

A LANDSCAPE PROJECT APPROACH OF THE CORRIDOR OF IMRAHOR VALLEY AND EYMIR-MOGAN LAKES THROUGH GIS & RS TECHNOLOGIES

E. Alarslan¹, T. Sayan², Y. Tabar³

¹Dr. Ing. Ebru ALARSLAN, Division Chief in the Turkish Ministry of Public Works and Settlement

²Tuba SAYAN, City Planner in the Turkish Ministry of Public Works and Settlement

³ Yasemin TABAR, Landscape Architect (Ms. GIS) in the Turkish Ministry of Public Works and Settlement

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I-INTRODUCTION

The main objective of this paper is to evaluate a potentially significant recreational area of Ankara and to inform about the landscape project approach by considering the relevant issues of the Recommendation of the Committee of Ministers to Member States on Urban Space (Rec. No. R(86) 11). Ankara is a landlocked city. However, it has various remarkable recreational facilities. The Corridor of Imrahor Valley and Eymir-Mogan Lakes is one of the attractive open and green space areas in Ankara. In this paper, the Corridor of Imrahor Valley and Eymir-Mogan Lakes is introduced in terms of recreational opportunities, threats on the region, and proposals generated with a view to comply with the Recommendation No. R(86) 11. To perform this study, geographical information system (GIS) and remote sensing (RS) methods will be applied to make relevant analyses as well as to generate effective solutions.

II. EVALUATION OF THE CORRIDOR OF IMRAHOR VALLEY AND EYMIR-MOGAN LAKES WITH A VIEW TO PROVIDE A NEW RECREATIONAL AREA TO ANKARA

II.1. The Basic Information on The Corridor of Imrahor Valley and Eymir-Mogan Lakes

Ankara is the capital of Turkey with 4,771,716 million inhabitants according to the figures of population census in 2010 (see also www.tuik.gov.tr). In view of the population and geographical position (landlocked city) of Ankara, recreational areas are vital needs of the city. The Imrahor Valley with many scenic beauties is located in south-east part of the city. The valley ending with Eymir-Mogan Lakes offers a picturesque landscape (see also fig.1).



Figure 1: The Site of the Imrahor Valley & Eymir-Mogan Lakes

The Imrahor Valley which has a curvy shape stretches over approximately 8 kilometer. The Corridor of Imrahor Valley and Eymir-Mogan Lakes is a remarkable urban recreational area in terms of natural beauty, water reservoir, air corridor and area of biological diversity. Moreover, the whole region has agricultural wealth as well as historical and archaeological assets. Thus, the total area that subjects to the landscape project is 3526 hectares (see also fig.2).

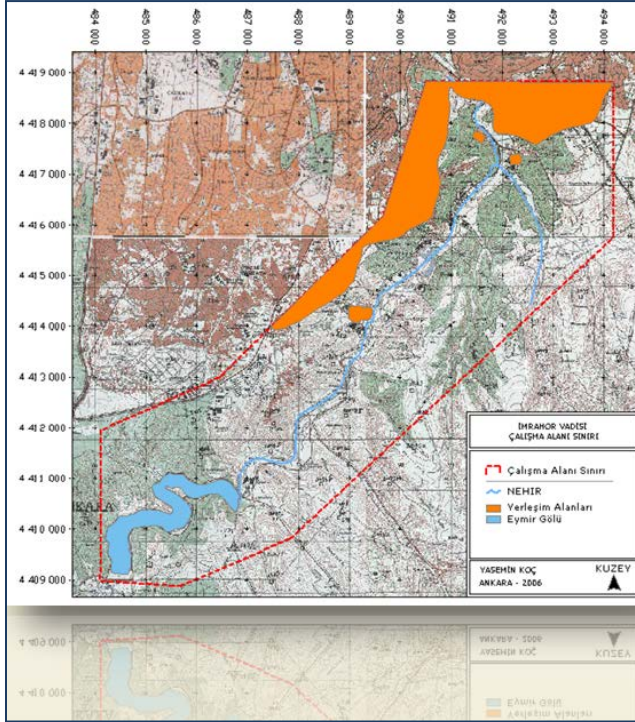


Figure 2: The Location of the Imrahor Valley & Eymir-Mogan Lakes

In Turkey, some misapplications were experienced in the rehabilitation of water basins and valleys, such as covering and drainage making facilities. To comply with the RAMSAR Convention, the relevant EU Directives as well as the Recommendation of the Committee of Ministers to Member States on Urban Space (No. R(86) 11), the water basins and valleys are protected by agreed principles on efficient land-use decisions with a view to conserving their aesthetical and functional features. River basins and valleys in Ankara are prone to domestic and industrial pollution due to rapidly increasing population and uncontrolled urban growth. In this respect, the rehabilitation of the Corridor of Imrahor Valley and Eymir-Mogan Lakes can be presented as a good example of conservation of natural resources and upgrading of urban open spaces.

II.2. The Need for a Landscape Project on The Corridor

In the light of the aforementioned facts, relevant strategies need to be designed to integrate the Corridor of Imrahor Valley and Eymir-Mogan Lakes into other urban facilities of Ankara. The Corridor has been under conservation since the first spatial plan of Ankara in 1932. Although the Corridor has been earmarked as one of the green axes of Ankara by various master plans so far, unfortunately it is becoming difficult to prevent constructions against the stress of the increasing population and inclining demand for housing.

In this respect, to design a landscape project on the aforementioned corridor will provide some opportunities in terms of environmental conservation and completion of green axis of Ankara in the west-south direction. The green axis stretches over from west to south with various green areas, namely Murted Plain, the Hippodrome of Ankara, the Municipal Olympic Games Area, the Ankara Sugar Factory Area, the Ataturk Forestry Farm, the Ankara Cultural Center, the Park of Abdi Ipekci, the Park of Kurtulus, the 50th Year Park, and the Corridor of Imrahor Valley and Eymir-Mogan Lakes.

In sum, the Corridor of Imrahor Valley and Eymir-Mogan Lakes is a significant recreational area as a last part of the green axis stretching over from west to south of Ankara. The Corridor will have a valuable contribution to upgrade the standard of "amount of green area per person" in the metropolitan area of Ankara. The Eymir-Mogan Lakes part of the Corridor is exposed to pollution due to rapidly increasing population and construction. The Lakes could also be exposed to die away because uncontrolled constructions on aquifer zones which the water resources to feed the Lakes are interrupted. Thus, a landscape project is required to generate sustainable policies and strategies to develop the Corridor and to provide natural conservation as well as to design a open green area to upgrade the standards on amount of green area per person in Ankara.

III. THE ROLES OF THE GIS & RS TECHNOLOGY IN PREPARATION OF THE LANDSCAPE PROJECT

The **Geographical Information System** (GIS) which stores and manages the spatial data plays an important role in performing complex analyses, such as management of economical, political, social, cultural resources and integration of those resources for a specific purpose. In this respect, methods of GIS are very useful in the preparation of the landscape project of the Corridor of Imrahor Valley and Eymir-Mogan Lakes. Furthermore, the means of **Remote Sensing** (RS) are also useful in terms of preparation of various analyses and implementation of the landscape project. The tools of GIS and RS provide opportunities for effective use of spatial data and interoperability of various data.

To bear in mind the benefit of using GIS and RS technology, the Turkish Ministry of Public Works and Settlement has an initiative to establish national spatial data infrastructure (NSDI) since 2009. After the completion of NSDI in Turkey, some basic documents such as national land-use maps, risk maps, and development plans will be produced to provide guidance to the various planning, landscape planning, and construction projects at different scales. In this respect, the landscape project of the Corridor will be a small example of interoperability of GIS and RS technologies with the spatial data.

In the following part, three different landscape planning models for the Corridor of Imrahor Valley and Eymir-Mogan Lakes through GIS and RS technology will be introduced. The technology of GIS and RS are especially used in preparing analyses maps such as maps of topography, existing land-use, and geology. In terms of RS technology, satellite images from IKONOS, IRS, and LANDSAT, aerial photos from the Turkish General Command of Mapping as well as the TNTmips program are used in the following models. In terms of GIS methods, CAD based program is used to generate the development plan of the Corridor (see also fig.3).



Figure 3: The 3-D Land Modelling of the Corridor on the Basis of the Aerial Photo.

IV. THE PROPOSAL ON HOW TO PREPARE A LANDSCAPE PROJECT FOR THE CORRIDOR OF IMRAHOR VALLEY & EYMIIR-MOGAN LAKES

To rehabilitate and develop the Corridor of Imrahor Valley and Eymir-Mogan Lakes, three different models on the landscape project will be introduced with a view to creating a new open green space for the metropolitan area of Ankara. While each model has a different approach, all of them aim at rehabilitating the Corridor as well as conserving the natural environment.

MODEL 1: Multi Criteria Decision Analysis

The Corridor needs to be rehabilitated with a view to natural conservation and the provision an open green area to the citizens in Ankara. The goal of the Multi Criteria Decision Analysis is to determine various recreational land-uses by means of preparing a site analysis appropriate for each land-use. To prepare a site analysis, a process is designed by order of the following stages:

- To set the criteria for the site analysis
- To set relevant weights of the criteria
- To scale the weights from "0" to "1"
- To perform site analysis for each land-use

The relevant land-uses are determined based on experience of landscape architects. The geographical particularities of the Corridor are taken into consideration as main determinants of the criteria guided to the site analyses. The relevant weights of the criteria are set in

accordance with the degree of importance by considering the summation of total weights should be equal to "100". The method of setting the weights of criteria is asking for scientific view of academics in the field of the Landscape Planning and making a synthesis of their views. In order to facilitate the calculation and evaluation, the weights are scaled between "0" and "1".

As a result of the Multi Criteria Decision Analysis that is explained above in step by step, 4 different land-uses were chosen among 16 in the following:

- Horse pick Riding Promenade Area
- Cycling Tracks
- Picnic Areas
- Hobby Gardens

For each land-use, the site analysis map is produced by means of GIS and RS. Each site analysis map shows feasibility of the site of a given land-use into 3 categories, namely appropriate, conditional appropriate, and inappropriate zones (see also fig. 4). The conditional appropriate zones refers the area need to have extra technical arrangement for a given land-use.

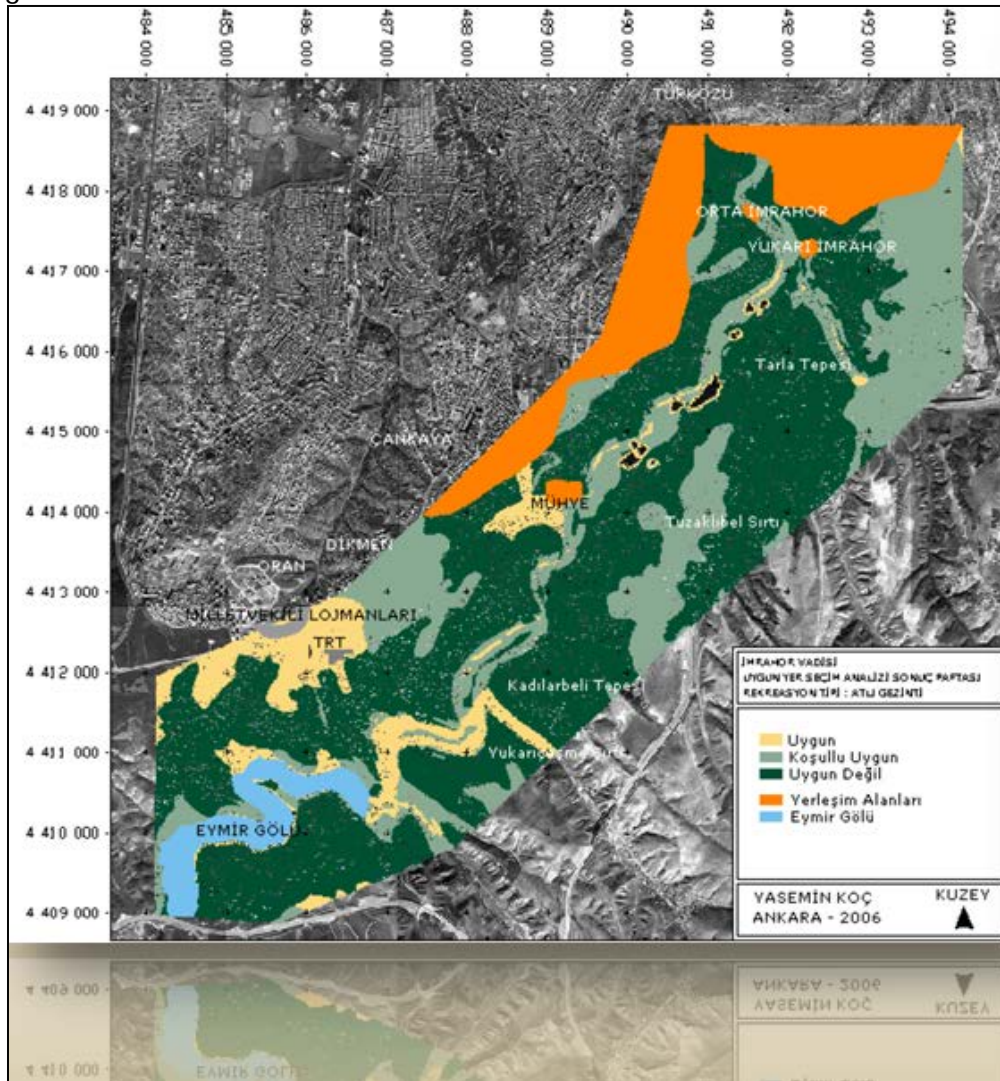


Figure 4: The Site Development of the Corridor As A Result of The Multi Criteria Decision Analysis (Yellow: Appropriate Zones Light Green: Conditional Appropriate Zones Dark Green: Unappropriate Zones Orange: Existing Settlement Areas)

MODEL 2: Evaluation of Problematic Areas and Opportunities

To focus on the natural conservation and rehabilitation of the Corridor, the existing land-use analysis covering data of environment, flora and fauna, climate, geology, topography, transportation, texture of property is prepared by means of GIS and RS (see also fig.5). As a result of the existing land-use analysis, main topics of problematic areas and opportunities to develop the Corridor are stated in the following:



Figure 5: The Analysis of Existing Land-use & Topography (Synthesis of spectral and panchromatic images of IKONOS)

PROBLEMATIC AREA 1: Limited Amount of Feasible Area Due to the Topological and Geological Disadvantages

Proposal for Solution: The steep slope areas can be used for various recreational purpose. The method of terracing slopes could also provide some platforms which are especially useful for hobby gardens. The basin of the Valley can be eligible for some agricultural facilities such as orchards and vineyards.

PROBLEMATIC AREA 2: Rural Residential Areas in the Corridor

Proposal for Solution: The rural areas can be integrated into the landscape project of the Corridor by nominating new functions such as tourism (pension houses), handcrafts (hand-knitting materials, carpet weaving, copper works), field sports (horse pick riding, rowing).

PROBLEMATIC AREA 3: Number of Brickyards in the Corridor

Proposal for Solution: The removal of brickyards are strongly recommended because of their highly pollutant factors. The governmental incentives and expropriation can be taken into consideration.

OPPORTUNITY 1: The Corridor is encompassed by forest areas.

Proposed Approach: The forest areas provide opportunity to prevent construction around the Corridor. It facilitates to conserve natural environment and to increase the amount of green area per person in Ankara. Thus, the landscape project on the Corridor can easily be designed in accordance with the principles of sustainability and liveability.

OPPORTUNITY 2: The flora of the Corridor is enriched by endemic species.

Proposed Approach: The landscape project can be enriched by various recreational facilities through existing endemic species.

OPPORTUNITY 3: The picturesque view of the Corridor is upgraded by lakes and ponds at various size.

Proposed Approach: Since Ankara is a land-locked city, the lakes and ponds might create various recreational facilities, such as walking promenades, cafés and restaurants , cycling tracks.

OPPORTUNITY 4: The Corridor has numerous accesses from main roads.

Proposed Approach: To have numerous accesses will cause many visitors to the Corridor. Thus, the attractiveness will be increased by improvement of transportation routes to the Corridor.

OPPORTUNITY 5: There is a limited constructed area in the Corridor.

Proposed Approach: Due to limited constructed areas, the methods of expropriation and replacement are strongly recommended in terms of increase the amount of open green areas .

MODEL 3: Integrated Approach on Landscape Planning

In the Model 3, it is aimed at supporting landscape planning projects by the relevant financial and administrative/organizational proposals. The model focused on especially the

Eymir -Mogan Lakes that were declared the Decree of Cabinet of Ministers number 90/1117 and date 22.10.1990 as "Special Environmental Protected Area". The Special Environmental Protection Areas are the ones that are rich in terms of natural, historical and cultural values and whose biological and ecological assets need to be preserved. The Authority for the Protection of Special Areas are in charge of taking measures to solve the existing environmental problems, defining the principles for preservation and land-use, developing the municipal spatial plans as well as ratifying these plans. Based on "The Convention for Protecting the Mediterranean Against Pollution", signed in Barcelona in 1976, The Authority for the Protection of Special Areas was originally established reports to the Prime-ministry in 1988. The authority reports to the Ministry of Environment and Forestry since 1991 (see also <http://www.ockkb.estep.com.tr>).

However, in Model 3, Local authorities are supposed to be the most effective administrative bodies in terms of implementation and monitoring of land-use decisions. Especially, due to the following reasons local authorities, namely municipalities in Ankara should be nominated:

- Efficient Organization & Coordination: The municipalities are local authorities to know the area and the texture of the property. Thus, they can easily contact with the relevant citizens and organizations to build the coordination with a view to generate sustainable policies and land-use decisions.
- Public Participation: Since the member of the municipal parliament constitutes with local citizens, public participation to the project as well as public control on the project will be easier.
- Sustainable Land-Use Decisions: The municipalities are the local authorities responsible for the preparation of spatial plans as well as landscape plans. Thus, they can easily integrate relevant land-use decisions of the landscape project into other local spatial plans.

In terms of financial issues of the model, obviously, the municipal budget will not be sufficient. Thus, public-private partnership can be an good approach for the project's financing. While the interested firms can initiate the project as a first-step investor, they can be attracted by the management of the income-producing facilities located in the project area. Furthermore, it is also recommended to ask for the support from central government's loan.

After outlining some key issues about the organization and financing of the project, the main objectives of the landscape planning can be stipulated as follows:

- ✓ To design the relevant land-use areas in the Corridor with a view to sustainable environmental resources and liveable urban environment for the citizens in Ankara
- ✓ To create the relevant land-use activities to support the financing of the project

To fulfil the above objectives, the landscape plan is designed on the basis of some principles, such as (i) conserving of forests, woods, and reedy parts in the lakes; (ii) providing a harmony of buildings in the Corridor in terms of height, colour, design with respect to the environmental quality; (iii) clearing aquifer zones not to interrupt the sources of water to the lakes. In the lights of these principles, the relevant land-uses are designed in the landscape plan as follows:

- Areas for restaurants, cafes, and motels

- Camping sites
- Picnic areas
- Areas for holiday houses (especially for weekends)
- Areas for field and water sports

V.CONCLUSION

As already emphasized, recreational and open green areas are vital necessities for Ankara because of its landlocked location. The Corridor of Imrahor Valley and Eymir-Mogan Lakes is one of the oldest potential green areas. The Corridor, especially the part of Lakes are highly exposed to the urban pollution. Thus, the Corridor needs to have a landscape project by concerning environmental protection. In this respect, three different approaches/models prepared by GIS and RS technologies were presented in this paper. The main contributions of GIS and RS technologies are to facilitate data collecting and processing, to produce reliable reference points in the area to guide for a better implementation of the project as well as to provide an opportunity for monitoring and auditing. Each model provides a solution for the Corridor in terms of the natural conservation and fulfilment of standards on amount of urban green area per person. As a holistic approach, it is also possible to integrate those three models into one.

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