EVALUATION OF TRANSPORTATION AND LAND USE AT HISTORIC GALATA CASE STUDY USING INDICATORS FROM SUSTAINABILITY MATRIX

N. AYDIN YÖNET*[1], F. YİRMİBEŞOĞLU[2]

[1]*Department of Architecture, Bahçeşehir University, İstanbul, Turkey.* [2]*Department of Urban and Regional Planning, İstanbul Technical University, İstanbul, Turkey.*

**Corresponding author: naydin@bahcesehir.edu.tr*

Abstract: The purpose of this paper is to examine the reintegration of a problem-laden historic zone into the surrounding urban fabric, based on parameters of sustainability potentials. Thus, the study aims to determine the sustainability potential of various projects prior to their execution, and hence to develop a model for evaluating how sustainability should figure into such projects. To this end, the Sustainability Matrix has been applied as a methodology for analyzing the project entitled "Application of Space Syntax in Regeneration and Transformation of Galata Area and Hendek Street". The matrix, due to the flexibility in the values assigned to its various indicators, can be adapted to different cites' or regions' needs. This study, in which the Sustainability Matrix was applied to the historic Galata District, proves that the matrix can be used to evaluate urban projects which focus on historic zones.

KEYWORDS: Sustainability Matrix, Galata District, transportation and land use

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Introduction

Sustainability is defined in the following way: "Development seeking to meet the need of the present generation without compromising the ability of future generations to meet their own needs. It aims at assuring the on-going productivity of exploitable natural resources and conserving all species of fauna and flora" (World Commission on Environment & Development, [1987])

Sustainability is currently a buzz-word in a variety of disciplines. In parallel with its rapid worldwide proliferation, it is becoming everyday more important in disciplines related to planning and design. As such, sustainability in urban planning and design are common issues. The purpose of this paper is to examine the reintegration of a problem-laden historic zone into the surrounding urban fabric, based on parameters of sustainability potentials. Thus, the study aims to determine the sustainability potential of various projects prior to their execution, and hence to develop a model for evaluating how sustainability should figure into such projects.

To this end, the Sustainability Matrix has been applied as a methodology for analyzing the project entitled "Application of Space Syntax in Regeneration and Transformation of Galata Area and Hendek Street" (Kubat *et al*, 2003).

This project was an apt candidate for this study due to the copious amount of information available. The entire project's planning decisions related to Galata—an important historic district—has been evaluated using the Sustainability Matrix. This allowed for the evaluation of urban projects prepared for historic areas based on their sustainability potentials.

Sustainability refers to an evolving process. Different social groups, cultures and classes have differing needs and tastes; hence each group interprets sustainability differently. As such, the indicators used to evaluate the sustainability potential of different projects show variation among

groups. Since the concept refers to an ethical and long-sighted process, it is of utmost importance for indicators to adapt to such changes.

The methodology selected for this study--the Sustainability Matrix--was used to compare various projects (or proposals therein) based upon their rapport with principles of sustainability. The matrix, which systematically evaluates projects based on the criteria of equity, environment, and economy, does so by determining if a project or its proposals measure up to sustainability indices. Thus, even before a project is begun it is possible to determine which project or proposal will have the greatest impact in terms of sustainability [Retrieved December 27, 2007 from http://www.ci.austin.tx.us/sustainable/matrixintro.htm].

The article has three main sections. In the first, sustainability indicators are studied and their relationship with the Sustainability Matrix is evaluated. In the second section, the Sustainability Matrix is dwelled upon in more detail and its criteria are investigated. In the final section, the matrix is applied to the Galata Project and its findings discussed.

Sustainability Indicators

The development of the concept of sustainability, which was defined in clear terms for the first time in the Our Common Future (Brundtland) Report dated 1987, has been analyzed from the viewpoint of sustainability indicators. Table 2 provides a detailed analysis of the projects evaluated in this paper based on social, economic and environmental indicators.

Sustainability potential can be defined as the level of sustainability of a project based on social, economical and environmental aspects. Sustainability indicators, in turn, are tools with which to measure how much of the sustainability potential has been achieved.

Sustainability indicators may be seen—falsely—as simple policy tools. In fact, the indicators are tools for effective communication during the application of sustainability policies. In the process of sustainability, governance, rather than government comes up as an important term. Having a firm grasp of the indicators is not enough; equally important is to understand and define the difficulties in their application. In this regard, Rydin, Holman and Wolff have analyzed three different projects. These projects are, the Joseph Rowntree Foundation/Civic Trust Project (focusing on English suburbs), the Department for International Development's project focusing on Russian regions and the PASTILLE Project (Promoting Action for Sustainability Through the use of Indicators at the Local Level in Europe). The study specifically focuses on the importance of governance indicators. Other topics of importance include the multi-actor (experts and others) base necessary for these projects, and the need for new legal/legislative formulations as well as the assignment of authority to different players (Rydin *et al*., 2003). . Even though these projects are located in different geographies, are articulated at different scales, and focus on different problems during the identification of sustainability indicators, their solutions to these problems are remarkably similar.

The sustainability indicators identified in the PASTILLE Project may be of use to local governments in the process of derivation of smart cities. The project includes different indicator groups. These are; satisfaction with local community services, local contribution to global climatic change, local mobility and passenger transportation, availability of local public open areas and local services, quality of local outdoor air, children's journeys to and from school, sustainable management of local authority and businesses, noise pollution, sustainable land use and availability of products promoting sustainability (Briggs, 2005).

Sustainability indicators can be classified as expert-oriented and citizen-oriented indicators. These two groups, which focus on different user-bases, show differences of preference based on the users' profiles, functions and political/administrative contexts. In comparing how these groups strive to attain sustainable development and what they measure, we see that citizen-oriented indicators are multi-faceted and focus on persons' behavior, while expert-oriented indicators typically have a holistic, singular focus. In the citizen-oriented approach, the main aim is to create an awareness towards sustainable development, while in the expert-oriented approach, performance evaluation is of prime importance. In the citizen-oriented approach, the target group is public, while in the expertoriented approach, the target group is experts. In looking at contextual differences, within the political/administrative context, we see that the citizen-oriented approach focuses on governance and networks, while the expert-oriented approach focuses on formal hierarchies within institutions. Looked at from the perspective of process participants, in the citizen-oriented approach, all participants both within and without the governmental body are active during the whole process, while in the expert-oriented approach, only the experts and certain administrators are active (Eckerberg and Mineur, 2003).

Local Agenda 21 (LA21) groups sustainability indicators under environment, economy, social issues, and democracy. European Common Indicators (ECI), on the other hand, has two groups: compulsory and voluntary indicators. The indicators used in the Environment Program (EP), naturally, focus on indicators related to the environment. While the LA21 indicators display a multi-faceted and inclusive structure, EP is more focused (wide scale environmental protection), and the ECI is quite multifaceted. Functionally, while the LA21 focuses on public-sector-oriented communication, EP places importance on up-to-date data obtained from municipalities. The ECI, on the other hand, focuses on objective data which makes comparison with Europe possible. In the political/administrative context, LA21 pulls together several actors (it is network influenced). The EP includes few external actors; it more truly can be described as an internal network. In the ECI, while some external actors participate, citizens are not included in the network. LA21 and ECI are citizen-oriented systems, while the EP is an expert-oriented system. As a result of all these comparisons, it is clear that the inclusion of citizens in any program is a difficult and expansive issue (Eckerberg and Mineur, 2003).

In their study on the performance of urban regeneration projects, Hemphill, McGreal and Berry mention five different sets of indicators. These are grouped under the following headings: economy and works, resource use, buildings and land-use, transportation and mobility, and community benefits. The greatest weight is placed on transportation and mobility indicators, while the lowest weight is on resource use (Hemphill *et al*., 2004).

As a relativistic concept, sustainability is an ethically-based and extended process. The concept, which includes economic, environmental and social issues, also touches upon concepts such as futurity, the environment, equity, and public participation. The success of sustainability-centered policies depends upon physical, behavioral, and governance-based factors. Factors such as urban structure and morphology, population density, urban macro-form, transportation, utility networks, urban heritage etc. also bear upon the success of sustainability policies. Also of importance are citizens' behavior mechanisms, their life-worlds, mobility patterns and awareness of environmental issues; as well as issues of governance--which entails institutional factors related to urban systems organization--public-private cooperation and the way in which this entrepreneurship takes place. As part of the BEQUEST (Building Environmental Quality Evaluation for Sustainability through Time) project, factors of planning, design, construction, property development and operation have been evaluated as part of development activities. Environmental, economic, social, and institutional issues have also been evaluated under the headings of environment and societal issues. Materials, building,

estate, neighborhood, district, city, urban region, national and global issues have been analyzed under the heading 'spatial level'. The timeframe has been divided into three segments including short-term (<5 years), mid-term (5-10 years), and long-term (>20 years) future. Local environment, economy, and social constraints have great bearing on the sustainability of a particular urban zone. For true success in the area of sustainability, full rapport between all stakeholders and various urban decisionmaking units, as well as all professional disciplines is compulsory (Bentivegna *et al*, 2002).

BEQUEST defines sustainability indicators at the urban scale using the Milton Keynes example. BEQUEST Milton Keynes sample defines sustainable indicators by helping these aims which are 'better integration of workplace and housing', 'higher balance of working near home', 'provision of green space, liner parks/planting etc.', 'redways – pedestrian and cycle routes separated from the normal road network', 'buildings to achieve "excellent" standard in the Building Research Establishment's Environmental Assessment Method [Retrieved February 15, 2008 from http://research.scpm.salfo rd.ac.uk/resources/InfoSheets/infolet2.doc].

Sustainability refers to a dynamic process. Different social groups, cultures and classes have differing needs and tastes; hence each group interprets sustainability differently. In the evolution of sustainability indicators, two different methods can be mentioned. The first is the modernist Topdown method. This method, which depends upon expert participation, is the subject of criticism because it cannot prevent the misuse of resources, and its character of alienation from local issues. The postmodernist Bottom-up method, on the other hand, is praised because it promotes user participation and allows end-users to have a say in the development of policies that will have an effect on their daily lives (Mcalpine and Birnie, 2005). The ideal combination may be the supplementation of the Top-down, expert-based practices with social participation per the Bottom-up method. Table 2 provides details regarding sustainability indicators in the case of the Guernsey Island. In the Guernsey example, the process begins with the Top-down method, but the indicators have been developed using the Bottom-up method. In this study, the cooperation between experts and local users in determining sustainability indicators is stressed. Use of the Bottom-up method is not compulsory, but the participation of local stakeholders in the process is quite important (Mcalpine and Birnie, 2005).

In the process of evaluation of environmental policies and plans, administrators and policy makers must evaluate local inputs along with expert views. The use of appropriate scales in sustainable management analysis is rather important. The scale which best suits data acquisition must be selected and the data must be integrated into higher-level plans using a clear audit-trail; political-bureaucratic and human-made boundaries must be eliminated (Fraser *et al*, 2006).

The United Nations have identified certain core sustainability issues. Holland Barrs Planning Group, which uses these core issues as a starting point, have developed a sustainability matrix to be used in studies related to sustainability (organizations, projects, products, services). The matrix involves two main axes. On one axis are the core sustainability goals, and on the other are core elements. Each project has specific opportunities and obstacles. As such, first the appropriate priorities must be determined for the project, and later the matrix must be applied. Using the matrix, a detailed evaluation of the project is possible [Retrieved November1, 2007 from http://www.hollandbarrs.com/articles /sustainability_matrix.pdf].

In determining sustainability indicators, the flexibility of indicators is an important criterion. The most basic criterion that is considered during the development of indicators is the limits to sustainability. The use of too many indicators in tackling complex problems may make it difficult to understand the whole picture. This may make it difficult to obtain meaningful results during the derivation and comparison of different indicators (Ghosh *et al*, 2006).

Ghosh has derived certain indicators to be used in evaluating housing areas (Table 2). All of these indicators are directly linked to ways-of-life and also affect the local environment. These indicators, besides their applicability at the local scale, can also be used at the national level (Ghosh *et al*, 2006).

In the communicative effectiveness of sustainability of indicators, the criteria of clarity, informativeness, relevance, and truthfulness are used. It is important for meaningful results that indicators possess these traits (Chess *et al*, 2005).

In defining sustainable urban form, Jabareen touches upon concepts of compactness, sustainable transportation, density, mixed land-use, diversity, passive solar design and green design. The basic typology determined for sustainable design is the concept of compactness; this entails the use of dense, compact, divers and highly integrated forms. The concept of sustainable transportation entails the elimination of unnecessary travel and the fostering of environmentally friendly and energy efficient forms of transport. In this transportation concept, the role of land use is of prime importance. Mixed use must be encouraged, thus eliminating unnecessary travel and, when it is necessary, making sure that distances to be traveled are not too great. Thus, environmentally friendly modes of travel such as walking or cycling can be used. Within the context of sustainability, density comes up as an important typology. The inherent correlation between low-density development and a good transportation network are increasingly being challenged. While certain views hold that higher density supports transit transportation, the opposite is also deemed true by some: that low density enhances the ease of travel to zones of urban activity and thus makes travel more efficient. The concept of mixed use requires that residential activity be integrated into all urban areas and that public areas should thus be made safer. The support of mixed use and the concomitant disdain of zoning is a hot issue of debate. Among this concept's main goals are the reduction of traffic congestion and air pollution, increasing pedestrian traffic, increasing interaction between residents and rendering neighborhood life attractive. Diversity, which is a key factor in the sustainability of cities, is a multifaceted issue. In a way, it is similar to the concept of mixed-use. It symbolizes the social and cultural facets of urban form. At the core of sustainable urban form is passive solar design. Ecological design and mixed land-use planning are policies which foster energy efficient development. Greening or green urbanism is an indispensable design concept in the definition of the sustainable urban form (Jabareen, 2006).

In analyzing the different studies above from the viewpoint of sustainability, the emergent trend has been that indicators related to sustainability are usually based on environmental, economic and social issues, and that the indicators themselves are based on similar criteria. Due to its wide scope, the Sustainability Matrix, which is the methodology chosen for the present study, includes most of the sustainability indicators used in the studies above. As such, and also due to its systematic and holistic approach, the Sustainability Matrix has been chosen for this study.

Methodology: The Sustainability Matrix

The sustainability matrix was developed through the efforts of a large group of contributors, including experts from various disciplines. The matrix, which was first used in the working plans for the Austin Sustainable Community Initiative, was approved in the June of 1997 (Bachmuth and Doxsey, 1996). Currently, all proposed projects for the city of Austin (Texas, USA) must have been evaluated using the matrix [Retrieved December 27, 2007 from http://www. ci.austin.tx.us/ sustainable/ matrixaustin.htm]. The Sustainability Matrix acts as a sieve to identify those projects where sustainability is a priority. Thus, projects that are the most promising in terms of their sustainability potential are identified before they are even begun. Due to the complex nature of

cities, their unpredictable dynamics and their potential for change, it is impossible to clearly foresee the outcomes of a project. But through the use of this matrix, some general estimates can be made regarding sustainability.

The Sustainability Matrix measures 13 basic criteria. These criteria are (X1) Public Health/ Safety, (X2) Maintenance, (X3) Socio-economic Impact, (X4) Neighborhood Impact, (X5) Social Justice, (X6) Alternative Funding, (X7) Coordination with Other Projects, (X8) Land Use, (X9) Air, (X10) Water, (X11) Energy, (X12) Biota, and (X13) Other Environmentals [Retrieved December 27, 2007 from http://www. ci.austin.tx.us/sustainable/ model.htm].

Each criterion is weighted differently. The weighting factor assigned to each criterion determines its effect on the final outcome (see Table 1) [Retrieved December 27, 2007 from http:// www. ci.austin.tx.us/sustainable/ model.htm]. The weighting factor itself is derived from component factors. The component factor is a product of the criterion's environmental, economic, social and logistic effects [Retrieved December 27, 2007 from http://www. ci.austin.tx.us/sustainable/ model. htm]. The impact indicator for each criterion has been detailed in the matrix tables (see Table 1) [Retrieved December 27, 2007 from http://www. ci.austin.tx.us/sustainable/ matrixconsider.htm].

To evaluate a project, its proposals are first assigned a possible rank with the help of impact indicators. Next, the possible rank is multiplied by the weighting factor and the weight value is derived. The total of weight values for each criterion provides the total score for the project. To summarize, the points are calculated as follows [Retrieved December 27, December from http:// www. ci.austin.tx.us/sustainable/ matrix score.htm].

Weighting factor x Possible Rank = Weight Value

Total Weight Values = Total Score (Higher values are more sustainable)

The possible ranks have been detailed in the matrix tables (see Table 1) [Retrieved December 27, December from http://www. ci.austin.tx.us/sustainable/ matrix score.htm].

Analysis: Galata Case Study

The aim of this study is to evaluate the way in which sustainability figures into the process of reintegration of a problem-laden historic area into the urban fabric. To this end, the Galata Project has been chosen.

Galata is the area where the Golden Horn meets the Bosphorus. Galata is 1300m from Taksim Square, which is accepted as the center of Beyoglu and Pera, and also the hub of the modern town. Thus Galata plays an important role by connecting old Istanbul to the new.

The main purpose of the Galata Project is, 'Reinstating Galata as a lively city core without compromising its historic character, using a method derived from the relationship between the area's transportation network and spatial configuration, and developing planning decisions to render Hendek Street a part of this project' (Kubat *et al*, 2003). This is based on the sustainability matrix criteria and this project can be classified as urban scale. The results of the Sustainability Matrix (Multi-Attribute Decision Utility Matrix), as applied to the Galata project are detailed in Figure 1.

The availability of concrete planning decisions as part of the project's results has made the application of the matrix easier. The sections titled Transportation Decisions and Land-Use Decisions below have been penned based on the project report (Kubat *et al*, 2003). The projects proposals for the Galata Area have been studied under 13 headings in the matrix, and, in Table 1, have been explained in detail per these 13 criteria.

The transportation decisions have been analyzed both as a whole, and also under four different headings: Pedestrian, Vehicular, Light Rail, and Sea.

Land-use decisions, likewise, have been analyzed as a whole, and also under seven different headings. These headings are: Reinstating Mixed-use (Tourism, Retail, Service, and Residential) instead of Undesirable Uses (Chandeliers, Hardware Stores, Electricians); Removal of Brothels and Reinstating Mixed-use (Tourism, Retail, Service, and Residential) in their stead; Urban Design of the Persembe Pazarı Shore Area; Planning of the Residential Area; Urban Design of the Golden Horn Shipyards; Urban Design of the Galata Port Area; and the Urban Design of the Kasimpasa Area.

4.1. Transportation Decisions (Kubat *et al*, 2003)

- One of the main goals of the plan is to attract pedestrian traffic into the area form the Taksim-Istiklal Street axis and the Karaköy Square. To this end, the project proposes that heavy vehicular traffic in the area must be reduced and parking restricted. Further proposals include, the opening of a pedestrian axis linking Karaköy Square with Istiklal Street; integration of this north-south axis with the Great Hendek axis (which will serve to connect it with the Galata Square and Kasımpaşa in the west); and to enhance the whole area with attractive urban design proposals. In this way, Galata will become an area which attracts pedestrian traffic, and one in which pedestrians can move in all directions through a series of pedestrian thoroughfares.
- In redesigning the Great Hendek Street as a pedestrian thoroughfare, vehicular traffic must be kept to a minimum in the Galata Square. Considering the traffic generation capacity of the Sishane Station on the new Taksim-Yenikapı Metro line, the importance of the to-bepedestrianized Hendek Street in connecting this point with the Karaköy Quay via the Yüksek Kaldırım Street is heightened. Thus, the project brings a holistic approach to integrating metro and pedestrian traffic.

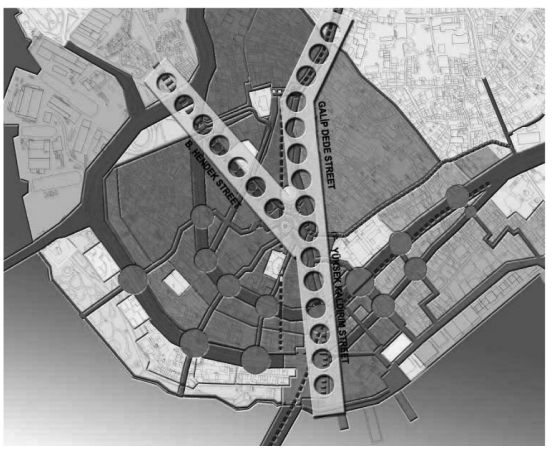

Figure 2: Proposed Pedestrian Lanes (Kubat *et al*, 2003)

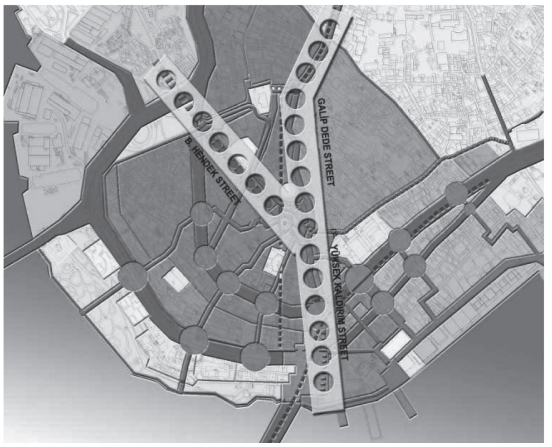

Figure 3: Proposed Vehicular Routes (Kubat *et al*, 2003)

The transportation proposals of the Galata Project have been evaluated using the Sustainability Matrix below.

4.1.1. Scoring of the Transportation Decisions

(X1) Public Health/Safety (Weight Value=78)

The crime rate in the area is quite high. The transportation proposals made for the area are positive in that they aim to increase public transport (which will support the historic functions of the area and aid in its integration with the rest of the city), and enhance pedestrian traffic. Thus, this is a project which brings certain solutions to the disordered traffic in the area. As such, if the Galata Project is postponed, this disordered situation will continue and this will contribute to the crime problem in the area.

(X2) Maintenance (Weight Value=26)

In developing transportation proposals, the project aims to utilize the existing infrastructure and to expand upon it. Thus, if the project is postponed, the existing infrastructure may decay further; this, in turn, will cause an increase in future expenditures for the city.

(X3) Socio-economic Impact (Weight Value=80)

It is anticipated that planning decisions prioritizing public and pedestrian traffic (which are relatively cheap) will increase traffic to the area. Given the area's central location, this increased traffic will most likely make the area more attractive for businesses.

(X4) Neighborhood Impact (Weight Value=110)

Pedestrianization of the Yüksek Kaldırım Street and reinstating its historic character; preservation of the historic metro route and its provision with new connections; pedestrainization of many roads and thus reinstating their historic character, can all be characterized as decisions which help protect the cultural heritage. Transportation decisions which increase usability and accessibility will also increase the area's comprehensibility.

(X5) Social Justice (Weight Value=96)

It is anticipated that the proposed transportation proposals will decrease the male-dominant usagepattern prevalent in the area. The new modes of transportation brought to the area (light rail, sea, vehicular, and pedestrian) will help attract all types of users to the area.

(X6) Alternative Funding (Weight Value=10)

The project is a good candidate for securing funds.

(X7) Coordination with Other Projects (Weight Value=36)

The proposed transportation system, when viewed in light of its basic tenets, has the potential of dovetailing with other macro- and micro-scale projects which may be implemented in the area. The project is sympathetic towards the historic fabric; it enhances the use of safe, public modes of transport and increases the accessibility of the area.

(X8) Land Use (Weight Value=100)

Transit and pedestrian oriented, low-impact transportation is positive when viewed from a sustainability perspective. It is also positive that transportation-capacity-enhancing proposals, in the form of new access points, are also integrated with the existing infrastructure, and will be realizable with minimum changes to this infrastructure.

(X9) Air (Weight Value=40)

The project proposes to increase low-impact transport modes and the pedestrianization of numerous streets. Besides their positive aspects in and of themselves, such proposals have the potential of mutual reinforcement, thus significantly reducing vehicular traffic.

(X10) Water (Weight Value=4)

It is not anticipated that the project will have a significant impact on water quality.

(X11) Energy (Weight Value=24)

The project reduces vehicular traffic, thus helping reduce energy use and increasing energy optimization.

(X12) Biota (Weight Value=4)

It is not anticipated that the project will have a significant impact on biota.

(X13) Other Environmentals (Weight Value=24)

Because the project includes different transport modes (pedestrian, sea, light rail, vehicular) it is deemed more flexible. It is anticipated that the new proposal will be easily implementable in the given context.

4.2. Land Use Decisions (Kubat *et al*, 2003)

- With its historic building stock, Galata has the potential of becoming a very big culturetourism center. As such, it is believed that tourism will be an important function for the area in the future. But the aim is not to turn the area--with its silent streets which enjoy popular use only during certain hours of the day--into an open-air museum. While it is important to preserve Galata's historic character and to turn it into a tourism center, equally important is to keep it a functioning and lively district. To achieve this, besides traffic generating functions such as retail and service, it is important to have a measure of residential function to keep the area alive at night. Besides these functions, it is important that mixed-use be introduced in some areas, and to combine tourism with social and cultural functions. The main purpose of the project is to reinstate Galata as an important center within Istanbul, without compromising its historic character.
- The shore area to the northwest of the Unkapani Bridge and the shipyards in its vicinity has been designated as special mixed-use areas. It is proposed that the plans for these areas be obtained through an international design competition. If the shipyard is to be moved out of the area, the land-use alternatives for the area include: an auditorium/cultural center or mixed use with an office/commercial core with public areas and residential units.
- The area to the east of the Karaköy Square is an under-utilized area today. It is proposed that the plans for the port facilities in this area be obtained through an international design competition. Infill buildings in this historic area should be weeded out and the remaining authentic structures should be adaptively re-used. In this way, the area can be made more attractive.
- One of the most important proposals of the project is to create anchor facilities at both ends of Hendek Street—a thoroughfare which best reflects the area's historic character. At the westward end of the street, the project proposes a mixed-use anchor, including residences. It is envisioned that parking facilities needed for the area will be integrated into this anchor. At its eastward end, Hendek Street, after traversing the Galata Square, reaches Yüksek Kaldırım Street. Here, the project proposes tourism, service, residential and retail functions.
- The project further proposes that incongruent functions such as chandeliers or electricians be removed from the area to be replaced with small hotels, souvenir shops, small restaurants, and entertainment areas. The project also proposes an increase in the number of musical instrument shops in the area.
- The shore area to the south of Perşembe Pazarı, besides its cultural potential, is designated as a green area--a much needed function in the area. The project proposes that the existing network of streets radiating outward from the Galata Tower should reach the shore area via new pedestrian bridges to be built over Tersane Street.
- The brothel zone, located near the (former) city gate (Gate No. 3) which provides access to the port from Galata's Yüksek Kaldırım Street houses an incongruous function, squeezed, as it is, between educational facilities and a residential area. The brothels are particularly problematic for women and children. The project proposes that this function which is incompatible with the area's character be moved elsewhere and the zone allowed to evolve according to Galata's needs.

4.2.1. Scoring of the Land-Use Decisions

(X1) Public Health/Safety (Weight Value=130)

Crime poses an important problem in the area. Crime rates in the Beyoglu area are high in general. One of the reasons for this is the wrong land-use patterns prevalent in the area, and this requires a speedy remedy. To change incongruent spatial patterns, these incompatible land-use patterns must change. With the new set of proposed land-uses, the area will be rendered safer. Thus, this proposal is deemed a positive one, with its potential to change the area into one where it is safe to live and walk.

(X2) Maintenance (Weight Value=130)

As a result of the abovementioned incompatible functions, the building stock in the area is quite dilapidated. The incompatible functions prevalent in the area (hardware stores, chandeliers, electrical parts stores, construction material retailers, brothels) should be removed from the area. For this reason, the area is in urgent need of attention.

(X3) Socio-economic Impact (Weight Value=100)

It is believed that turning Galata into a lively historic center which caters to the tourism industry will provide substantial benefits for the area's economic and social development. The land-use proposals also suggest the inclusion of residential, retail, and service functions in this mix. If all of these changes are indeed realized, the area will attract substantial business investment.

(X4) Neighborhood Impact (Weight Value=110)

For the historic fabric in Galata to be preserved, the existing land-use patterns must change. With the new tourism, residential, service, and retail functions proposed, the historic buildings will be utilized and thus preserved. In its present state, the Galata District is a zone of decay, squeezed between the Taksim-Istiklal Street and Karaköy. With the proposed functions, the area will be better integrated with neighboring urban areas, and achieve a more lively character. The aim of creating a living historic center and an international center of culture and tourism has been evaluated as very positive. Planning decisions which foster recreational and educational functions in an area which is very accessible will increase social liveliness. All of these changes will lead to increased property and land prices in the area. Rehabilitation of the area both in physical and social terms will lead to its increased utilization.

(X5) Social Justice (Weight Value=96)

With the changing land-use patterns within Galata, the area will be much less male-oriented, and will begin to serve the general population.

(X6) Alternative Funding (Weight Value=10)

Because the proposed planning decisions will improve the area physically, environmentally, socially, and economically, it will be relatively easy to secure funding for these projects.

(X7) Coordination with Other Projects (Weight Value=36)

The project's planning decisions have the capacity to create a lively city center. The creation of such a center will have positive repercussions for all projects—be they macro or micro—taking place in the near vicinity of Galata.

(X8) Land Use (Weight Value=100)

The removal of old functions and the introduction of tourism, service, retail, residential, and mixeduse in their stead will have a positive effect on the area's sustainability. While the project does propose occasional infill buildings, its main goal is to preserve the existing building stock and to rehabilitate it. The new land-use pattern, which supports pedestrian activity, is supported by lowimpact transportation solutions.

(X9) Air (Weight Value=40)

The heavy traffic in the area will lighten as the area's land-use patterns change. This will be positive for the air quality in the area. The introduction of green areas will also contribute to air quality.

(X10) Water (Weight Value=4)

The project has been deemed neutral in terms of water impact.

(X11) Energy (Weight Value=8)

Since the land-use proposals will potentially decrease vehicular traffic in the area, the project's effect on energy efficiency and optimization will be positive.

(X12) Biota (Weight Value=8)

The park proposal between the Unkapanı and Galata bridges will have some positive effects on the ecosystem in the shore area.

(X13) Other Environmentals (Weight Value=4)

The land-use proposals do not include any terms regarding buildings' design, materials or adaptive reuse; in short, no strategy regarding sustainability is outlined.

4.3. Evaluation of the Galata Project According to the Sustainability Matrix

The sustainability-based priorities of the project's proposals:

1. (2B-Table 1) Removal of Brothels and Reinstating Mixed-use (Tourism, Retail, Service, and Residential) in their stead (780 points)
2. (2A-Table 1) Reinstating Mixed-use (Tourism, Retail, Service, and Residential) instead of Undesirable Uses (Chandeliers, Hardware Stores, Electricians) (770 points)
3. (2C-Table 1) Urban Design of the Perşembe Pazari Shore Area (677 points)
4. (2E-Table 1) Urban Design of the Golden Horn Shipyards (606 points)
5. (2F-Table 1) Urban Design of the Galata Port Area (552 points)
6. (2G-Table 1) Urban Design of the Kasimpasa Area (524 points)

7. (1A-Table 1) Pedestrianization Proposals (504 points)
8. (2D-Table 1) Residential Area Proposal (406 points)
9. (1C-Table 1) Light-Rail Proposal (334 points)
10. (1D-Table 1) Sea Transportation Proposal (257 points)
11. (1B-Table 1) Vehicular Transportation Proposal (134 points)

The above proposals have been divided into five groups, taking into consideration the natural clustering tendency that has taken place based on scores; that is, proposals which have received similar scores have been grouped together. This was deemed important for achieving sound results. Five groups have been identified. Proposals with the highest scores are in Group 1; proposals with the lowest scores are in Group 5.

Group 1: This group contains the following proposals: Removal of Brothels and Reinstating Mixeduse (Tourism, Retail, Service, and Residential) in their stead (780 points), and Reinstating Mixed-use (Tourism, Retail, Service, and Residential) instead of Undesirable Uses (Chandeliers, Hardware Stores, Electricians) (770 points). The difference in scores between Group 1 and Group 2 is 103 (780-677). The difference in scores between the highest- and lowest-scored proposals within Group 1 is 10 (780-770).

Group 2: This group contains the following proposals: Urban Design of the Perşembe Pazarı Shore Area (677 points), and Urban Design of the Golden Horn Shipyards (606 points). The difference in scores between Group 2 and Group 3 is 125 (677-552). The difference in scores between the highestand lowest-scored proposals within Group 2 is 71 (677-606).

Group 3: This group contains the following proposals: Urban Design of the Galata Port Area (552 points), Urban Design of the Kasımpaşa Area (524 points), and Pedestrianization Proposals (504 points). The difference in scores between Group 3 and Group 4 is 146 (552-406). The difference in scores between the highest- and lowest-scored proposals within Group 3 is 48 (552-504).

Group 4: This group contains the following proposals: Residential Area Proposal (406 points), and Light-Rail Proposal (334 points). The difference in scores between Group 4 and Group 5 is 146 (552-406). The difference in scores between the highest- and lowest-scored proposals within Group 4 is 72 (406-334).

Group 5: This group contains the following proposals: Sea Transportation Proposal (257 points), and Vehicular Transportation Proposal (134 points). The difference in scores between the highest- and lowest-scored proposals within Group 5 is 123 (257-134).

Proposals in Group 1 concern land-use patterns which negatively affect the area.
Proposals in Group 2 relate to the rehabilitation of decaying zones within the area.
Proposals in Group 3 concern changes which will increase the area's liveliness.
Proposals in Group 4 are supporting proposals for those in Group 3.
Proposals in Group 5 have little effect on the area.

Evaluation of Transportation Proposals' Scores: Proposals regarding the pedestrianization of Galata are quite important for the district's sustainability and have therefore received high points. Proposals regarding light-rail and sea transport support the decision to pedestrianize the area. In terms of vehicular traffic, there is little change outside the areas being pedestrianized.

Evaluation of Land-Use Proposals' Scores: Among the land-use proposals, those that aim to remove functions that are incongruent with the area's historic character and contemporary

potential have received the highest points. Second-tier proposals concern those related to reclaiming of unused areas, while the last-tier proposals are those related to creating more liveliness in the area.

When the matrix is looked at as a whole, it is seen that all of the proposals have received meager scores with regard to environmental criteria. The reason for this is that the project lacks clear proposals to address environmental issues. Because no data regarding financing options was found, the 'Alternative Funding' criterion was scored equally for all proposals.

Conclusion

The Sustainability Matrix is an important tool for determining the priority of different urban projects which aim to promote sustainability.

This paper shows that the Sustainability Matrix can be used to systematically evaluate different projects based on their sustainability potential. The matrix, due to the flexibility in the values assigned to its various indicators, can be adapted to different cites' or regions' needs.

This study, in which the Sustainability Matrix was applied to the historic Galata District, proves that the matrix can be used to evaluate urban projects which focus on historic zones.

While in the City of Austin example, the Sustainability Matrix was used to evaluate different urban projects, here, the different proposals within a single project were evaluated. The study shows that the matrix can also be used to evaluate such proposals.

In projects in Turkey in general, and in Istanbul in particular, the general observation that the Sustainability Matrix's environmental criteria (air, water, energy, biota impact, and other environmentals) are not catered to, can be made. For this reason, in projects evaluated using the Sustainability Matrix, environmental criteria (which account for 20% of the total points) will receive meager points. Another reason why projects often fail in Turkey is due to funding problems. Since there are no funds allocated for the Galata Project, a sound evaluation regarding the 'Alternative Funding' criterion could not be made in the matrix. The matrix needs to be reevaluated according to the particular conditions prevalent in Istanbul, and the weight of the environmental factors within the matrix should be reconsidered. Due to lack of coordination between planning institutions and a lack of consistent policies, many projects are hard to implement. The resolution of such problems for the successful implementation of sustainable projects is of prime importance.

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APPLICATION OF SPACE SYNTAX
IN REGENERATION AND TRANSFORMATION OF
GALATA AREA AND HENDEK STREET
PROPOSED URBAN DESIGN AREAS
EXISTING PROJECTS
PROPOSED PEDESTRIAN AXES
VEHICULAR AXES
RAILWAY SYSTEMS
PEDESTRIAN - VEHICULAR JUNCTION
SPECIAL SOLUTION AREAS
MIXED-USE AREAS
RESIDENTIAL, COMMERCIAL, SERVICES AND TOURISM
PUBLIC AREAS
EDUCATIONAL, RELIGIOUS, CULTURAL
AND ADMINISTRATIVE FACILITIES
COMMERCIAL - SERVICE AREAS
RESIDENTIAL AREAS
GREEN AREAS
PARKING LOTS
ACCESS POINTS TO THE GALATA DISTRICT
CIHANGIR
TOPHANE
KASIMPASA
TAKSIM
ISTIKLAL STREET
RESIDENTIAL AREA
GALATA PORT PROJECT
URBAN DESIGN PROJECT AREA (MIXED-USE)
PASSENGER BOATS TERMINAL
SEA BUS TERMINAL
COMMERCIAL+ SERVICES
MIXED-USE TOURISM-SERVICES RESIDENTIAL-COMMERCIAL
BEYOĞLU MUNICIPALITY
PARKING LOTS
GALATA TOWER
VOYVODA STREET
KASIMPASA URBAN DESIGN PROJECT AREA (MIXED-USE)
TERSANE STREET
PARKING LOTS
PARK
PERŞEMBE PAZARI URBAN DESIGN PROJECT AREA
GALATA BRIDGE

Figure 1

TABLE 1

SUSTAINABILITY MATRIX "GALATA SAMPLE"

			(1) TRANSPORTATION PROPOSALS											(2) LA
			1A		1B		1C		1D					2A
			Pedestrianization Proposals		Vehicular Transportation Proposal		Light- Rail Proposal		Sea Transportation Proposal		TOTAL SCORE			Reinstating Mixed-use
Weighting Factor	Component Factor	CRITERIA Impact Indicators	Possible Rank	Weight Value	Possible Rank	Weight Value	Possible Rank	Weight Value	Possible Rank	Weight Value	Possible Rank	Weight Value		Possibl Rank
% 13	%85 Social %15 Environmental	**X1: Public Health /Safety** Public Health Safety Crime Prevention	2	26	1	13	1	13	1	13	6	78		8
% 13	%65 Economic %35 Environmental	**X2: Maintenance** Maintenance Protects Assets	2	26	2	26	1	13	2	26	2	26		10
% 10	%50 Social %50 Economic	**X3: Socio-Economic Impact** Local Job Creation: Consider Long-term (not construction) Consider Spin-off (not City Jobs) Job Training Public-Private Partnerships	6	60	1	10	2	20	1	10	8	80		10
% 11	%80 Social %10 Economic %10 Environmental	**X4: Neigborhood Impact** Preserves or Adds Heritage Value Adds or Increases Utilization or Access Increase Property Values Adds/Increases Recreational Opportunities Adds/Increases Educational Opportunities	10	110	1	11	10	110	6	66	10	110		10
% 12	%90 Social %10 Economic	**X5: Social Justice** Equity Diversity (Consider who is being served)	6	72	1	12	2	24	1	12	8	96		8
% 5	%100 Economic	**X6: Alternative Funding** Grants Aid Bond Alternatives	2	10	2	10	2	10	2	10	2	10		2
% 6	%50 Economic %20 Environmental %30 Logistical	**X7: Coordination with other Projects** Coordination with other Projects/Departments Consolidation of Services Synergy Shared Operating System Benefits	6	36	2	12	6	36	6	36	6	36		10
% 10	%15 Social %85 Environmental	**X8: Land Use** Regional Sustainability Preservation of Sensitive Lands Adds New Asset in Nodal Area Transit or Pedestrian Oriented Development Improves/Increases Carrying Capacity of Existing Infrastructure Contribute to Nodal Development	10	100	2	20	8	80	6	60	10	100		10
% 4	%100 Environmental	**X9: Air** Zero Pollution Optimization	10	40	1	4	2	8	1	4	10	40		10
% 4	%100 Environmental	**X10: Water** Zero Pollution Optimization Conservation	1	4	1	4	1	4	1	4	1	4		1
% 4	%100 Environmental	**X11: Energy** Conservation Optimization Renewables	2	8	1	4	2	8	1	4	6	24		2
% 4	%100 Environmental	**X12: Biota** Diversity Preservation Restoration Location	1	4	1	4	1	4	1	4	1	4		1
% 4	%100 Environmental	**X13: Other Environmental** Design Materials Adaptive Re-use	2	8	1	4	1	4	2	8	6	24		1
				504		134		334		257		632		

DEFINITIONS OF POSSIBLE RANK

X1: Public Health / Safety

- **10 Urgent** - Necessary to remedy or prevent a major health/safety hazard
- **8 Essential** - Necessary to remedy or prevent a major health/safety hazard
- **6 Minor** - Potential hazard, deferral of project would increase level of hazard
- **2 Minor** - Potantial hazard, deferral of project would not increase level of hazard
- **1 Neuter** - Project does not remove any health or safety hazard
- **0 Negative** - Project may create a health or safety hazard

X2: Maintenance

- **10 Urgent** - Maintenance already failed
- **8 Essential** - Annual maintenance progr
- **6 Necessary maintenance** - deferral wil significant increase cost to the City
- **2 Necessary mantenance** - deferral will result in significant increase cost to the (improvement of an existing asset)
- **1 Neuter** - Not applicable, adds new ass
- **0 Negative** - Project would result in main being done where none is needed

ND USE PROPOSALS																
nstead of Undesirable Uses	2B Removal of Brothels and Reinstating Mixed-use		2C Urban Design of the Persembe Pazari Shore Area		2D Residential Area Proposal		2E Urban Design of the Golden Horn Shipyards		2F Urban Design of the Galata Port Area		2G Urban Design of the Kasimpaşa Area		TOTAL SCORE	
Weight Value	Possible Rank	Weight Value	Possible Rank	Weight Value	Possible Rank	Weight Value	Possible Rank	Weight Value	Possible Rank	Weight Value	Possible Rank	Weight Value	Possible Rank	Weight Value
104	10	130	8	104	2	26	8	104	6	78	2	26	10	130
130	10	130	1	13	6	78	2	26	2	26	2	26	10	130
100	10	100	10	100	1	10	10	100	10	100	10	100	10	100
110	10	110	10	110	10	110	10	110	10	110	10	110	10	110
96	10	120	8	96	1	12	8	96	6	72	8	96	8	96
10	2	10	2	10	2	10	2	10	2	10	2	10	2	10
60	10	60	8	48	6	36	6	36	6	36	6	36	6	36
100	10	100	10	100	10	100	10	100	10	100	10	100	10	100
40	1	4	10	40	1	4	1	4	1	4	1	4	10	40
4	1	4	1	4	1	4	1	4	1	4	1	4	1	4
8	1	4	1	4	2	8	1	4	1	4	1	4	2	8
4	1	4	10	40	1	4	1	4	1	4	1	4	2	8
4	1	4	2	8	1	4	2	8	1	4	1	4	1	4
770		780		677		406		606		552		524		776

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X3: Socio - Economic Impact

10 Very high positive economic impact
8 High positive economic impact
6 Moderately positive economic impact
2 Low positive economic impact
1 Neutral economic impact
0 Negative economic impact

X4: Neighborhood Impact
X5: Social Justice
X8: Land Use
X9: Air
X10: Water
X11: Energy
X12: Biota
X13: Other Environmentals

10 Very high positive impact
8 High positive impact
6 Moderately positive impact
2 Low positive impact
1 Neutral impact
0 Negative impact

X6: Alternative Funding

10 Grant awarded
8 Grant award pending
6 Grant in process
2 Project is eligible for a grant
1 Project is either not eligible for a grant, or grant application is not under consideration

X7: Coordination with other Projects

10 Project completion necessary for a related project that is underway
8 Project completion necessary for a related project that is scheduled in the future
6 Project plans laid out for utilization of synergistic opportunuties
2 Project offers synergistic opportunities
1 Project does not affect/cannot affect any other project positively
0 Project would negatively impact another project's completion

TABLE 2

Author	Study	Scale	Social	Economic	Environmental
Rydin, Y., Holman, N., Wolff, E.,	English Suburbs	Urban	The policy gaps about the transition areas (suburban areas) between rural and urban	The policy gaps about the transition areas (suburban areas) between rural and urban	The policy gaps about the transition areas (suburban areas) between rural and urban
	Russian Regions	Regional	Importance of establishing a broad stakeholder/partnership base, adaptation of approach to suit the country context, time is needed to build long-distance relationships and foster team spirit	Importance of establishing a broad stakeholder/partnership base, adaptation of approach to suit the country context, time is needed to build long-distance relationships and foster team spirit	Importance of establishing a broad stakeholder/partnership base, adaptation of approach to suit the country context, time is needed to build long-distance relationships and foster team spirit
	PASTILLE	Local	Institutions and decision processes, issues of legitimation , knowledge claims and the actors	Institutions and decision processes, issues of legitimation , knowledge claims and the actors	Institutions and decision processes, issues of legitimation , knowledge claims and the actors
Briggs, G.	PASTILLE	Local	Satisfaction with local community services, availability of local public open areas and local services, children's journeys to and from school, sustainable management of local authority and businesses	Sustainable land use, local mobility and passenger transportation, sustainable management of local authority and businesses, availability of products promoting sustainability	Local contribution to global climatic change, local mobilitry and passenger transportation, quality of local outdoor air, noise pollution, availability of products promoting sustainability
Eckerberg, K., Mineur, E.	Agenda 21	Local	Fear of violence,children, proportion of population with asthma, proportion of people involved in voluntary organisations, election turnout among first-time voters	Level of employment, level of education, sales of eco-labelled foodstuffs	Energy consumption per capita, number of days with satisfactory air quality, proportion of journeys made by public transport
	European Common Indicators	Local	Citizens' satisfaction with the local community, availability of local public green areas, children's journeys to and from school, sustainable management	Sustainable land use, local mobility and passenger transportation, sustainable management, products promoting sustainability	Local contribution to global climatic change, local mobility and passenger transportation, quality of local outdoor air, noise pollution, products promoting sustainability
	Environmental Program	Local-Urban-Regional		Environmentally effective transport, sustainable energy use	Environmentally effective transport, safe goods, sustainable energy use, ecological planning, environmental effective waste management, sound indoor environment
				Economy and work, buildings and	

Hemphill, L.,McGreal, S., Berry, J.		Urban	Community benefits	land use, transport and mobility, resource use	Resource use, transport and mobility
Bentivegna, V., Curwell, S., Deakin, M., Lombardi, P., Mitchell, G., Nijkamp, P.	PICABUE_ Sustainable Development Model	Local-Urban-Regional	Not cheating on our children (futurity), ability to influence decisions (public participation), equal access to resources (equity)		Preserving the eco-system (environment)
	BEQUEST (Building Environmental Quality Evaluation for Sustainability through Time) (framework version 6)	Urban	Access, safety+security, health+well-being, community, governance, justice, ethical systems	Production, building stock, transportation+utilities,finance	Natural resources, environmental pollution, land use, biodiversity
	BEQUEST (Milton Keynes Sample)	Urban	Better integration of workplace and housing, higher balance of working near home	Better integration of workplace and housing, higher balance of working near home	Provision of green space, liner parks/planting etc., Redways (pedestrian and cycle routes seperated from the normal road network), buildings to achieve "excellent" standard in the Building Research Establishment's Environmental Assessment Method
Mcalpine, P., Birnie, A.	Guernsey Island	Urban	Population, health, education, social participation, crime, housing	Housing, eeconomic performance, international transport, workforce development, land use, local transport	Energy consumption, international transport, biodiversity, air quality, water quality, water resources, land use, household and commercial waste, local transport
Holland Barrs Planning Group _ Holland, M.	UN	Local-Urban-Regional	Social and community health	Stable and diverse local and global economies	Climate change and air emissions, energy supply, water and liquid waste, resources and solid waste, ecosytem disruption, food supply
	Sustainability Matrix	Urban	Individual and Community Health	Local economic vitality and stability	Energy and emissions, water, stormwater and liquid waste, resources and solid waste, ecosystem integrity, food
Ghosh, S., Vale, R., Vale, B.	Sustainable Residential Areas	Local-Urban-Regional	Lifestyle	On site food production	Domestic energy use, household transport energy use for travel to work, carbon sequestration, waste production
Jabareen, Y.R.	Sustainable Urban Form	Urban	Compactness, density, mixed land uses, diversity	Compactness, mixed land uses, density, diversity, sustainable transport	Compactness, sustainable transport, density, diversity, passive solar design, greening