

# The Reuse of Historical Railway Stations in Turkey

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Received 01.15.2015; Accepted 04.04.2016

**ABSTRACT:** In this paper, the build and survived railway stations over the time at which first railway line construction started at Turkey until the present had been examined and the ones which were out of use and lost their original function with time had been determined. Also the determined building stock had been evaluated based on the principle of giving new function to the old buildings, in especial of station buildings. The obtained data had been scanned by means of software prepared by the expert system approach in order to make a priority order for buildings. The priority order of 40 stations which found to be eligible for re-usage and had been chosen among the examined 580 stations had been made. In this way discarded railway heritage action plan has been prepared for the solution of problems in the state. The solution proposes is guiding many countries, especially in Turkey.

**Keywords:** Railway Buildings, Re-use, Conservation, Turkey Railways, Stations.

## INTRODUCTION

The concept of sustainability come up for the first time in 1977, in D. Pirages' book of the "Sustainable Communities" (Tekeli, 1999). However, the concept accepted by whole world after 1970s when it is used in the World Commission on Environment and Development report, published at 1987, where contains debates on finding solutions to the environmental problems at all level.. This report which is known as "Our Common Future" contains "Sustainable Development" means that clutch international framework wins (Ekinci, 1995). Common Future, sustainable development report state that "today's needs are sustained without compromising future generations' ability to meet their own needs ". The concept, then Nations adopted on the meeting with the global agenda such as the 1992 Rio World Environment and Development Conference, 1995 Copenhagen Social Development Conference, 1996 İstanbul Human Settlements Conference Habitat II, 2002 in Johannesburg, the United Nations World Sustainable Development Summit. As a result, the concept initially only tried to be limited to manifest in the circumferential plane. However, the content that acquired in the 2000s is large enough to articulate concepts to almost every topic in a universal size.

Today sustainability is based on, ecological, social and

economic components and each carries its own different values (Avrupa Mimarlar Konseyi (ACE), 2005). While it is possible to collect environmental components under title of the atmosphere, land, oceans and seas, water and biodiversity, social components main theme consist of equality, health, education, shelter, security and population. Sustainability of economic indicators can be handled in two main themes, namely the economic structure and consumption and production patterns. Economic structures of the sub-themes of economic performance are trade and financial condition. Consumption and production patterns in its main theme can be divided in to three sub-themes as material consumption, energy use and waste generation and management (Nemli, 2004).

In this context while, re-use of old buildings is indirectly related to ecological and social sustainability, it is directly related to the economic context.

## Literature Reviews

Actually there is not a new phenomenon from the past about the re-use of old buildings. Because the man-made destruction of the buildings is not common until the industrial revolution. However, after the industrial revolution, to break down and to make a new one become usual (Cantacuzino, 1989). Then the adaptive re-use (adaptive reuse) concept becomes the new architectural approaches in the 1960s. It gains appreciation

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with the growing environmental movement in the 1970s. Because recycling buildings is an important and effective protection tool. Initially, the method put forward in order to prevent the destruction of historic buildings, with time, it is starting to be used for buildings which are non-historic in terms of economic value but are not out of use. Adaptive reuse concept is defined as the repair and rehabilitation of existing buildings while preserving the essence of the past (Cantell, 2005). Since the 1980s, it becomes an important component of rehabilitation and re-use position in the European construction industry. Workload reaches 40% of the construction industry. It is accepted by the owners who want to live in a contemporary building since it is less than the cost of a new building. So that old buildings which are rehabilitated or provided with new functions, cost between 50-80% of the cost of building a new building (Highfield, 1987). Since the 1990s, settled in the world agenda, "sustainability" is a complete support point for the concept of adaptive re-use of the revealed, recycling approach which is presented by environmental and economic sustainability expands in a vast area in terms of reuse and reduction of waste material. In the most basic sense it finds its mean in the adaptive re-use in the construction industry (DEH, 2004). As a result, it is understood that it is possible to survive old buildings longer by providing them a new function (Friedman, 2010). It also realized that the re-use of buildings could have a significant impact on urbanization (Robert, 1989). Situations that require buildings to be given new functions can be connected to two reasons in terms function itself and construction. These are the aging of the building function and the lost of building's individual function. However, both cases are directly related to the development of technology, the change of society life and generated new policies and they can be divided into two main parts.

- Historical / Cultural / sociological reasons;
- Economic / Environmental reasons.

Therefore, each building on the re-use is unique, has its own dynamics. Most important thing is that re-use must respond both user's and building's needs together. In fact, the re-use in the design and implementation of criteria for what should be a matter of consensus that could not literally finalized. On one hand, emerging technologies offers new opportunities for the use of buildings every day. On the other hand, a new provided function in the building is important for future sustainability (Conejos, et al., 2011).

In addition, for the construction of new buildings "energy intensive" effort needed, and for the reuse of existing buildings "labor intensive" efforts needed (Altınoluk, 1998). However, the more the interference measurements applied to the structure increases, the more the possibility to adapt to new user increase, while costs ,time and energy are reduced (Özel ,2006). That is why present building and function should be well examined when old building is re-functionalized. For example, providing new functions in the old building from the 1980s put forward commercial and industrial buildings which are well-build and

have adaptable spaces (Cantacuzino,1989).

Railway buildings, which are one of the main parts of the historic industrial buildings, are also noteworthy in this context. Railway buildings in various countries and cultures are considered as 'technical monuments' Railway heritage is consist of a wide variety of instruments from huge to hand use such as railway archives, station buildings, locomotives, wagons, bridges, viaducts, signal boxes, pumps, water tanks, various technical equipment, watches, furniture and huge buildings. According to the heritage railway line unlimited diversity and similarities can be seen in different countries and provinces. The construction of railway both by state and railway stations, the change of construction process according to the technological possibilities and railway development and the influence of local culture reveals a rich railway heritage. The most attractive universal aspect of railway heritage is that it include ties both between local values and cultures (Burman, 1997).

The most striking structures in the protection of railway heritage studies are inherently old station building. While stations are key point for transportation systems in one side, on the other side they are composition of various indoor and outdoor construction groups and expansive in urban areas. In addition, one side of this complex situation include the intensity and the crowd while the other side hosts the layout and accessibility along which many advantages and disadvantages occur (Bertolini & Spit, 1998). Emerged in the 1830s, captures the golden age until the early 1900s, until the 1950s still watching the railway station in the development process is the decline and abandonment period in the history of stations after 1960. In this period, with rail transport , because of being behind in terms of technological reason , need of new routes and the competition between transport systems , the old stations lost their function partially or completely and remain unavailable in many countries. After that the problem of protection of stations which are building stones of railway heritage comes out with the concept of 'protection ', started at 1960s, which includes 'sustainability " too, at 1990s. The two main approaches in the process that began in the 1960s in parallel with the new conservation approaches period until today is seen to be at the forefront.

- State-owned stations, without having the objective of profit motive, use of general interest.
- The privately owned stations use for service sector for income-generation.

In this context, many applications are made in different countries. For instance, In the 1950s, growth in 50 years which emerge at the "Protection of Railway Heritage" movement at UK is remarkable. By the 2000s in England about 170 historic lines open to be used for touristic purposes, with approximately 1000 paid 23,000 volunteer staff (Tillman, 2002). In France historical railway stations and trains started to be used for touristic purposes after 1960s. The historical railway stations are managed by nonprofit organizations like French Association of the Friends of Local Railways (FAFLR) which is found by volunteers by the support of French National Railways(FNR) at 1960s

(Dufetrelle, 2002). In Germany, "museum railways" called railway heritage movement, began in the mid-1960s. Actual results of studies concluded in 1990 which began to strengthen 1970s and 1980s (Echensperger, 2002). In 1993, in Germany VDMT (Verband Deutscher Museums und Touristikbahnen), the Association of the German Museum and Tourist Railways were found. Until now, with the projects developed by the Association, approximately 100 historic buildings re-arranged for tourist purposes and stations were re-functionalized (Höhmman, 2002). Steam train usage for touristic purposes started in 1980s with the efforts of volunteer groups. Those historical railway stations are generally belong to local railway stations. Central governments are not keen on the railway heritage because of the cost and operational problems. However, local governments who think that creation of tourism corridor studies provide support to small settlements will contribute to the studies (Maggi, 2002). In the United States from the 1970s a variety of work appears to be done which are analogous to ones in Europe. Firstly, the "National Register of Historic Places" list were recorded which included historical railway stations need to be preserved. Then, the construction of the necessary legal arrangements has started which allow re-use and promote re-use. (U.S. Congress. Senate. Commite on Commerce, 1975). After US government has implemented various projects in various regions prepared under the leadership of local government, central government and voluntary civil society organizations. As a result, whether in Europe Asia or America the protection of railway heritage based on voluntary approach and nonprofit organizations which are focused on usage for museum and tourist purposes. Otherwise, waiting for investments and projects from central management slows down the process. The main support often come primarily from local governments in terms of the potential to contribute to the regional development, very few examples exists that contains central government. The main expectation from central government is legal basis rather than financial resources. In addition, facilities in private sector hands, compared to one in the hands of government, are faster in the processes of decision-making and implementation of projects. Just solving the financial and functional problems of the buildings on the attention of society, is not enough. All segment of society must provide consensus on the future of building. In addition, legal restrictions, prevents the conversion much more when the size of building grows. The need for support of local governments and the will of the central government for the necessary arrangements increase (U.S. Congress. Senate. Commite on Commerce, 1975). Therefore, both private and public sector must find new ways to re-use the old building stock. Databases on the old buildings at this point can be an effective solution to be created. Because the project prepared under the leadership of local governments and public will contribute the connection between investors and owners of old buildings (Latham, 2000). In the work with that sense the context of historical station buildings in railway heritage in Turkey were examined. Indeed, among constructed 600 stations since 1856 until now, 1/3rd of

constructed stations have lost their functions. The re-use of this building stock is important in terms of protection of railway heritage and sustainability.

## MATERIALS AND METHODS

The transportation policy in Turkey after 1950 is shifted to road in parallel to whole world. The rapid development of road transport, opening the road to almost any point, converted into a form of double road even highway of the main artery and virtually no investment in this process is made for railway, that is why railway have no change to compete with highways in passenger transportation. On the other hand because of the freedom provided by highways and the distance of railway stations to the accommodation units decreases the demand of railways. Even if the main reason for closing stations is lack of demand, the reasons can be divided in to four parts.

### Emerging Technologies and Projects

Technological developments in the drawn vehicles; The first locomotive used is steam, it often needs to replenish coal and water, and it cannot move non-stop. That is why when stations are chosen it is cared to be close to water foundations. The distances between stations are kept to be 15-20 km. But, the developed locomotive technology, diesel and electrical locomotives put an end to this needs. Many small mid-stations remain useless.

Technological developments in the signaling system, the 98 % of railway stations in Turkey are single line.

In this context, many of the intermediate stations in single line system in Turkey consist only of train maneuver and crossing points system. Previously performed by human power, signal routing time activities connected with developing automation technology, you do not need staff at intermediate stations. All facilities in the station area will remain dysfunctional.

### Emerging Lines and Carried Out Projects

The recent project runs by TCDD1, intensified the pressure to shut down and leave the existing station building. The construction of new lines like "Marmaray" and YHT reduces the importance of stations which are constructed on old line. When the project is completed many small lines will remain useless.

### Closing Line

The lines remaining in the city center;

One of the reason for closing stations with railway lines is because station which is out of city at the beginning, but with the expanding city remained at the center of the city reach a situation that threaten the city traffic. With the special effort of local government, the lines at the center of the city are tried to be cancelled and the railway tried to be shifted toward out of city.

### Tree Type Line Structure

Railway activities carried out by Ottoman Empire were developed with the condition of giving privilege to foreign countries which

is highly prevent the occurrence of the integrated ,self-looped line structure in Anatolia. The occurred line system is the tree type line system which reaches from ports in coastal areas and markets and production areas inland. It is not possible to use this construction efficiently. The cycle tried to be provided by additional lines in Republic time however, it is impossible to fix the situation in some lines.

### The Change Or Elimination Of Special Need

Since in Turkey, until the 1950s the railway was the most important transportation system, it required to build some special stations for particular needs. For instance, stations constructed in big industrial organization for transportation of workers and burden .When the organization is closed, the station is closed. Another important need of that time is the collective military shipments. For this reason station building is constructed close to various military units. However when the need of station disappeared, it is abandoned. The most tangible example for change of need is the Logistic Center projects of TCDD after 2000.However, it is not possible to host centers in this size by present stations. That is why new stations fields are constructed and many of the old stations are remain useless.

### Natural Disasters and Security Issues

The disasters happened in Turkey effects station too .For instance, after Marmara earthquake in 1999, many historical stations at the region got harmed and destroyed. On the other hand, another problem is the security problem especially for the station located in rural areas. Many empty stations are being burned, some of station cannot survive from destructive effects of human even if they are tried to be protected by covering the spaces with walls.

As a result, when 7 region 20 lines and 580 station buildings are examined in Turkey the following results of figure 1 are obtained. 67% of the stations in the station building functions in Turkey are still used, the 31%. Remains unavailable.2 % of these stations is re-used. That is why there is no point in making plan of action of unused stations. (Fig.1)

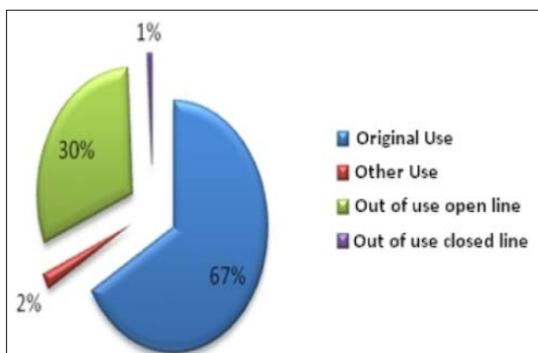


Fig. 1: Distribution of Usage Status

### Methods

All re- use and functionalized processes are unique for building whether it is railway station or not. It is not possible to produce and carry out certain methods in certain patterns.

The following function choice sizes are valid for both old and re –used or functionalized functions.

- Spatial development / functional fiction;
- Structural size / spatial magnitude;
- The location of the building / environmental factors;
- Structural condition / technical infrastructure;
- Protection status / legislation.

However, in railway stations case another criteria is added. This criterion is the condition of usage of railway. Such as, some function of a railway station may have lost their function or in some cases the whole railway may lost its function or it may even be completely closed. In second case it is easier to functionalize the station building. In firs case, since the line still in use it may bring about some problems like security and noise.

In the paper those main elements are takeover. Each analysis valuated, use, size, location-transportation, structural condition, protected status, and original value analysis have been carried out

Then working with rule-based information system, the generated system is prepared with the use of expert system which Works with if-then rules. With the algorithm seen in Fig. 2 so the rules system had executed to analyze 580 stations in terms of providing new functions in Turkey.

The build program aim is to simplify the evaluation of topic for those who are not expert and to provide information in a short time for experts. While constructional status analysis, usage status analysis, transportation status analysis and protection status analysis are directly evaluated, size status analysis and original value status are evaluated secondly in order to propose level of priority among station buildings. As a result, the buildings that should be re-used are analyzed based on Fig. 2 and Table 1.

The prepared expert system is briefly works as; in the first stage the system scans 580 stations in terms of construction status and separates the ones which valuated as 0-destroyed, by reaching the result "Passenger building does not exist". In the second stage the ones with non –zero value are analyzed in terms of usage status, the ones with "0-original use" are defined as "the station function continues 'and removed from system with that result. In the third stage the transportation status analysis is made and the ones with '0-rural area 'are separated and the buildings will be protected are identified. The protection analysis of this buildings are made and the ones which do not have an appropriate generate are separated with the result 'not recommended for use', the ones which are appropriate for protection , according to their damage level result as 'restoration and protection proposed 'and 'protection proposed'. In the fourth stage ,the kind of function will be determined according to transportation status which is not

Table 1. The Used Values

	0	1	2	3
Constructional status	Destroyed	Very damaged	Less damaged	Damage free
Usage status	Original use	Other use	Out of use open line	Out of use closed line
Transportation status	In rural area	On main road	Rural residential	Urban residential
Conservation status	New construction	Historical construction unregistered	Historical construction containing registration	Historical construction Registered
	(+1)	(+2)	(+3)	(+4)
Size status	Small	Medium / Small	Medium / Huge	Huge
	(+1)	(+1)	(+1)	(+1)
Original value status	Have additional facilities	Have historical importance	have architectural importance	View/Environment

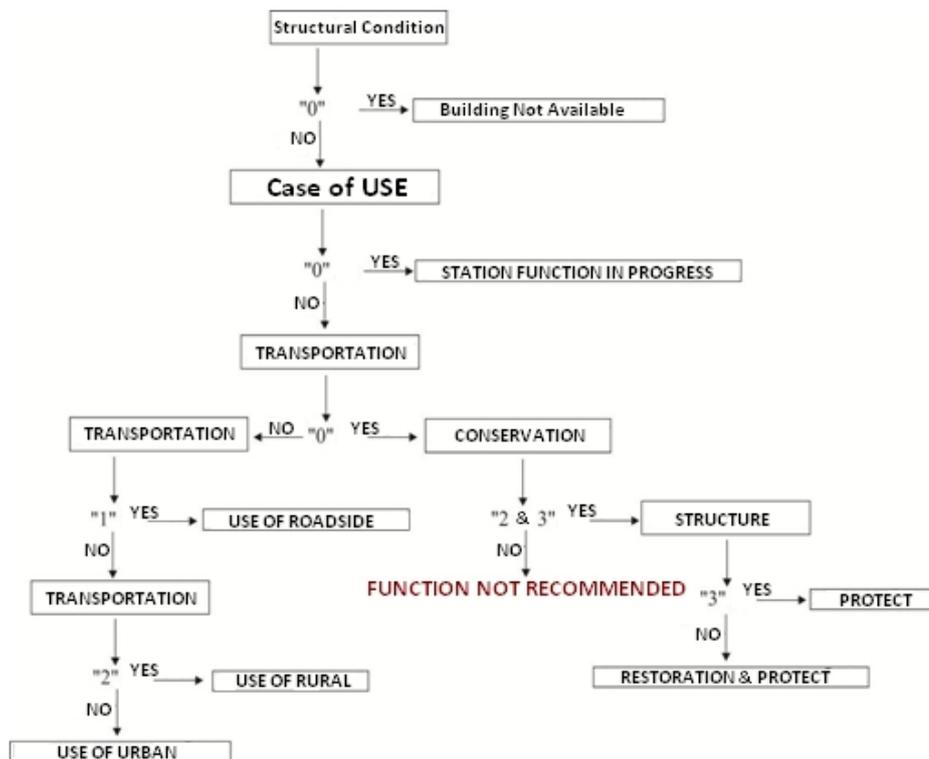


Fig. 2: The rule-based knowledge representation of the study

Out the third stage .In the fifth stage ,the system collect the ,constructional use, transportation ,protection status values based on the values given at table 3.28 for each different transportation ,then it reaches the result by adding original

value status and size values ,it determines the maximum value that station can reach. The founded result is arranged according to priority .The prepared expert interface is shown in Fig. 3. In software firstly region name is chosen then the line is

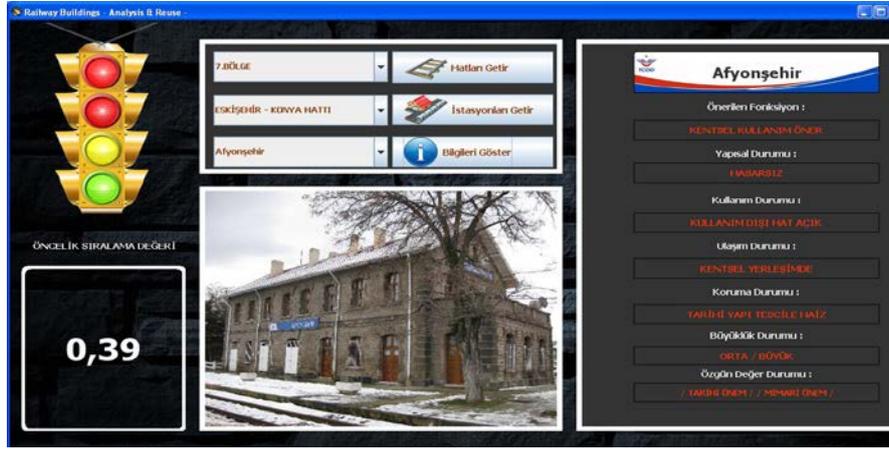


Fig. 3: Interface of program

determined and then the station name is entered, finally by pressing 'show information' button the system is worked. So that, the system is show results for entered name among 8 different result. Furthermore the analysis results data and priority level can be obtained.

## RESULTS AND DISCUSSION

According to obtained results during research, examined 40 stations found to be proper for reuse among 580 stations in Turkey. The distributions of stations and the priority order are shown in the Table 2.

Table 2. Priority Order

Roadside Use	Rural Use	Urban Use
Kuleönü	0.61	Eğirdir 0.68
Çukurhüseyin	0.50	Maliköy 0.58
Bakır	0.50	Doğançay 0.53
Sığırcı	0.50	Keçiborlu 0.53
Taşagül	0.44	Diliskelesi 0.47
Kavak	0.44	Tavşanlı 0.47
Okçugöl	0.44	Hereke 0.47
Çapalı	0.44	İnönü 0.47
Kurtçimeni	0.39	Babaeski 0.47
Samurçay	0.39	Çukurbük 0.47
Soğanlı	0.39	Tuzhisar 0.47
		Sarımsaklı 0.47
		Çivril 0.47
		Kabakça 0.42
		Sinekli 0.42
		Karpuzlu 0.42
		Karaağaçlı 0.42
		Beyce 0.42
		Böceli 0.42
		Kocabaş 0.42
		Bozkurt 0.42
		Arıkbaşı 0.37
		Sudurağı 0.37

Use appropriate Roadside Station Number 11 Pieces;  
 Use the appropriate Rural Number of Stations 23 Pieces;  
 Use appropriate Urban Station Number 6 Pieces.

It is highly important in order to show the accuracy of analysis method used in the research that Maliköy, Gazi, Sığırıcı and Keçiborlu are found to be appropriate for re-functionalizing, Kemer and Şirinyer stations are continued to search for re-functionalizing and the restoration studies of Diliskelesi, Tavşancıl and Hereke are still continued.

At the end of the study, the stations which are unused are obtained and the ones with appropriate conditions for re-use are determined. In order to prepare plan of action the stations are arranged according to priority order. By this conclusion, a guided program is produced for TCDD and the investment that may be done by private sector. On the other side the work is an example for other countries with similar problems.

## CONCLUSION

At the end of the 1990, when the railways are start to revise among transportation systems, it brings about new investment, the development is not just limited to railway stations and train technology. The integration of present buildings to the system or the construction of new buildings according to new systems is become inevitable. However, naturally, the problem of re-use of old railway stations which are named as railway heritage after 1990s occurs. Turkey faced with the same problem after 2000. In the research, it is seen that, the 37 stations are completely destroyed and the 1 of 3rd of remained stations are out of use among examined 580 stations in 7 regions after 2008 .However, the complete re-use of this building stock which consists of 110 stations is not possible. The single line management, build companies special objectives, the technical impossibilities because of the technology used, the construction far from the residence between 20-30 km, not reachable even with road transportations makes these buildings useless. The research proposes protection for buildings among these which are important historically and architecturally. 40 stations are valued separately which are appropriate for re-use.

The building stock which is constitute target group of research when investigated ,firstly, the private and public sectors considered separately and the station buildings divided in to three parts in order to propose re-use, priority order and database are prepared. At the end of the study, information about whole stations in Turkey is obtained in detail, the station buildings are proper for re-fictionalization is detected. With prepared projects and developed proposals, the ability to re-use of station buildings in a wide range has been proved. Although the study is likely to constitute a base in many scientific studies to be conducted in the future, it is certain that more work is needed to implement the project and preserve the railway heritage. In order to protect the railway heritage and sustain sustainability, particularly TCDD, government agency and private sector should give importance and show support for the topic.

## ENDNOTES

1. Türkiye Cumhuriyeti Devlet Demiryolları

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