under cause and effect relationships. Case study is an appropriate strategy to answer research inquiries such as 'how' and 'why' (Robson, 1993; Yin, 1998). In general, case study is a

method that preferred when questions 'why' and 'how' emerged and also the researcher have very little control over events (Yin, 2002).

With the help of case study, literature knowledge that is discussed during this study will be questioned in the context of example buildings, thus sustainability concept in industrial buildings will be presented.

THE CHANGES AND TRANSFORMATIONS OF INDUSTRIAL BUILDINGS

Building with its environment gains more importance and becomes a big part of a whole (Kuban, 2007). Before the industrial revolution, architectures and cities were developed only in the framework of the needs, then they were faced with a quick regeneration and after the Second World War, changes became more visible. Therefore, in certain buildings, loss of function because of technological backwardness, economical wears, finally, functional changes had happened. These situations also caused undamaged urban fabrics, negative living conditions, regional wears and architectural decrepit.

Industrial buildings among these buildings were developed by the Industrial Revolution but industrial buildings began to get older and dysfunctional because of these beloved mentioned reasons in the last century -especially after the Second World War-:

- Resource shortages/ need for displacement;
- Technological backwardness;
- Physical attrition, wear and tear (they faced negative effects of production process such as high temperature, harmful gases, extreme pollution throughout the years); Hence, these abundant and vacant industrial areas with their structures became the problems of the urban life, which needed urgent solutions.

Because of these reasons; turning these re-functioned sediment buildings and their entourage more viable and livable must be the most important objective. Preserve social fabric, integration of old buildings and areas to new regions are required and urban life must be sustained in old/new areas (Baytin (Polatoğlu), 2003). In the name of sustainability, researches on these buildings solely could be realized by "Social, Physical and Economic Recovery".

When these areas were built, they were the facilities with technological and physical equipment satisfying needs of the age, in the course of time; these areas were abandoned because of the functional changes or dysfunction and industrial heritage was imperiled.

However, industrial areas and buildings with their mechanical equipment associated with the structures in which they are included are the important indicators of the socio-economic past of a country. Generally, only these buildings which are designed to satisfy functional objectives are transformed because of their symbolic existence and their representativeness (Cengizkan, 2006).

SUSTAINABILITY AND SUSTAINABLE DEVELOPMENT

Projects include many different phases from exploration through design, construction, operation and decommissioning. Project activities are result in a very wide range of direct and indirect environmental, social and economic impacts (Keeble et. al, 2003). Because of this reason, a project is sustainable when the project improves in all three sustainable development dimensions, i.e. environmental respect, social integration and social economy, maintaining cost, time, quality and performance, at an acceptable range (Fernández-Sánchez and Rodríguez-López, 2010).

Sustainability is a worldview that fulfills economic, environmental and social needs without harming living conditions of posterity. In the context of sustainability, sustainable construction differentiates itself from traditional construction by adding cost, quality and time objectives along with minimizing resource consumption, minimizing environmental degradation and creating healthy built-up environment (Kibert, 1994).

Kibert's definition can be considered as the inception of sustainable construction. It identifies the central objectives of sustainable construction, which provides a high building

performance for the occupiers. However, it does not establish its relationship with social and economic environment (Zhou and Lowe, 2003).

Hill and Bowen (1997) divided Kibert's principles in four 'pillars': social, economic, biophysical and technical.

- Social sustainability highlights improvements in the quality of human life, and human living environment, which include culture, health, education, and intergenerational equity.
- Economic sustainability includes the use of full-cost accounting methods and real-cost pricing to set prices and tariffs for goods and services and achieve more efficient use of resource.
- Biological sustainability includes the motion that sustainable construction needs to protect the natural environment rather than pollute, encourages the use renewable resource and reduce the use of water, energy, materials and land in each stage of a project.
- Technical sustainability requires high performance, durability, quality and mixed use of a building.

In the concept of sustainability; the economic, social and environmental aspects, which are inextricably linked, remain the three fundamental pillars that must always be appropriately addressed (Ekundayo et. al., 2011). Getting these primary aspects of sustainability –economic, environmental and social– in relation to the architectural works; four key questions relating to economic, social, environmental and natural resources use can lead us:

- Economic: Will the project generate prosperity and enhance the affected economies?
- Social: Will the project be implemented in a socially responsible manner and benefit the affected communities in a fair and equitable way?
- Environmental quality: Will the project cause long-term damage to the environment?
- Use of natural resources: Will the project protect and enhance natural capital? (Keeble et. al, 2003).

By the turn of the 20th century, due to fast industrialization and rapid urbanization, the natural and the built environment have been facing several environmental, economic and social problems. These problems are mostly environmental oriented in the developed countries, whereas they are more concerned with economic and social issues in the developing ones. To overcome these current problems and to ensure future progress in the improvement of economic, social and environmental conditions in human settlements, the concept of "sustainable development" has emerged as a challenge to realize economic and social development, and environmental protection, which are interdependent and mutually reinforcing components of sustainable development- the framework for our efforts (Hoşkara and Sey, 2008).

In this respect, dealing with the concept of sustainable development "economical, social and environmental" values should be added to the research of sustainability and architecture relationship. To achieve sustainable development; sustainable construction which can be defined as a holistic process aimed to promote economic justice and human dignity while building settlements and re-achieve and maintain harmony between the natural and built environment (CIB and UNEP-IETC, 2002) appears to be an important criterion. In the global perspective sustainable construction -that can be defined as a socio-economic environmental approach- at the same time has national, regional and local visions (CRISP, 2004).

Old / historical urban areas are considered the most important documents because of transmitting the social lives, economic, technological conditions and cultures of societies to future generations. Due to this property they become one of the most important components that make up the social environment. Especially when old urban areas are examined, it is monitored that industrial buildings stand out due to some reasons peculiar; therefore, the "re-evaluation and transformation" works with the concept of sustainability is thought to provide important contributions for architecture.

In this context, there is going to be a discussion about three basic sustainability dimensions; the social, environmental and economical impacts on the industrial buildings which are affected by transformation and conservation in Golden Horn.

Sustainability Criteria

In this study three industrial buildings are going to be examined with the primary sustainability criteria (economical, social and environmental) because the information about technical criteria such as conflict, quality, management, application, etc. (Işık, et. al., 2012) are not accessible by the researchers. Thus the relation to architectural work and technical sustainability is not going to be presented by the study. Before discussing the social, environmental and economical impacts on the three chosen industrial buildings; determined sustainable indicator depending on the comprehensive literature survey shown in Table1.

Table 1. Sustainable indicators (Source: Işık, et. al., 2012).

ECONOMICAL INDICATORS	
<ul style="list-style-type: none"> • Cost • Time • Technical Requirements • Bureaucracy • Types of contracts • Strategical Decisions • Bidding competition • Management of Financial Risk • Economic flows (related to the life cycle) • Innovation • Economic performance • Potential financial benefits • Trading opportunities • Employment 	
ENVIRONMENTAL INDICATORS	
<ul style="list-style-type: none"> • Soil • Water • Atmosphere / Air • Biodiversity Landscape • Land use • Resources • Waste • Energy • Transport • Effects on Neighbors • Material Use Indoor environmental quality • Project Environmental Management • Legal • Health and comfort • Conservation of old building stock and physical assets (Physical Sustainability) 	
SOCIAL INDICATORS	
<ul style="list-style-type: none"> • Culture <ul style="list-style-type: none"> ◦ Historic Environment ◦ Cultural Heritage ◦ Built Heritage ◦ Built environment ◦ Protection to landscape and historical sites and culture • Public Accessibility • Participation of all Actors Security • Public Utility • Social Integration • Responsibility • Social Infrastructure <ul style="list-style-type: none"> Local demographics - Local education - Local health & safety & security - Local development- Provision of ancillary amenities to local economic activities - Pressure on public transport services- Access to regulatory and public services • Communication and Management • Product features <ul style="list-style-type: none"> Quality of Building as a Place to Live and Work - Building Related Effects on Health and Safety of Users- Access to Services Needed by Users of a Building - User Satisfaction - Land Use and Its Influence on the Public - Project Function - Organizational Objectives) • Satisfaction 	

CASE STUDIES IN GOLDEN HORN DISTRICT

Being the center of İstanbul with the prime location for centuries, Golden Horn whose industrial and historical heritage's of great importance, has started to fall from grace and become old since the beginning of 20th century until its re-discovery in recent years. For this reason, the region with potentially quite accumulation has taken place in the process of urban transformation with many projects. In this section, three large scale industrial buildings which are effected by transformation and conservation in Golden Horn are analyzed by using three basic sustainability dimensions; the social, environmental and economical impacts.

Silahtarağa Power Plant --- Santral İstanbul (2007), İstanbul

It's the project of Silahtarağa Power Plant, that is a typical modern industrial setting formed in the beginning of the 20th century, be transformed into a museum, recreational and educational center as Santral İstanbul (<http://www.arkiv.com.tr/p6191-santralistanbul-cagdas-sanat-muzesi.html> Accessed 09 June 2012).

The environmental analysis of the building can be summarized as:

- **Location:** Established at the end of the Golden Horn, at the mouth of Kağıthane and Alibeyköy rivers.
- **Old function:** The land spread over in total 118 000 square meters with machine rooms where the turbine generator sets, boiler rooms, warehouses, administrative buildings, workers' housing, and large areas of coal. They have changed functionally because of being unable to meet the functional needs with the increase of population, technological backwardness and physical wears (<http://www.santralistanbul.org/pages/index/silahtaraga-elektrik-santrali/tr> Accessed 09 June 2012)
- **New function:** The plant provided electricity to Istanbul from 1914 until 1952 and put an end to the electricity production in 1983. Today, the complex whose project was completed and opened in 2007, hosts university educational units, a contemporary art museum, energy museum, food and beverage and entertainment venues, recreation areas (<http://www.santralistanbul.org/pages/index/silahtaraga-elektrik-santrali/tr> Accessed 09 June 2012)
- **Buildings:** Internal spatial arrangements of old buildings regulated mostly preserving their original state. There are existing protected machinery spaces, turbine generating sets, control room and a new energy playground in the Energy Museum. As a result of conversion of workshop and storage buildings of the former power plants, Tamirane and Otto Santral, Krek Theatre / performance space (as dining, refreshment and entertainment venues) has emerged (<http://www.santralistanbul.org/pages/index/silahtaraga-elektrik-santrali/tr> Accessed 09 June 2012). A new structure Main Gallery, a 5-storey building skeleton that composed of reinforced concrete surrounded by a porous metal shell, (with ground floor) is a contemporary art museum. Educational units of Bilgi University are also new buildings.
- **Layout:** Complex is positive in terms of the overall settlement layout and routing. Because of its point on the Golden Horn, the complex can be easily detected from the environment from different scales and functions structures.
- **Transportation:** Taksim AKM – Santralİst service bus, private transportation (parking) and public transport (sea + road) are available. In addition, the project has contributed to the strengthening of the regional transportation network.

The social analysis of the building can be summarized as:

- Silahtarağa Power Plant is the Ottoman Empire's first urban-scale power plant.
- The Energy Museum which came about with the conversion of the power plant's original turbine rooms and meticulous preservation of its contents is Turkey's first industrial archaeology museum (<http://www.santralistanbul.org/pages/index/silahtaraga-elektrik-santrali/tr> Accessed 09 June 2012).

- The Main Gallery building is a contemporary art museum of contemporary art exhibitions and cultural activities, got the prize of "International Architecture Awards 2010" (<http://www.santralistanbul.org/pages/index/silahtaraga-elektrik-santrali/tr> Accessed 09 June 2012).
- The campus is an urban center of attraction due to being a training center and a cultural platform for the public.
- It's an important part of "Golden Horn Cultural Valley" project. But the project is disconnected with other project points from place to place (transportation, events, etc...).

The economical analysis of the building can be summarized as:

- It couldn't meet the needs of the building due to increases of maintenance costs attended economic damage in the late '70s. For this reason, the economic life of the finished production was stopped in 1983.
- Today, due to hosting many cultural and artistic activities, it is connected to its own structure and institutions as well as contributes to economic rather.

Cibali Tobacco Factory --- Kadir Has University (2002), İstanbul

It was established that changes in the industrial structure of the region socially and economically, today the "Golden Horn Cultural Valley" project turned into a university campus by installing educational function as Kadir Has University.

The environmental analysis of the building can be summarized as:

- **Location:** Located on the coast of the Golden Horn (Cibali side), next to the Unkapanı bridge.
- **Old function:** Cibali Tobacco Factory was established in 1884, tobacco processing and cigarette production. Factory operated by the French until 1925, with the establishment of the Republic, state enterprise has passed. The building lost its original function in 1995 and remained empty until 1997 (Alper M., 2004). Because of entering service in private enterprise cigarette factories with their advanced production technology it has undergone a functional change.
- **New function:** When restoration work lasted in 1998 until 2002 by Kadir Has Foundation, the building re-opened as a form of a higher education institution as Kadir Has University. Under the Faculty of Fine Arts building, there are also remains of a bath with a parking lot, the 16th century Byzantine cistern which were included in the protection.
- **Buildings:** 35 000 m² area, preserving its original form a connected by courtyards and passageways. It has been transformed into a courtyard net spaces (Alper. 2004).
- **Layout:** The complex can be easily detected from the environment from different scales and functions structures.
- **Transportation:** Transportation can be done by a private car or by public transport (road and maritime transport). There isn't enough car park because of the building layout. So drivers has to leave cars on paths between in the neighborhoods surrounding the building.

The social analysis of the building can be summarized as:

- Close to the time it was built around, it was an important structure that changes the socio - economic characteristics.
- Today, the technology of the factory transfers the task in the other factories. Large-scale structures in the center of the city's main transport axes (Unkapanı Bridge - The Golden Horn coast road) is located on the conversion of an important and valuable because it has become necessary to remain within the region.
- The Project got an award of European Union Prize for Cultural Heritage / Europa Nostra Awards (Oral, 2006).
- Because of being an university campus, students' increasing dormitory and the regional housing needs have little effect for residential areas.

- Closer integration with the environment is weak due to inward-looking layout.
- The Project is an educational part of “Golden Horn Cultural Valley” a very important project in urban scale. But with the other project points is still disconnected.

The economical analysis of the building can be summarized as:

- University campus, job opportunities created by itself, outside the inner circle could not be economically significant effect.
- There has been an increasing on using the port sides.

Lengerhane Building and Hasköy Shipyard --- Rahmi Koç Museum (1994 and 2001), İstanbul

Lengerhane Building and Hasköy Shipyard near the Golden Horn was purchased by the Rahmi M. Koç Museum and Cultural Foundation and was converted to a first industrial museum which is shown in Figure 3 (<http://www.vsdergi.com/200808/03/01.asp> Accessed 09 June 2012).

The environmental analysis of the building can be summarized as:

- **Location:** Near the Golden Horn on the side of shipyards, nearby the Golden Horn Bridge (E5).
- **Old & New Function:** In 1991, Foundation purchased the Lengerhane Building which was constructed during the Ahmet III as a shipyard and then it was used as a ethyl alcohol storage for Monopoly-Cibali Tobacco Factory. After the 2,5 years of restoration, the Museum is opened in 1994. Also, Ottoman Maritime Company (Şirket-i Hayriye)’s smallest dockyard Hasköy which was put into service in 1861, was purchased in 1996, it was renewed in 2001 and was incorporated to the museum (<http://www.vsdergi.com/200808/03/01.asp> Accessed 09 June 2012).
- **Buildings & Layout:** Museum includes original Lengerhane structure and additional underground exhibition places, shipyard, café-restaurants and open exhibition-activity places.
- **Transportation:** Transportation can be done by a private car or by public transport (road and maritime transport). Museum has a car park.

The social analysis of the building can be summarized as:

- Two important buildings that lost their functions are crucial as being the first Turkish industrial museum.
- Like other transformation projects, it remains as a punctual visiting center, has not a network with other centers of attractions in the region.
- Open exhibition places, café and restaurants are contributed to the city- coast relationship.
- It has a weak direct social-cultural interaction with its location.
- It has positive effects as a cultural center of attraction for public by enriching the city.

The economical analysis of the building can be summarized as:

- After the abundance of these important industrial buildings to their fate, these were purchased by the Rahmi M. Koç Museum and Cultural Foundation, transformed and operated by this foundation.

EVALUATION OF SELECTED INDUSTRIAL BUILDINGS UTILIZING THE SUSTAINABILITY CRITERIA

The results of change and transformation activities within industrial buildings that are located in Golden Horn area can be summarized:

Silahtarağa Power Plant --- Santral İstanbul (2007), İstanbul

In the context of building and urban area integration; the relationship of open-area and access, the relationship of old building stocks and physical assets, creating environmental perception, the

contributions of building to the urban and immediate surroundings and also being an urban image are the positive impacts of this change and transformation activities.

Also in the context of building and local area integration; transforming building as a campus and educational center had provide some contributions such as local education and development. Also with providing a stronger transportation network, public accessibility had increased. Santral İstanbul building as a public cultural platform creates a center of attraction and increases social integration.

Conservation of old building stocks placed special emphasis on that physical sustainability had been implemented in the process of restoration.

Cibali Tobacco Factory --- Kadir Has University

In the context of building and urban area integration; the relationship of open-area and access, the relationship of old building stocks and physical assets, creating environmental perception, the contributions of building to the urban and immediate surroundings and also being an urban image are the positive impacts of this change and transformation activities.

Also in the context of building and local area integration; from a factory building to an university, building gets another identity. Using building as an education building; necessitates using housing zones potentials more efficiently and that provides some ancillary amenities to local economic activities. This transformation also increased the usage of Golden Horn ferry quays and also creates an urban benefit. But having a weak integration with the immediate surroundings makes social integration lower. It is accessible with public and private transportation so public accessibility is very high.

Lengerhane Building and Hasköy Shipyard --- Rahmi Koç Museum

In the context of building and urban area integration; the relationship of open-area and access, the relationship of old building stocks and physical assets, creating environmental perception, the contributions of building to the urban and immediate surroundings and also being an urban image are the positive impacts of this change and transformation activities.

It is accessible with public and private transportation so public accessibility is very high. Unlike the other urban transformation projects in Golden Horn, this building has a characteristic of being disconnected from the other transformation areas. It also has a weak social and cultural interactive relation with the place it has positioned. This situation also creates weak integration.

In this context, Table 2 focuses on evaluation of selected industrial buildings with the sustainability criteria that were outlined in Table 1.

Table 2. Evaluation of selected industrial buildings with the sustainability criteria (Source: Authors).

	Silahtarağa Power Plant Santral İstanbul	Cibali Tobacco Factory Kadir Has University	Lengerhane Building and Hasköy Shipyard Rahmi Koç Museum
Economical Aspects	<ul style="list-style-type: none"> * Potential financial benefits (+) * Trading opportunities (+) * Innovation (+) * Economic performance (+) * Employment (+) * Time (+) * Strategic Decisions (+) * Management of Financial Risk (+) 	<ul style="list-style-type: none"> * Potential financial benefits (+) * Employment (+) * Innovation (+) * Economic performance (+) (-) * Time (+) * Strategic Decisions (+) * Management of Financial Risk (+) 	<ul style="list-style-type: none"> * Potential financial benefits (+) * Trading opportunities (+) * Innovation (+) * Economic performance (+) * Employment (+) * Time (+) * Strategic Decisions (+) * Management of Financial Risk (+)

Environmental Aspects	<ul style="list-style-type: none"> * Landscape / Landuse (+) * Conservation of old building stock and physical assets (Physical Sustainability) (+) * New buildings / addition (+) * Conservation of indoor Furnishing (+) * Material Use (+) * Effects on Neighbors (+) * Project Environmental Management (+) 	<ul style="list-style-type: none"> * Landscape / Landuse (+) * Conservation of old building stock and physical assets (Physical Sustainability) (+) * New buildings / additions (+) * Conservation of indoor Furnishing (+) (-) * Material Use (+) * Effects on Neighbors (o) * Project Environmental Management (+)(-) 	<ul style="list-style-type: none"> * Landscape / Landuse (+) * Conservation of old building stock and physical assets (Physical Sustainability) (+) * New buildings / additions (+) * Conservation of indoor Furnishing (+) * Material Use (+) * Effects on Neighbors (+) * Project Environmental Management (+)
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Table 2. continued

Social Aspects	<ul style="list-style-type: none"> * Public Accessibility (+) * Social Integration (-) * Public Utility (+) * Responsibility (+) * Historic Environment: <ul style="list-style-type: none"> Cultural Heritage (+) Built Heritage (+) Built Environment (+) Protection to landscape and historical sites and culture (+) Protection of historical building (+) * Social Infrastructure: <ul style="list-style-type: none"> Local education (o) Local development (+) Local demographics (o) Local health & safety & security (+) Provision of ancillary amenities to local economic activities (+) Pressure on public transport services (-) Access to regulatory and public services (+) * Communication and Management (+) * Product features : <ul style="list-style-type: none"> Land Use's Influence on the Public (+) Project Function (+) Organizational Objectives (+) 	<ul style="list-style-type: none"> * Public Accessibility (+) * Social Integration (-) * Public Utility (+) * Responsibility (+) * Historic Environment: <ul style="list-style-type: none"> Cultural Heritage (+) Built Heritage (+) Built Environment (+) Protection to landscape and historical sites and culture (+) Protection of historical building (+) * Social Infrastructure: <ul style="list-style-type: none"> Local education (+) Local development (+) Local demographics (+) Local health & safety & security (+) Provision of ancillary amenities to local economic activities (+) Pressure on public transport services (-) Access to regulatory and public services (+) * Communication and Management (o) * Product features: <ul style="list-style-type: none"> Land Use's Influence on the Public (+) Project Function (+) Organizational Objectives (+) 	<ul style="list-style-type: none"> * Public Accessibility (+) * Social Integration (+) * Public Utility (+) * Responsibility (+) * Historic Environment: <ul style="list-style-type: none"> Cultural Heritage (+) Built Heritage (+) Built Environment (+) Protection to landscape and historical sites and culture (+) Protection of historical building (+) * Social Infrastructure: <ul style="list-style-type: none"> Local education (o) Local development (+) Local demographics (o) Local health & safety & security (+) Provision of ancillary amenities to local economic activities (+) Pressure on public transport services (-) Access to regulatory and public services (+) * Communication and Management (+) * Product features: <ul style="list-style-type: none"> Land Use's Influence on the Public (+) Project Function (+) Organizational Objectives (+)
<p>User manual for this table; (+) is used for positive effects, (-) is used for negative effects, (o) is used for ineffective/neuter effects</p>			

Table 2. continued

CONCLUSION

In this study, in terms of sustainability criteria the changes and developments of the large-scale industrial buildings / areas located in the Golden Horn -which is an important area in the city- have been examined. Positive aspects of sustainability provided by the conversion of industrial buildings can be discussed under three main headings:

Environmental benefits:

- Having a unique architectural language,
- Because of being durable, it is easier to protect and support these cultural buildings than the other structures.

Social benefits:

- Public utility,

- Create awareness of social and historical values,
- The property of being documents of technological development,
- Aesthetic features.

Economical benefits:

- As being cultural properties they create an existing building stock,
- Provide economic vitality,
- As being potential centers, they provide contribution to tourism (Kıraç, 2001).

As a result of inspections that have done; it is thought that all three buildings transformed into new and correct functional forms. These three buildings that are examined in the study - beside maintaining physical existence- they became living places in terms of social and economic aspects and became attraction points in the city in accordance with their new functions.

Therefore, all three examples that have examined under this study (generally) provides economic, social and physical sustainability criteria which are presented in Table 1 as main criteria of sustainability -even if these buildings can't comprise all the entries under main topics. In Turkey, projects about transforming of industrial building are generally handled as structural transformation projects or urban design projects (Oral, 2006). Instead of this kind of approaches to provide sustainability it has to be planned in accordance with a common vision with a holistic approach. Also, it is thought that all these kind of projects need to be planned considering past, accepting today and thinking the future.

Industrial buildings -with even only their assets- allow the urban places they are located to contribute social and physical revitalizations. But generating a design and planning strategy between these potentials areas and the other parts of the city is much more important.

As a result, to ensure the sustainability of industrial buildings, it is necessary to create relationships with the surrounding areas and similar projects, increase work and production facilities within the place they are located, develop these industrial buildings as social and cultural centers and regenerate this areas with recreation areas and tourism facilities, also solutions shouldn't be unaware of each other for this kind of valuable areas of the city.

With the acceptance of changes and transformations as a sustainable action, implementation of these recommendations during mentioned processes; to provide much more economic, social and environmental benefits in the three basic steps of sustainability is more likely.

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