Urban ecosystem-based planning and design strategy of an urban river, Tabakhane stream, Aydın, Turkey

Bülent Deniz*

Aydın Adnan Menderes University, Faculty of Agriculture, Landscape Architecture Department, 09100 Aydın, Turkey

The aim of this study was to improve the spatial priorities depending on ecosystem-based planning and design strategies for Tabakhane stream in Aydın city, Turkey. Current state analyses were conducted to reveal the problems. The impact values and ten evaluation criteria were determined using a ranking technique and SWOT analysis. Being close to open spaces was the biggest strength, while the poor image of the streambed was the major drawback. The main threat was ignorance of the ecological, recreational and social importance, while the biggest opportunity was being a component of the green infrastructure system. As a result, ecological, social and recreational values of the stream have to be considered. Also, open spaces and the circulation system along the stream should be connected with the open spaces of the city and public awareness should be increased. Participation of the local municipality, NGOs, and universities in the planning and management processes should be achieved.

Keywords: Ecological corridor, planning and design strategy, urban ecosystem, urban river.

THE proportion of the population living in cities has continuously risen and this dramatic increase has been accompanied by intensified urban development which threatens and deteriorates natural and semi-natural areas in or near the urban areas. Urban ecological networks are especially important because, in these fragmented cultural landscapes, they may provide the only opportunity for corridors, connectivity and wildlife movement[1,2]. One of the important types of ecological corridors in these urbanized landscapes is the stream corridor[3]. Streams are ecological corridors that make a great contribution to urban ecology and they are also important components of the urban landscape that improve the economic and social structure of societies[4,5].

Most cities, in general, have been built along river corridors. This is due to the benefits that rivers provide[6,7]. Although previous studies in this area have focused mostly on the management of green spaces such as parks rather than river corridors[8], the latter have also been studied as an important part of natural network systems, as well as cultural and recreational resources. Ecological processes and biodiversity of the rivers have the potential to be managed for a number of benefits, e.g. flood protection, cultural heritage, energy production, recreation, and desirable residential and business development opportunities[8]. However, especially in big cities, since rivers are often not given enough importance in the early stages of planning and urban design, tremendous pressure has been put on them[4]. Therefore, many of the streams have disappeared or deteriorated through flood control, drainage works and urban development. Also, they have been channellized[9] and flood control measures have destroyed the natural environment stream of corridors as well as public accessibility to the water[10]. On the other hand, there have been efforts to restore their ecological condition and habitat value in many places worldwide. Besides ecological aspects, riverbanks have great opportunities for recreational use in urbanized areas. As the streams are linear corridors serving as biological conduits for wildlife[3] and providing ample recreational opportunities, they have a unique role as an important component in the green infrastructure of a city.

Green infrastructure can be broadly defined as a strategically planned network of high-quality natural and semi-natural areas with other environmental features, which is designed and managed to deliver a wide range of ecosystem services and protect biodiversity in both rural and urban settings[11]. Green infrastructure uses natural processes to improve water quality and manage water quantity by restoring the hydrologic function of the urban landscape, managing stormwater at its source, and reducing the need for additional grey infrastructure in many instances. One of the important objectives of green infrastructure is to reduce stormwater volume, which improves water quality by reducing pollutant load, streambank erosion and sedimentation[12]. Green infrastructure elements are planned and managed primarily for stormwater control[13], but they also exhibit ecological, recreational, social, economic and environmental benefits[12,14–16].

The city of Aydın in Turkey is surrounded by natural mountainous areas, especially in the north and fertile agricultural lands in the south. Tabakhane stream emerges from the hilly terrain on the northern side, passes

*e-mail: bdeniz@adu.edu.tr
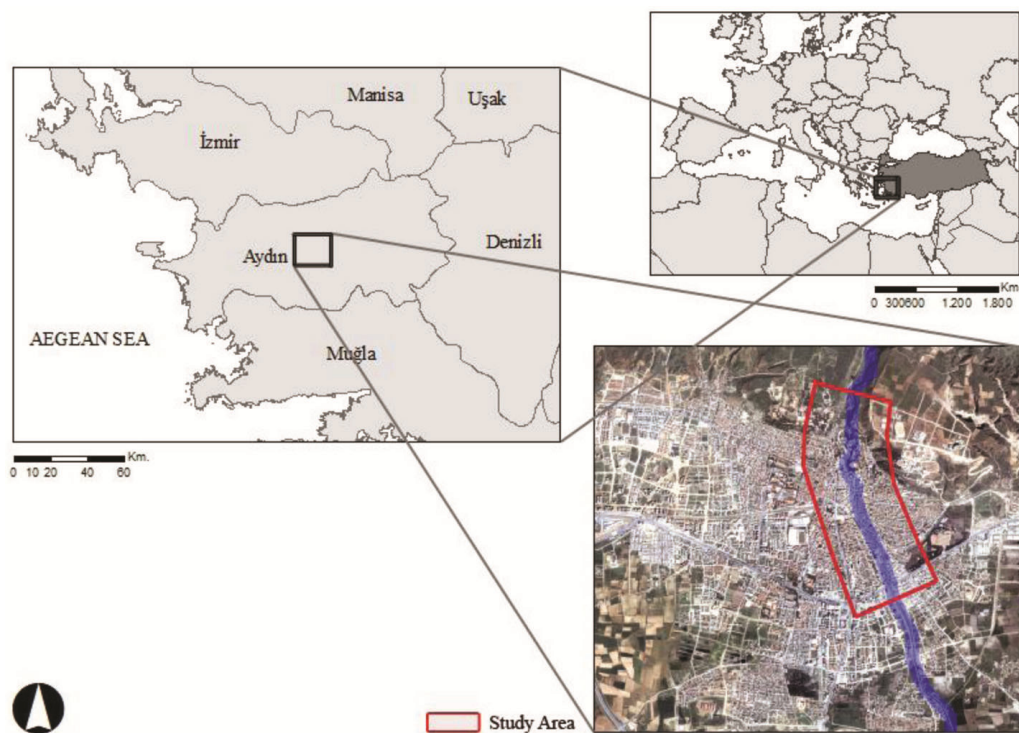
Figure 1. Provincial border of Aydin and Tabakhane stream, Turkey.

through the centre of the city and merges with Meander River on the low plain. The stream plays two important roles as it passes through the city: (i) it is an ecological corridor to connect the northern natural and seminatural landscape to the agricultural matrix in the south, and (2) it provides several opportunities for the city with its social and recreational uses.

In the case of Aydın, the stream is used for its recreational value. There are some parks, walking trails and a picnic area along the streambank. Unfortunately, the stream lost its natural and habitat value a long time ago because of flood control measures without ecological concerns, as a result of concrete construction of the whole stream channel. Tabakhane stream is an important linear ecological corridor with its ecological, recreational and social potential. Therefore, it has to be given special interest for planning, design and management. The stream covers a valuable location by connecting several land use types and public open spaces like urban parks, open markets and a downtown square, as it runs through the city centre. The aim of this study is to evaluate the current situation of Tabakhane stream, understand the problems and identify solutions for planning and application initiatives by considering its ecological, recreational and social values. Well-planned and managed stream corridors with their surroundings can offer attractive outdoor areas for recreation and wildlife. These stream corridors can be an integral part of the green infrastructure system of a city.

Data and methods

The study was conducted in the city of Aydın, Turkey. Aydın province is in west Turkey with a population of about 1,080,000. The population of the city centre is about 287,000. To the north of the city, there is a mountainous landscape and scarcely populated villages. In the south, surrounding the city there is a plain, dominated by agricultural land uses, which is irrigated and shaped by the Great Meander River. The study area is situated between the transition zone from the mountainous natural and semi-natural landscape to the plain of the agricultural lands[17].

The Tabakhane stream, which arises from Paşa Plateau, flows to lower areas dividing the city centre into two and merges with the Great Meander River (Figure 1). Literature sources, satellite images, Google Earth views, city development plans, photographs of the area, notes taken during the fieldwork and observations and analysis forms are prepared originally for this study.

Tabakhane stream forms a large alluvial cone under the settlement and is an important water resource which can be used for energy, irrigation or for drinking water in Aydın[18]. Texier, a traveller, who came to Aydın in 1843, pointed out that Tabakhane stream, connected by two stone bridges, flows through the most important settlement centre of the city[19]. Today, Tabakhane stream is surrounded by intense residential, industrial and commercial areas. Railways and important main roads cross over

the stream. In some locations, its bed is narrow and it is mostly covered with concrete. It can be highlighted that the surrounding urban land uses can be classified under three different types. Inside the borders of the study area, the northern part of the stream is surrounded by an urban park. There are highly intense residential areas along the middle part, and industrial areas can be seen in the southern part. In this context, the study area is evaluated in three different land-use parts: 'north part', 'middle part' and 'south part' (Figure 2). The research methodology comprises of three main stages (Figure 3).

Conceptual analysis and data collection

Literature review and pre-observations of the research area were done, and data were collected and classified.

Organization of the study

The current state of Tabakhane stream and its surroundings was analysed with respect to the problems occurring along the stream. The problems identified were classified as 'land-use problems', 'management problems', 'user based problems' and 'ecological problems'.

SWOT analysis was carried out by an expert group of 15 members including landscape architects, urban planners and civil and environmental engineers. SWOT is a field-based, qualitative analysis technique derived from observations. It is used to evaluate verbal data as well as to define and provide solutions for both internal and external problems[20]. SWOT analysis was carried out to identify the strengths and weaknesses, and to reveal the opportunities and threats of the settlements. For each SWOT analysis title, ten evaluation criteria were determined. Impact value '0' was set as the minimum, while '10' was the maximum. For each evaluation criterion, the importance level was determined using the 'ranking technique', and the priority values were calculated numerically[21]. According to this scale, it was evaluated from 'low important' to 'extremely important'. In the evaluation, 2, 4, 6 and 8 were accepted as median values, and the total of the impact factors and the importance levels of the criteria were ranked according to each criterion (Figure 4).
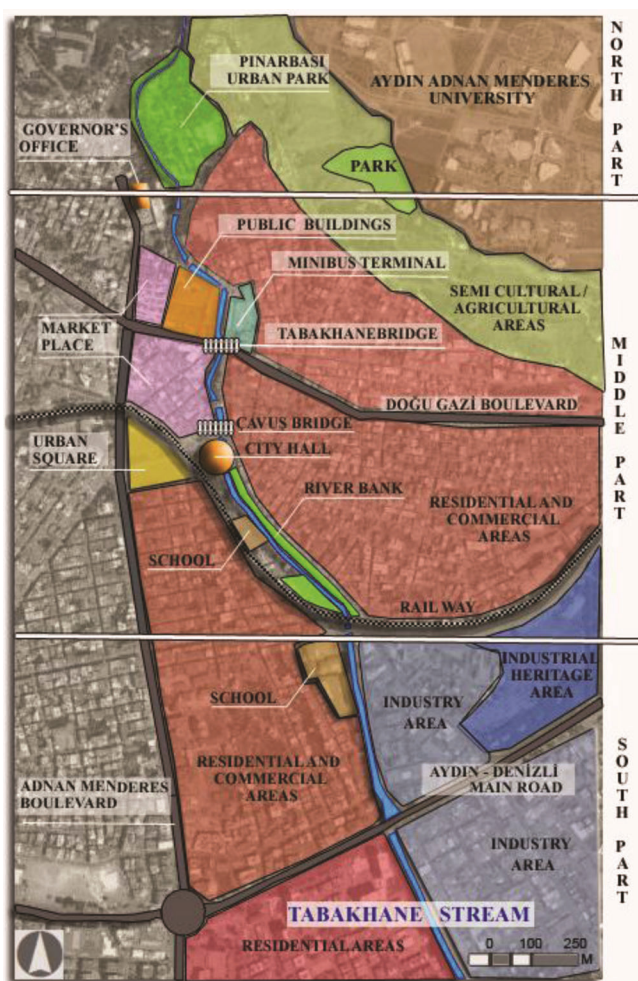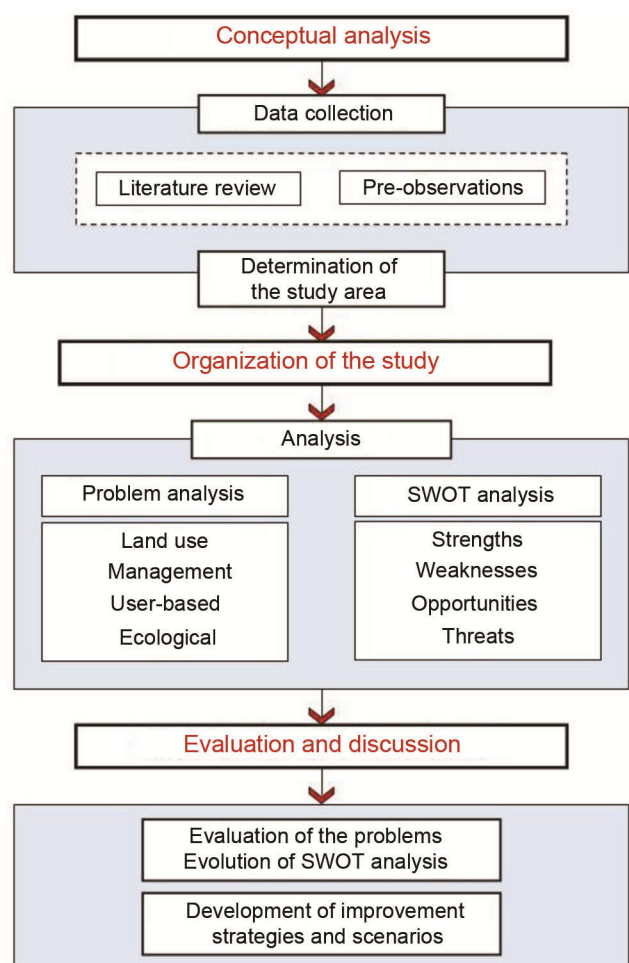

Figure 2. Main land uses along the study area.

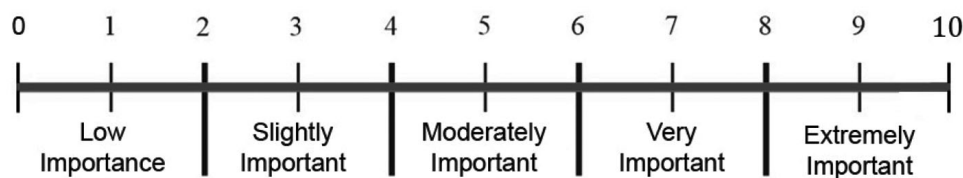**Figure 3.** Flow chart of the study.

Figure 4. Ten-point scales used in the ranking techniques.

The sum of the impact values, which were given to the evaluation criteria by each expert, was obtained and the arithmetic mean was calculated to determine the 'average impact value'[22,23].

Evaluation and discussion

Improvement strategies and scenarios were developed in order to improve the potential of Tabakhane stream as an ecological corridor, integrate the stream with the city, create a more liveable environment, guide local administrators on planning and construction processes and to accomplish integration of the stream with the green network system of the city.

Results and discussion

Current state analysis

The problems related to the Tabakhane stream were determined (Table 1, Figure 5).

Table 1 reveals that most parts of the study area are densely populated. There are apartments in the middle part of the study area, which are built extremely close to the streambed and obstruct the view of the stream. Therefore, the stream cannot be viewed and has little impact on the identity of the city. People also have difficulties reaching the stream in most parts of the study area. The streambed was constructed using concrete, became narrow, and lost its natural condition. The 'Stream Bank Design Project' was undertaken in the middle part of the study area in the 2010s by the municipality, but the streambed and other open spaces were not included in the project. The green infrastructure concept as a planning tool was not integrated into the city's development plans. There is a need for urban open system strategy. There are two important historical bridges on the stream. However, they cannot be viewed clearly as there is not enough space around, so the sight distance is insufficient. There are no identification boards and the bridges are not illuminated effectively. The material texture of the urban equipment is not in harmony with the historical pattern. There is pollution, particularly due to littering. While the flow rate is low in summer, litter gathers in some parts of the stream. Also, there is vandalism in the recreation areas. Considering the fact that there are schools in the area, broken guard rails pose serious safety problems. The most remarkable green opening in the study area is the Pınarbaşı Urban Park. However, the park does not have any connectivity with the other parts of the stream. The green areas are fragmented along the stream, and continuity of the wildlife is not provided. The streambed is only considered as an engineering problem. Planning, design and management processes have been ignored. The ecological, economic, recreational, social and cultural benefits of the stream as a green corridor cannot be achieved.

SWOT analysis

Tables 2–5 show results of SWOT analysis.

Strengths: The total impact value of the evaluation criteria related to strengths was calculated to be 71.3 (Table 2). The highest average impact value was obtained from the second criteria (Being close to the most important public open spaces …, average impact value of 8.3). This shows that the experts considered that the stream's central location has great importance. The habitat value of the northern part of the study area was evaluated as one of the most important strengths with an average impact value of 7.9. The lowest score was for the fifth criteria, which is the stream's contribution to the water cycle, and it was found to be moderately important (average impact value of 5.7). This shows that, although it has to be one of the most important strengths, the expert group evaluated the stream as it has lost its main characteristic and does not have enough contribution.

Weaknesses: The total impact value of the evaluation criteria related to weaknesses was calculated to be 74.9 (Table 3). This shows that the weaknesses which were accepted as 'evaluation criteria' are important for the improvement of the stream, its close environment and the city. The appearance of the stream as an open concrete channel has been considered by the expert group as its weakest feature (average impact value of 8.0). Low perception level and accessibility of the stream, and the densely populated surrounding areas were the other most important weaknesses.

Streambed is covered by impermeable concrete
and extremely narrowed in some parts

Poor urban scenery of the historical pattern
and high-density urbanization around the stream

Stream is exposed to littering
and has poor flow potential

Recreational uses along the stream

Safety problems on the stream

Figure 5. Photographs highlighting the problems related to the Tabakhane stream.

Table 1. Problems related to Tabakhane stream, Aydın, Turkey

Analysis of the current state of Tabakhane stream and its surrounding environment	
Land use	Most of the middle and southern parts of the steam are surrounded by highly intense urban and industrial areas.
	There is no buffer zone between the stream and the surrounding land.
	The ecological, economic, recreational, social and cultural functions of the stream have been disregarded by the false land-use decisions. High-density buildings were constructed close to the stream which resulted in a narrowed streambed.
	There are limited open areas along the stream.
	In the middle part along the stream, the municipality designed a relatively small stream bank park. Unfortunately, this park does not integrate with urban open areas and has limited contribution to the city's ecological and recreational value.
Management	The streambed is covered by impermeable concrete surface (Figure 5).
	The important green areas of the city have not been integrated with the stream corridor.
	The historical pattern of the stream did not receive the attention and respect it deserves (Figure 5).
	Its ecological importance has been ignored.
	The stream cannot be perceived adequately and has no contribution to the identity of the city.
	Users cannot access the stream.
User-based	It is exposed to pollution due to environmental uses (Figure 5).
	There is vandalism inside the green areas. Some of the urban furniture is destroyed. The broken railings pose danger for the users.
Natural and ecological	The stream ecosystem has not been taken into consideration.
	Flow potential of the stream is poor.
	Wide open areas around the stream that can provide habitats for wildlife do not exist.
	Native plants have been removed.
	The wildlife habitat and therefore the stream fauna have been destroyed.

Table 2. Strengths

Evaluation criteria	Average impact value
Flows through important places of the city.	7.7
Is close to the most important public open spaces (such as the city centre, main boulevard, open market place, city main square and industrial heritage area).	8.3
The historical bridges on the stream play an important role in the identity of Aydın city.	7.1
The streambank possesses recreational facilities.	6.7
It contributes to the water cycle.	5.7
As it flows through the city, it connects different land-use types.	6.9
It flows through the largest urban park in Aydın.	7.1
There are open spaces along the stream which have potential for urban renewal.	6.9
The northern part of the study area has great habitat value.	7.9
It has a function as an urban air corridor.	7.0
Total	71.3

Table 3. Weaknesses

Evaluation criteria	Average impact value
It is surrounded by densely populated urban areas.	7.8
The flow potential of the stream is poor.	6.9
It is exposed to pollution.	7.3
The streambed is covered by impermeable concrete surface.	7.0
It is seen as an open concrete channel.	8.0
Several recreational, social and educational activities are possible.	7.5
The stream has almost lost its habitat value since the streambed is constructed of concrete.	7.5
Polluted stormwater collected from the city's streets is diverted to the stream.	7.3
The stream cannot be seen, and in some parts, it cannot be accessed. The perception level of the stream is low.	7.9
People are not conscious about the recreational, social and ecological importance of streams in Turkey. Similarly, the importance of the stream for the city of Aydın has not been recognized.	7.7
Total	74.9

Table 4. Opportunities

Evaluation criteria	Average impact value
The stream has the potential for pedestrian-oriented accessibility.	7.9
It is an important component for the green infrastructure system.	8.2
The areas close to the stream have the potential for urban renewal.	6.6
The newly designed projects have a chance to attract more public to the site.	7.3
The streambank has recreational potential for the public with green areas and playgrounds.	7.7
The streams in most cities are an important parts of their identity. Tabakhane stream has the potential to change the image and identity of Aydın.	7.4
The poor state of the stream has to be renewed. This provides an opportunity for new sustainable design projects.	7.0
Design, renovation and restoration works on river corridors are insufficient in Turkey. Tabakhane stream has the potential to be an excellent example for sustainable urban river design/management works.	6.7
Urban areas in Aydin are densely populated. Tabakhane stream has the potential to allow the city-dwellers to breathe, as it can be developed as an important green corridor.	7.9
New design projects will have a potential to increase the quantity and quality of the green areas. Native plants can be reintroduced in the stream corridor.	7.3
Total	74.0

Table 5. Threats

Evaluation criteria	Average impact value
The possibility of flood poses a threat for the surrounding areas.	6.3
There are security problems.	6.6
Littering and wastewater discharge from the neighbouring residential areas to the stream causes pollution.	6.7
Deterioration of the natural structure of the stream has a negative effect on the urban ecosystem.	6.4
There is urban pressure due to incompatible land uses around the stream.	6.9
Local authority must create small recreation areas along the stream bank instead of approaching the stream as a whole.	7.4
The local government considers the stream as a management and planning problem, instead of focusing on its ecological, recreational and social importance; so management solutions are not integrated with the stream as a primary planning instrument.	7.9
There is uncontrolled industrial waste and wastewater discharge from the industrial site near the stream.	6.5
There is inadequacy of design and planning studies for rehabilitation of the stream and insufficient availability of funding.	7.5
There is also insufficient support from NGOs and scientific communities such as universities.	5.9
Total	68.1

Table 6. Improvement strategies of ecological corridor value

Problems	Proposals
The streambed is concreted and has lost its natural characteristics.	Rehabilitation and restoration projects should be undertaken to reclaim its ecological value. If possible, permeable materials should be used instead of concrete.
Native plants have been removed to be used elsewhere.	Native plants are important for ecological integrity. The municipality and universities should introduce and promote the use of native plants.
There are not enough open areas around the stream that can provide habitats for wildlife.	Ecological corridors are important for wildlife; so open areas should be increased in number and quality of the open areas improved and connected with the surrounding natural areas for the continuity of wildlife.
Green areas are fragmented along the stream.	The ecological value of Pınarbaşı Urban Park should be protected, and its connectivity with the other urban open spaces improved.

Table 7. Strategies for greenway system

Problems	Proposals
Pedestrian access and continuity has been taken into consideration around the stream.	Continuous pedestrian and bicycle links that connect the stream to other public open spaces should be established.
Tabakhane stream is being handled only as a linear and concreted channel.	It should be evaluated together with its surroundings, green spaces and other uses.
Adequate importance is not being given to the historical pattern of the stream.	Historical bridges, a historical open marketplace and the Aydın Textile Industrial Heritage Area should be connected. The urban furniture should be in harmony with the historical pattern.
Streambed solutions are being handled from an engineering point of view.	The water system should be managed using integrated ecological, social, recreational and engineering solutions. Design solutions should be improved where people can access the stream and socialize.
Limited areas for recreational activities.	The industrial area can be used for recreation after the buildings have been moved.

Opportunities: The total impact value of the evaluation criteria related to opportunities was calculated to be 74 and was found to be important in general (Table 4). The biggest opportunity for the stream and the city is the stream being an important component for the green infrastructure system (average impact value of 8.2). The least important value, among others, was its potential for urban renewal (average impact value of 6.6). In Turkey, urban renewal areas in most of the cities have been considered unearned incomes and precious lands. These areas can be

Table 8. Sustainable planning, design and management strategies

Problems	Proposals
The industrial area remains within the centre of the city. There is uncontrolled industrial waste and wastewater discharge.	There are negative effects of industrial facilities, both in terms of urban health and urban aesthetics. Existing industrial facilities should be removed from the city.
The urban scenery at the stream and its surroundings is poor.	Spatial effects and urban space quality should be taken into consideration. New projects for improving the aesthetic value of the streambank should be designed. Also, high-quality urban furniture and holistic design will promote the use of the same.
Need for higher level of cooperation between local government, universities and non-governmental organizations to deliver sound and holistic solutions.	Academic disciplines related to planning and design, especially should be taken into consideration and included in the decision-making and planning processes.
Possibility of flood threat for the surrounding areas.	Streambed cleaning should be done regularly. In some parts, the streambed is narrow. If necessary, enlargement works of the streambed should be undertaken and stormwater management taken up.
Technical staff and the public do not have enough information on the importance of using native plants in their projects and applications.	Informing the public about being conscious of using native plants in the environment is important.
Security problems.	Keeping away the marginal groups will increase the use potential of the area. Also, maintenance of the broken railings and lightings will provide safety.

Figure 6. Planning proposal for the surrounding areas of the stream.

easily converted into dense developments without taking proper planning and design principles into consideration. This shows that, although the experts find this criterion important, they approach the urban renewal issue with suspicion.

Threats: The total impact value of the evaluation criteria related to threats was calculated to be 68.1 and was found to be important in general (Table 5). The main threat was seen so that the local government accepts the stream as a management and planning problem, instead of considering its ecological, recreational and social importance (average impact value of 7.9). Inadequacy of design and planning studies for the rehabilitation of the stream and availability of insufficient funding and lack of holistic approach were the other most important threats to the stream.

Conclusion

Studies have indicated that urban and sub-urban stream corridors offer a variety of recreational, social and aesthetic values to residents and ecological values for wildlife[10, 24]. Unfortunately many streams have disappeared or deteriorated in urban areas[25] like as in Tabakhane stream.

Tabakhane stream has lost nearly all of its habitat value. Parks and walking trails along the streambed are not well-planned, and integrated into the city's greenway system. So the results of the analysis point to the importance of the stream as a component of the urban open space system. SWOT analysis performed in this study showed that the rehabilitation and improvements to the stream corridors are important and the stream corridor being close to the most important public open spaces is critical. Improvement strategies and proposals will help integrate the stream into the city's green network system (Tables 6–8). There are old buildings which should be renovated. Viewpoints along the stream should be determined and openness should be achieved. The 'Stream Bank Design Project' in the 2010s should be evaluated again. Punitive sanctions should be imposed till the industries are moved to another area, and awareness-raising activities should be carried out. The stream corridor should be connected to other natural areas; the green network system should be improved. Ecological, economic, recreational, social and cultural benefits of the stream should be achieved. According to the experts, the central location of the steam has great importance. On the other hand, connectivity of the important public open spaces has not been provided. This shows that people want the stream to play a more important role in the life of the city. Design projects should evaluate the stream, not only as a line, but also a part of the green infrastructure. The appearance of the stream as an open concrete channel is the weakest feature. Continuity of water in the streambed should be provided. If, the stream is taken into consideration from the beginning of the design process, urban transformation and renovation areas in the immediate vicinity of the stream will provide an opportunity to reveal its importance in urban design. Both the public and municipality should be informed about the ecological importance of the stream. Finally, considering all the recreational and ecological values and opportunities, we propose the following (Figure 6): (i) The stream corridor should be connected to other larger natural areas. (ii) While improving its surroundings, the ecological, social and recreational purposes of the stream have to be recognized. (iii) Recreational circulation systems like pedestrian trails and bikeways, should be connected to the urban pedestrian system. (iv) Alternative open spaces and parks along the stream should be promoted. (v) Public awareness about the importance of the stream should be increased. It is crucial to understand that these aims and strategies could only be achieved by integration and participation of the local municipality, NGOs and universities in the streams planning and management process.

1. Dramstad, W., Olson, J. and Forman, R. T. T., *Landscape Ecology Principles in Landscape Architecture and Land-Use Planning*, Harvard University, Island Press, Washington DC, 1996.
2. Deniz, B., Esbah, H., Kucukerbas, E. V. and Sirin, U., Analysis of vegetation structure in urban land uses: case of the city of Aydin. *Ekoloji*, 2008, **17**(66), 55–64.
3. Forman, R. T. T. and Godron, M., *Landscape Ecology*, John Wiley, New York, 1986.
4. Kilicaslan, Ç. and Malkoc True, E., Evaluating and integrating the existing potential of a stream to future decision-making processes: a case study of Tabakhane Stream, Aydın, Turkey. *Oxid. Commun.*, 2016, **39**(1–2), 529–542.
5. Malkoc True, E. and Kılıçaslan, Ç., Integrating the stream as an important part of urban areas into the urban decision making process. In Second International Urban, Environment and Health Congress, Abstract Book, Cappadocia, Turkey, 2018, p. 451.
6. Eden, S. and Tunstall, S., Ecological versus social restoration? How urban river restoration challenges but also fails to challenge the science – policy nexus in the United Kingdom. *Environ. Plan. C*, 2006, **24**, 661–680.
7. Grimm, N. B., Faeth, S. H., Golubiewski, N. E., Redman, C. L., Wu, J., Bai, X. and Briggs, J. M., Global change and the ecology of cities. *Science*, 2008, **319**, 756–760.
8. Holt, A. R., Moug, P. and Lerner, D. N., The network governance of urban river corridors. *Ecol. Soc.*, 2012, **17**(4), 25.
9. Kılıçaslan, Ç., Özkan, M. B., Geçmişten günümüze Meles Deresi. *ZKÜ Bartın Orman Fakültesi Dergisi*, 2006, **8**(9–51).
10. Asakawa, S., Yoshida, K. and Yabeb, K., Perceptions of urban stream corridors within the greenway system of Sapporo, Japan. *Lands. Urban Plann.*, 2004, **68**(2–3), 167–182.
11. EC, Building a green infrastructure for Europe, European Commission Report, Luxembourg, 2018, p. 24; ISBN 978-92-79-33428-3, doi:10.2779/54125.
12. EPA, Green infrastructure opportunities that arise during municipal operations. Office of Wetlands, Oceans and Watersheds, National Estuary Program, EPA 842-R-15-002, United States Environmental Protection Agency, Washington DC, 2015.
13. Rutherford, S., The Green Infrastructure Guide: Issues, Implementation Strategies and Success Stories. West Coast Environmental

Law Research Foundation, National Library of Canada Cataloguing in Publication, 2007.

14. Benedict, M. A., *Green Infrastructure: A Strategic Approach to Land Conservation*, American Planning Association, APA Press, PAS Memo, Washington DC, 2010.

15. McMahon, E. T., Green infrastructure. *Plann. Commissioners J.*, 2000, **37**(4), 4–7.

16. Wolch, J. R., Joshua, J. B. and Newell, P., Urban green space, public health, and environmental justice: the challenge of making cities 'just green enough'. *Lands. Urban Plann.*, 2014, **125**, 234–244.

17. Deniz, B., Use of landscape structure indices in assessing urban land use transformation and their contribution in urban planning practices: case of the city of Aydin, Ph D dissertation, Ege University, Institute of Natural and Applied Sciences, 2005, p. 205.

18. MEU, The Ministry of Environment and Urbanization, State of Environment Report of Aydin: Governorship of Aydin, Provincial Directorate of Environment and Urbanization, Turkey, 2011, p. 232.

19. Suad, A., Charles Texier: Küçük Asya, Coğrafyası, Tarihi ve Arkeolojisi, Enformasyon ve Dokümantasyon Hizmetleri Vakfı Yayınları, Ankara, 2002.

20. Demir S., Esbah, H. and Akgün, A. A., Quantitative SWOT analysis for prioritizing ecotourism-planning decisions in protected areas: Igneada case. *Int. J. Sustain. Develop. World Ecol.*, 2016, **23**(5), 456–468.

21. Gül, A. and Şahin, C. K., Current situation analysis of natural sites in our country (Example of Bodrum Peninsula). III. National Black Sea Forestry Congress, Artvin, 2010, vol. 4, pp. 1564–1574.

22. Yılmaz, E., SWOT technique; A sample application with a participatory approach in the beekeeping industry. Ministry of Environment and Forestry, 2006, Publication No. 274, DOA Publication No: 40, ISBN: 975-8273-84-1101.

23. Kilicaslan, Ç., Malkoc, E., Özkan, B., Tunçalp, G. and Aydın, A. O., Kentsel Sit Yerleşimlerinde Dış Mekan Yaşantısının Değerlendirilmesi:Şirince Köyü, Selçuk. *Ege Üniversitesi Ziraat Fakültesi Dergisi*, 2012, **49**(3), İzmir: Ege Ünv. Yay.

24. Shafer, C. S., Scott, D., Baker, J. and Winemiller, K., Recreation and amenity values of urban stream corridors: implications for green infrastructure. *J. Urban Design*, 2013, **18**(4), 478–493.

25. Kılıçaslan, Ç., Özkan, M. B., Akarsuların kentsel gelişme–dönüşüm süreci içinde çeşitli kullanımlar yönünden etkileşimlerinin İzmir kenti örneğinde ortaya konulması. *Ege Ünv. Ziraat Fakültesi Dergisi*, 2005, **42**(2), 179–190.