



# YEŞİLİRMAK BASIN LANDSCAPE ATLAS PROJECT

TURKEY'S NATIONAL PROPOSAL FOR EUROPEAN LANDSCAPE  
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## 1. INTRODUCTION

Turkey has come a long way in the accession process to European Union by having initiated its inner dynamics. “Yeşilirmak Basin Landscape Atlas (Landscape Character, Landscape Diversity and Biodiversity, Landscape Quality, Landscape Strategies) project is a significant milestone in fulfilling the requirements of European Landscape Convention (ELS) adopted in 2003 by our country. This project demonstrates the method and the approach of integration with sectoral plans, primarily spatial planning within the conventions highlighted under the European Landscape Convention (European Union Water Directive, Basin Development Plans, Water Action Plans, Strategic Environmental Impact Assessment, Natura 2000 etc). Objectives of Yeşilirmak Basin Landscape Atlas are to carry out the landscape character assessment (landscape character, landscape function, change and pressures and landscape quality analyses) on the basis of natural and cultural landscape inventory of Yeşilirmak Basin, to identify the landscape character types and landscape character areas, as well as landscape diversity and biodiversity, to create the map of landscape quality, and consequently, to establish sectoral landscape guidelines.

The project consists of 3 fundamental stages: study-inventory-evaluation and landscape database preparation; landscape function analyses, indicators and landscape character evaluation; issuing the sectoral landscape guides and landscape atlas. The project, was initiated on 31 October 2012, and concluded on 20 April 2015. The kick-off meeting was held under the scope of the project in Amasya, in 2013, and the workshops were held with the participation of relevant public bodies, non-governmental organizations and public in Samsun, and also in Tokat and Çorum, in 2013 and 2014, respectively. The training meeting was held in Ankara in 2014, and the closing meeting was held on December 2015.

In the project, the landscape planning approaches were directed at the microbasins levels, as well as the decisions on protection, management and planning. In this context, the backbone of the analyzes was constructed by landscape function analyzes which were constructed in coordination with the notion of ecosystem services; indicators of human use, socio-economic structure, riparian corridors along with other indicators of basin evaluation; and landscape impact, change and pressure analyzes. By taking into consideration the factors increasing or decreasing landscape quality, first, potential landscape quality/factors to increase landscape quality were determined under the Landscape Quality and Landscape Quality Objectives heading. Secondly the existing landscape quality was revealed, as a result of integration of factors decreasing/increasing the landscape quality. Quality objectives were defined and mapped on the basis of existing landscape quality of the basin, the microbasins, and finally spatial objectives were determined.

In the Spatial Cohesion-Noncohesion-Conflict Areas section, existing context was evaluated with regards to the preparation of ecology based environmental plans and development plans which is a hot debate especially last few years. This assessment focuses on the concept of landscape quality of the environmental plans that were prepared for the provinces within the Yeşilirmak Basin. It was revealed that some of the decisions taken in the relevant environmental plans were conflicting with the landscape quality concept that focuses on ecology in some microbasins. These assessments show that there is an urgent legal and administrative need for the integration of landscape plans and landscape planning approaches with the spatial planning activities and sector plans (protection, forestry, agriculture, etc).

The ecological vulnerabilities were presented related to the forest, protection, agriculture and urbanization sectors utilizing the relevant landscape functions within the scope of “Landscape Development Strategies and Landscape Guides”. In addition to that, the guidelines for development strategies and landscape were produced for each sector. The microbasins, vulnerable to erosion (potential erosion risk, surface water flow, landslide and Hydro Electric Power Plants (HEPPs), the microbasins which require the rehabilitation due to urban solid wastes and discharge points and the microbasins requiring the rehabilitation due to agricultural contaminants were determined in order to define the strategies related to the landscape rehabilitation. Moreover, priorities of rehabilitation were determined for microbasins in the 1st, 2nd and 3rd rank microbasins.

Consequently, Yeşilirmak Basin Landscape Atlas has the quality to be a guide to all public organizations and institutions (governors, district governors, mayors, heads of the villages, field services of departments, etc.), NGO representatives during the spatial planning and decision-making processes at the microbasin level. Atlas is user-friendly; since it was prepared to have a language and mapping system that everybody can understand. Furthermore, “Preparation of Yeşilirmak Basin Landscape Atlas” is a project that will pave the way to removing the significant shortcomings of spatial and sector plans in Turkey. That being said, the most important step to realize all these aspects is to enact the laws related to the landscape protection, management and planning, and to implement them.



## What is the Landscape Atlas?

Landscape Atlas is an important tool that produces the strategies for utilization of country's landscapes in line with the balance of protection and utilization, provides the data/information to the decision-makers in decision taking processes related to the different sectors. Landscape atlas enables the integration of landscape planning or landscape planning approaches with the plans of different sectors (urbanization, protection, forestry, agriculture, industry, etc.) as emphasized in the European Landscape Convention. The objectives of Yeşilirmak Basin's Landscape Atlas are to evaluate the landscape character (landscape character, landscape function, change and pressure and landscape quality analyses) based on the natural and cultural landscape inventory in Yeşilirmak Basin and to determine the landscape character types and landscape character areas, landscape diversity and bio-diversity and to prepare the landscape quality map, and to develop the landscape protection/development strategies, and to prepare the sector landscape guides.

## Activities of Landscape Atlas

According to the European Landscape Convention that was signed by Turkey on 20.10.2000 and came into force in the international platform on 1 March 2004, each party undertakes to determine its own landscapes everywhere in the country, their typical features and to solve the forces and pressures which transform them, record the changes, define the landscape quality objectives, and to establish and implement the landscape policies which aim to protect, manage and/or plan the landscape. In this context, Preparing Yeşilirmak Basin Landscape Atlas Project is a starting point of the development of a national landscape database and "National Landscape Strategy and Action Plans" by the Ministry of Forestry and Water Affairs, main institution in charge of implementing the convention. Furthermore, as output of this project; landscape atlas was prepared.

## Who Can Benefit from Landscape Atlas?

The Landscape Atlas prepared within the scope of project can be used as follows:

- Planning, managing and protecting the protected areas,
- Management of natural sources and cultural inheritance,
- The spatial planning from smaller scales to the larger scales, since it is a tool showing the sensitivities regarding "Environment" during the preparation of Basin and Regional Spatial Strategy Plans,
- The evaluation of small scale plan, project or programs to be carried out within the scope of strategic environmental evaluation,
- Integrated management, planning and protection of resources within the basin,
- Taking the decisions about location selection, planning and development of different sectors as emphasized in ELC, since it is a tool which will consider the environmental sensitivity that will direct the "Sector Plans" at the Regional, Sub-Regional or Basin scales.

The "Landscape Atlas" serves as a guide in all plan, project and applications where the environmental vulnerabilities should be taken into account.

## Landscape Atlas User Manual

**Section where the brief information related to the subject is provided:** The explanatory information is provided about the inventory, analyses and evaluations in the atlas.

**Section where the relevant inventory or maps related to the analyses are available:** In order to be easily understood by different users of the atlas, all maps related to the landscape analyses are digitized 726 microbasins and at the scale of five.

**Section where the photographs related to the analyses or inventory are available:** The photographs, which are selected and drawn with due care from the basin for the relevant analyses or inventory and information of location, is provided with x and y coordinates according to European Datum Universal Transverse Mercator projection system. These photographs are associated with the five scaled maps.

## Landscape Character Areas (LCA)

The geomorphologic units were taken as basis in determining the landscape character areas in the project and the visibility analyses were made and the borders were determined using the topographic maps. 20 landscape character areas were determined at the region/basin level in the Yeşilirmak Basin.



## 2. DATA AND METHOD

The method used in the landscape atlas is an approach that allows performance of the landscape character assessment by determining the landscape character and landscape character areas at the local. At regional and national level; it allows for recognition of landscape diversity and biological diversity on the basin basis; contributes to the development of biological diversity and landscape inventory database, hence to the creation and development of "Landscape Information System"; includes the generation of landscape quality map on the basin basis, furthermore, the landscape protection and development strategies and the sector landscape guides. The main philosophy of method consists of the principles of rationality, wholism and sustainability. Atlas is used as an important direction, decision support, control, assessment and monitoring tool in realization of those principles. The method related to the atlas consists of 4 interactive sections: landscape inventory, landscape analyses, synthesis and landscape management.

## 3. INVENTORY

Inventory section provides information about current situation of the natural and cultural landscape elements which are essential in taking decisions about the change in the landscape and its future, as well as temporal changes, especially of cultural landscape elements.

### Location of Basin in Turkey

There are 25 hydrologic basins in Turkey. Yeşilırmak Basin is the 6th biggest basin of Turkey, and approximately 3.956.798 hectares which forms 5% of Turkey. Yeşilırmak, having 519 km length, is the second longest river of Turkey.

11 provinces are within the basin borders namely; Tokat, Samsun, Amasya, Çorum, Sivas, Yozgat, Gümüşhane, Giresun, Erzincan, Ordu and Bayburt. There are 4 city centers (Tokat, Samsun, Amasya, Çorum), 55 districts and 194 municipalities in the basin.

### NATURAL LANDSCAPE INVENTORY

- **Topography and Geomorphology**
- **Geology**
- **Climate**
- **Hydrology and Hydrogeology**
- **Soil**
- **Flora**
- **Fauna**
- **Hydrobiology**
- **Flora and Habitat**
- ***Habitat Species and Vegetation***
- **.Conservation Areas**

### CULTURAL LANDSCAPE INVENTORY

Development of Assyrian, Hittite, Phrygian, Medes, Persian, Galatian, Roman, Byzantium, Seljuk and Ottoman civilizations starting from Hattis may be observed as well as their interactions with each other in Yeşilırmak Basin. This historical inheritance formed a geography where the traditions and customs that are brought from Chalcolithic Period, around about 6000-3000 BC, to the present and that their traces are seen both in the settlement areas and socio-economic structure. The information is provided about the current situation of cultural structure of the provinces in Yeşilırmak Basin in this part.

- **Population**
- **Socio-Economic Structure**
- **Social Infrastructure**
- **Technical Infrastructure**
- **Local Architecture**
- **Historical Structures**
- **Socio-Cultural Values**
- **Socio-Cultural Values**



## 4. ANALYSIS

Following studies are carried out within the landscape analyses:

1. Landscape Character Analyses: Determining the Landscape Character Types and Areas
2. Landscape Function Analyses
3. Landscape Indicators
4. Landscape Impact-Change-Pressure Analyses
5. SWOT Analyses of Sectors

### UNITS WHERE ANALYSES RESULTS WOULD BE BASED ON: MICROBASINS

Atlas studies includes the analyses were carried out at the basin, sub-basin and microbasin scales. The landscape character analyses was carried out at the sub-basin level, and the landscape function analyses, landscape impact-change and pressure analyses at the microbasin level.

The sub-basins of Yeşilırmak Main Basin were determined and coded as Yeşilırmak, Kelkit, Çekerek, Çorum and Tersakan River Basins. Thus, a hierarchical classification was made at the basin, sub-basin and microbasin scales, respectively. "Weighted Arithmetic Average" method was used in transferring the maps obtained as a result of landscape analyses to the microbasins level.

#### Why Microbasin?

##### To be able to:

- Carry out the works at basin level in the national projects (Basin Protection Action Plans, Eastern Anatolia Water Basin Rehabilitation Projects etc.),
- Provide convenience to determine the strategies on the province and district level,
- Present the synthesis and analyses in more simple and basic form through the spatial planning,
- Partially define the inputs and outputs.

## 5. SYNTHESIS

Synthesis phase comes right after assessing the results of landscape character analyses carried out under the scope of landscape analyses; landscape function analyses; landscape indicators, landscape impact-change-pressure analyses and SWOT analyses. Potential landscape quality / factors that improve the quality of the landscape and factors that diminish it are identified and mapped. Consequently, the current landscape quality is revealed.

### Landscape Quality and Landscape Quality Targets

In order to present the landscape quality of Yeşilırmak Basin, the landscape function analyses, landscape indicators and the analyses results, obtained from the landscape impact-change and pressure analyses, were used. The experts from different professional disciplines (landscape architect, urban planner, forest engineer, geologist, geomorphologist, agriculture engineer, climate scientist) scored the relevant criteria in order to determine the weighted coefficients of factors increasing the potential landscape quality/landscape quality, and decreasing the landscape quality. The arithmetical mean of scores, given by 45 persons, was taken and the coefficient of each analyses was defined and on this basis, the landscape quality maps were prepared. Landscape quality is determined by overlapping the potential landscape quality with the factors that diminish the landscape quality in GIS environment.

### Potential Landscape Quality/Factors Improving the Landscape Quality

The quality of landscape, consisting of the local ecosystems or land use mosaic, is related to the healthy operation of different ecosystems within the landscape. In this scope, it is assumed that the ecosystems, which are almost natural and are less affected by the human intervention, have the healthier potential landscape quality. The analyses results, which increase the landscape quality ecologically, are scored between 1 and 5 and then, the score of 21 criteria, which increase the landscape quality, are added for each microbasin using the weighted coefficients given by the experts and the potential landscape quality of each microbasin in Yeşilırmak Basin is defined.



#### Potential Landscape Quality/ Factors That Improve Landscape Quality

1. Landscape diversity (Shannon's Diversity Index)
2. Landscape diversity (related to the landscape character types (LCT))
3. Landscape's habitat function
4. Landscape connectedness
5. Biological diversity / Plant biological diversity
6. Biological diversity / Vertebrae
7. Biological diversity / Reptiles
8. Biological diversity / Aquatic species
9. Biological diversity / Insects
10. Water infiltration in the landscape
11. Cultural richness in the landscape
12. Visual landscape quality
13. Rates of fundamental land use in the microbasins
14. Population change (1980-2014 change in %) decreasing population values between the years 1980-2014
15. Human use indicator: Forest areas' increasing values
16. Human use indicator: Agriculture fields' decreasing values
17. Human use indicator: Settlement areas' decreasing values
18. Rate of total stream length within the forest vegetation in the microbasins
19. Rate of water surfaces (dam, lake and pond) in the microbasins to the microbasin area
20. Rivers, having the ecologic corridor characteristic
21. Wetlands

#### Factors That Diminish Landscape Quality

Natural intervention regimes and data, which can be obtained for the human intervened area, are mapped within the scope of natural and human interventions decreasing the landscape's ecologic quality. The maps, including 26 criteria related to the subject, are mapped using the weighted coefficients given by the experts and the factors, decreasing the landscape quality, are defined in the microbasins.

#### Factors That Diminish Landscape Quality

- 1. Potential erosion risk of landscape
- 2. Surface flow in the landscape
- 3. Population density
- 4. Population change (1980-2014 change in %) decreasing population values
- 5. Human use indicator: Forest areas' decreasing values
- 6. Human use indicator: Agriculture fields' increasing values
- 7. Human use indicator: Settlement areas' increasing values
- 8. Road rate per km<sup>2</sup> in the microbasins
- 9. Rate of total stream length within the agriculture field cover in the microbasins
- 10. Rate of stream length in the 50 m buffer zone of roads
- 11. Rate of agriculture fields in the locations where the slope is higher than 6% to the microbasin area
- 12. Nitrogen amount transferred to the streams
- 13. Phosphore amount transferred to the streams
- 14. Problematic microbasins regarding the discharge points in the basin
- 15. Problematic microbasins regarding the solid waste storage areas in the basin
- 16. Microbasins, having the structuring pressure on the agriculture fields
- 17. Classification of microbasins according to the physical and inorganic-chemical parameters, group A
- 18. Classification of microbasins according to the organic parameters, group B

- 19. Classification of microbasins according to the inorganic contamination parameters, group C
- 20. Problems, arising from HEPPs
- 21. Landslide potential of landscape
- 22. Microbasins where the settlement is available that the slope is 40% and higher
- 23. Microbasins where the settlement is available that the slope is between 20-40%
- 24. Microbasins where the active fault lines, having the earthquake risk, is available
- 25. Microbasins, having the settlement and agriculture fields in 300+700 m buffer zone of dams
- 26. Microbasins, having the stone and mine quarries

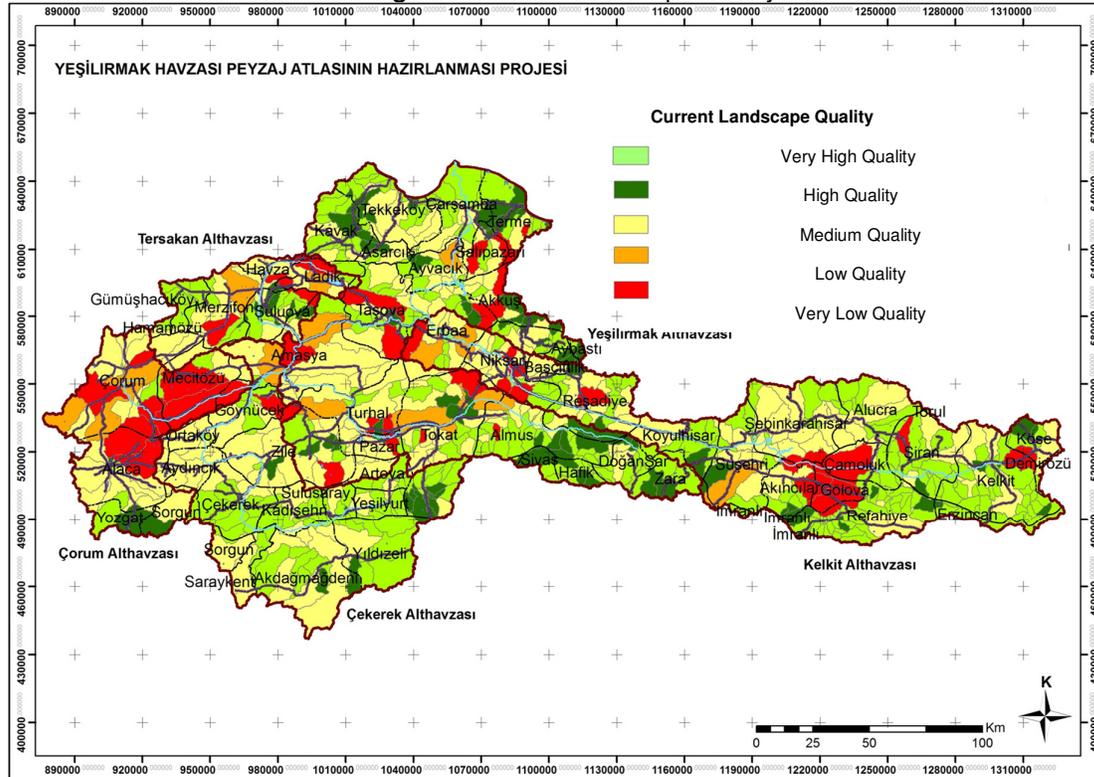
### Current Landscape Quality

Current landscape quality is identified by benefiting from factors that improve and diminish the landscape quality.

Diminishing landscape quality and high level of degradation are seen in the basins where there are many factors that diminish landscape quality. One should be very careful in terms of course of action to be carried out in such areas where the ecologic sensitivity is very high. Increased negative factors will further decrease the landscape quality.

Microbasins with degraded landscape quality are generally close to the microbasins with very little degradation. The fact that the ecological vulnerability is high in one area will have a steering effect on the use of land. Conservation should be ensured in areas where vulnerability is high, and use predominant development should be ensured in areas where vulnerability is low. "Landscape rehabilitation" should be an issue to consider in use-predominant areas. Thus, rehabilitation objectives can be fulfilled, and quality of landscape will be increased in problematic areas in time.

**Figure 1. Current Landscape Quality**



### Landscape Quality Objectives

Strategies are developed in order to accomplish the landscape quality objectives and landscape quality targets.



## 6. SPATIAL COHESIONNONCOHESION AND CONFLICT AREAS, LANDSCAPE DEVELOPMENT STRATEGIES AND SECTOR LANDSCAPE GUIDES

The data, obtained as a result of landscape analyses, is compared with the Environmental Plans within the basin in the Project on Preparing the Yeşilirmak Basin's Landscape Atlas, and the decisions in the environmental plans are evaluated regarding the environmental vulnerabilities. The areas that may be called as the spatial cohesion, noncohesion or conflict areas are defined. Some strategic recommendations are presented related to such conflict areas at the microbasins level.

### Terminology, Used in the Development of Landscape Development Strategies and Sector Landscape Guides

1. Landscape Protection Area/Pure-Absolute Protection Area
2. Landscape Protection Area/Protection Weighted Use
3. Limited Landscape Use Area/Balanced Protection and Use
4. Controlled Landscape Use Area/Use Weighted Protection
5. Potential Landscape Use Area/Use

## 7. IDENTIFICATION OF VULNERABILITIES IN THE SECTORS AND URBAN AREAS

Ecosystem services that play a significant role in the identification of assessment of ecological vulnerabilities of the landscapes and their functions (by providing sources to landscapes, supporting, regulating and acting as cultural functions) are interpreted regarding the agriculture and forest sector as well as urban areas; relevant strategies are set.

7 principle functions, which are assessed within the scope of landscape functions, are taken into account in determining the sector ecologic sensitivities. Those functions are landscape's habitat function, biological diversity function (total of vegetative, mammal, aquatic, reptile and insect biological diversity), water infiltration, potential erosion risk, surface water flow, visual landscape quality and culture richness. First, the ecological vulnerabilities related to each sector was determined at the microbasins level and referring to the sector characteristics of microbasins, the landscape development strategies related to each microbasin were developed. Then, "1st and 2nd Degree Hot Zones, which require the Special Landscape Management", were defined in the Landscape's Sustainability.

### Landscape Development Strategy and Landscape Guide of Forestry Sector

**Forestry Strategies:** They are identified as follows; protection of forests from the fires, struggle against the forest pests and diseases, decreasing the forest crimes, protection of forest areas and borders, conservation of biologic diversity in the forest areas, strengthening of forest infrastructure, supporting the forest villagers, increasing the forest maintenance and measures, rehabilitating the destroyed forests, renovation of forests, enhancing the quality and productivity in the forest products, providing the industrial forestation, meeting the young tree and seed needs, soil conservation and basin improvement, ecosystem-based and multi-purposed planning, production proper for the market demand, decreasing the production costs, trend toward the non-wooden forest products, application of certification, protective and environmental services for the forests, recreational services, development of human resources.

### Landscape Development Strategy and Landscape Guide of Agriculture Sector

**Agriculture Strategies:** They are determined as sufficient and reliable food production and consumption, using the brood stock proper for the locality, live-stock improvement and increasing the culture race animal quantity, caring-breeding, improvement of health and hygiene conditions of the shelters, improvement of grasslands and increasing the quality rough feed production, use of consciousness and quality input, opening the irrigable areas to the irrigation, developing the mechanization and technology use, struggle against the diseases and pests, soil improvement and land integration, using the water resources in the production of water products, preventing the water resources from contamination, production of products which their value added is high and advantageous for the province, decreasing the production costs, improvement of organization, processing, development of evaluation and marketing organization, increasing the plant and animal health application to the international standards in our country, carrying out the national and international application and research projects in order to control the diseases and pests and to provide the



accreditation, development of control and supervision services, production quality and proper for standards, development of ecologic agriculture, prevention of environmental pollution, conscious use of natural resources, not using the agriculture fields out of purpose.

## **Landscape Development Strategies and Landscape Guide of the Urban Areas**

Since it is believed that it is necessary to take decisions and strategies related to the urban areas with the stakeholders such as Ministry of Environment and Urbanization and local administrations in development of strategies, only strategies related to tourism are given in this part.

**Tourism Strategies:** They are identified as follows: providing incentives for implementation of tourism investment projects, increasing of investments in the Yeşilirmak Basin, processing of tourism products consistent with the local environment, society and local culture during the development process, putting forward the ecotourism as a strong tool in the local development of areas that their potential is high, creating the special development regions for the ecotourism, and measuring the satisfaction of visitors and tourists participating in the activities that are organized in the environment, areas where the tourism potential is high in Yeşilirmak Basin.

## **Landscape Rehabilitation**

Natural and human interventions, which create the scar appearances in nature and cause problems, are defined as follows under this heading in order to determine the microbasins requiring the landscape rehabilitation in the basin;

1. Vulnerable microbasins regarding the erosion (potential erosion risk, surface water flow, landslide and HEPPs)
2. Microbasins requiring the rehabilitation due to urban-originated solid waste and discharging points
3. Microbasins requiring the rehabilitation due to agriculture-originated common pollutants.

## **Microbasins Vulnerable to Erosion (Potential Erosion Risk, Surface Water Flow, Landslide and HEPPs)**

The analyses and maps related to the potential erosion risk, surface water flow, landslide and HEPPs are overlapped and the degrees of ecologic vulnerabilities are identified. Areas vulnerable to erosion in Yeşilirmak Basin is on the upper basin sections of Kelkit and Yeşilirmak subbasins. These sections could be considered for basins for afforestation and some rehabilitation techniques.

## **Vulnerable Areas Due to Solid Waste and Discharge Points**

The analyses maps of water infiltration, surface water flow and visual landscape quality are overlapped and degrees of ecologic vulnerability are determined. Next stage is to overlap the microbasins that have intensive solid wastes and discharge points with ecological vulnerability maps which leads to identify the most problematic basins regarding waste and discharge. The microbasins that must be primarily protected are; Ortaköy, Merzifon, Taşova, Erbaa, Tokat center and Reşadiye districts.

## **Vulnerable Areas Due to Agricultural Pollutants**

Water infiltration, surface flow water and visual analyse maps are overlapped and the degrees of ecologic vulnerability are determined. The ecologic vulnerabilities are found at the higher level in the north of basin. Maps of the microbasins with intensive spread polluters and map of ecological vulnerabilities are overlapped to define the priority microbasins. Districts within Çekerek and Çorum Basins are identified as priority areas for rehabilitation in terms of spread polluters. Higher density is found regarding the water infiltration and surface water flow in the Yeşilirmak Basin, especially regarding the common pollutants in Çorum, Tokat and Amasya center.

## **8. LANDSCAPE MANAGEMENT**

Landscape management is steering the social, economic and environment related changes in the landscape in a sustainable framework so that sustainable development can be accomplished. Suggestions are provided for he basin within the framework of "Communique on Organization, Duties,



Principles and Essence of Work of Basin Management Boards” that went into effect on 18 June 2013, and was published on Official Gazette Number 28681 that is paralel to EU Water Directive.

The general framework and aims of the management should be well determined in providing the communication and coordination among units in order to establish the management models for a new organization or to operate better the existing organization; and in determining the responsibility of distribution among the institutions and persons.

It is recommended to establish the “Sub-basin Commissions” which are based on the sub-basins and mostly consist of the sectors at the stage of carrying out the above defined works related to the basin within the scope of Project on Preparing the Yeşilirmak Basin’s Landscape Atlas.

In addition to the five sub-basin management boards that are recommended within the scope of Yeşilirmak Basin, the sector stakeholders should be formed, consisting of different sectors of each basin, they should come together and state their opinions in the decisions to be passed on the sub-basin basis. Hence, it shall be possible to prepare all plans at the basin scale and all plans and projects at the province scale upon obtaining the opinions of different stakeholders.

A technical team consisting of various disciplines (landscape architect, urban planner, forestry engineer, agricultural engineer etc) that works under sub-basin management boards, should fulfil the duty of informing the decision makers about the realization of decisions taken.

Sub-basin management boards should be represented by people from relevant institutions as it is described in “Communique on Organization, Duties, Principles and Essence of Work of Basin Management Boards” and should convene twice a year under the leadership of the governor of the biggest province in the basin to discuss all the problems related to the basin, and information about decisions taken in the “Yeşilirmak Basin Management Board” as well as the suggestions should be provided.

## 9. STAKEHOLDER ANALYSIS AND SURVEYS

Stakeholder analyses and surveys are carried out in order to identify all stakeholders that might be affected by the current problems or possible project; as well as determine the relation, strengths and effects of these stakeholders to the project and to define the strategies of participation.

The opening meeting was held within the scope of Project on Preparing the Yeşilirmak Basin’s Landscape Atlas started on 31 October 2012 in Amasya, 2013, and workshops were held upon participations of the concerned public institutions, NGOs and public in Samsun, 2013, Tokat and Çorum, 2014. The training meeting was held in Ankara, 2014, and closing meeting was held on December, 2015.

During all these meetings, the participant planning and management approach was presented at 3 fundamental stages: establishing the study-inventory-assessment and database of the project; the landscape function analyses, indicators and landscape character assessment; preparing the sector landscape guides and landscape atlas. The views and ideas of all participants that might be reached at the center and locally were obtained and integrated to the project. Furthermore, the survey was implemented in Samsun, Tokat, Amasya and Çorum, and the public’s approach and attitude were also discussed.

The study is completed upon grouping the main stakeholders from prominent sectors of tourism, agriculture, and forestry on national, regional and local levels besides developing strategies by carrying out a stakeholders’ analyses.

### Surveys

The number of survey pages and implementation locations are identified by using the Samsun, Tokat, Amasya and Çorum Provinces’ and Districts’ population statistically known as TR83 and the “Systematic Sampling Method” within Yeşilirmak Basin. Survey is applied randomly and on the basis of volunteering principle. It is taken into consideration to keep the numbers of both genders similar while conducting the interviews. 411 interviews were held. The field work started in Samsun and completed in Tokat, Amasya and ve Çorum, respectively. The interpretation of the surveys are carried out on SPSS programs.



## 10. RESULTS AND RECOMMENDATIONS

An interdisciplinary group worked very intensively in field and in office to produce the landscape atlas. Landscape atlas reveals the necessity to integrate the environmental, social and economic planning with the landscape planning approaches. Results and suggestions are presented in this chapter from general to specific which are derived from the inventory, analyses and synthesis methods applied with the basic philosophy of “think globally, act locally“.

1.As a result of literature scanning, interviews with the institutions and organizations, workshops, training meetings, it is found that the landscape planning and landscape planning approaches are the urgent necessities for the sustainable use of natural resources. It is also necessary to determine the environmental priorities in the sectors such as urbanization, agriculture, forest, tourism, etc. and such information could not be obtained at the decision stage according to the feedbacks from the workshops and field works. In this context, the content and subjects of the landscape atlas have the qualification to eliminate this lack both in the Ministry and provincial organizations.

2. It is a national responsibility to integrate the plans related to the different sectors in Turkey and spatial plans with the landscape planning processes as stated in the European Landscape Convention, Yeşilirmak Basin’s Landscape Atlas is a good example how this integration could be made in parallel to the water action plans in the national main river basins.

3.“Landscape Character Assessment” and “Landscape Character Type Determining” are pioneering approaches made at the national, regional and local levels in Turkey as they are at the scale of basin within the project.

The data related to the climate, geology, geomorphology, soil and land cover was overlapped in the defined method at the region/basin level, and as a result of it, 3453 landscape character types were obtained. 7741 landscape character types (LCT) were found at the sub-basin/province level. At the provincial level, almost 2.2 folds of LCT were found.

The geomorphologic structure was considered as a dominant character in determining the landscape character areas and as a result of visibility analyses, 20 landscape character areas were obtained. In the basin, 11 lowlands, 3 plateaus, 5 mountains and 1 lake were found as the landscape characters. The sustainability of LCA is provided upon including the proper use of each landscape character in the location. The problems will gradually increase in the parts where the settlement areas in LCA, especially having the lowland character and industrial facilities in the agriculture fields and their immediate vicinities during the course of time (Zile lowland, Amasya Göynücek Lowland, etc.).

4. 47 analyses and definitions were made in the project. Some of this data includes the landscape analyses as the synthesis of academic works carried out in Turkey since 1930s, and some includes the definitions and analyses at the microbasin level which is an important geographical unit to determine the natural borders in the landscape. Moreover, it also consists of the impact, pressure and change analyses and information about the current situation of landscape quality on the basin level. Without doubt, the analyses to be made and maps to be issued may be developed further in the future works and some criteria may be omitted and some added. The important thing is that the criteria to be used have the data and information infrastructure to be supported by the official organs of the government.

5. After all analyses, the landscape guides were prepared for the agriculture, forestry, settlement, landscape recovery sectors, and microbasins indicating the ecologic vulnerability for each sector were defined. Thus, it is clearly indicated what can be done in each basin at the spatial scale.

**Forestry sector:** It was found that the ecologic vulnerability was low in 7 microbasins among the microbasins having the forest character according to the map that was prepared pursuant to the method, and the “controlled use” was recommended. It was found that the ecologic vulnerability was at the medium level in 144 microbasins and the “limited use” was recommended. It was found that the ecologic vulnerability was high in 74 microbasins and the “protection predominant use” was recommended. It was found that the ecologic vulnerability was very high in 34 microbasins and the “pure/absolute protection” was recommended. When the population density in such areas was considered, some of those microbasins were named as hot zones which the attention must have been paid gradually. In this



scope, 53 microbasins were defined as 1st degree hot zone, 52 microbasins 2nd degree shot zone, 154 microbasins 3rd degree hot zone and their significance situations were presented.

Landscape conservation area/pure-absolute protection areas must be protected in the forest management. In such areas, no forest operation activities should be carried out, mostly the scientific-purposed studies must be executed. In such areas, the activities on strengthening, supporting and developing the habitat and biological function and the vegetation should be taking place. The endeavors should be directed at taking the necessary steps to achieve the objective “landscapes where the target is active conservation”.

It is recommended that the landscape protection area/predominantly protection use areas shall be managed based on the protection use balance. As the protection would be the first aim, it may be permitted some activities so as not damaging to the overflow capacity of environment within the forest. However, the protection aim must be more predominant than use. They are the areas where the landscape character recovery and rehabilitation occur according to the preference of the stakeholders and current land use activities. The necessary steps should be taken so that those areas may achieve the objective, “recommended to provide landscape sustainability”. As long as the conditions permit, it should be aimed to bring it to the upper group.

Limited landscape use defines the areas where a balanced protection use occurs upon including the balanced protection and uses. There might be some degradation in the landscape. The principal objective should be the recovery of such degradations to “increase the landscape value/recover the landscape”.

Controlled landscape use/use predominant protection defines the microbasins where there is protection but predominant activity is the utilization. It must be provided that the landscape may be inherited to the next generations upon taking the protection steps as using them. It represents the areas where the forestry activities, which currently continue in the region, may also continue normally. There might be some problematic areas in the landscape; the principal objective should be “recovery of landscape/recover it for the nature” through the landscape rehabilitation activities in such predominant use areas.

**Agriculture sector:**The ecologic vulnerability was found to be low in 3 microbasins among the microbasins having the agriculture character according to the map that was prepared pursuant to the method, and the potential landscape use was recommended, and it was found that the ecologic vulnerability was at the medium level in 224 microbasins and the “controlled use” was recommended. It was found that the ecologic vulnerability was high in 232 microbasins and the “limited use” was recommended. When the population density in such areas was considered, some of those microbasins were named as hot zones which the attention must have been paid gradually. In this scope, 74 microbasins were defined as 1st degree hot zone, 173 microbasins 2nd degree shot zone, 212 microbasins 3rd degree hot zone and their significance situations were presented.

Limited landscape use defines an area where there is a balance between protection and use. It should be encouraged to carry out awareness increasing activities and trainings and to provide information regarding which steps should be taken in the relevant areas and how they should be applied. In this context, if the agricultural use will continue, then the soil processing procedures should be performed which will not cause erosion; the production methods with terracing should be encouraged; the agriculture pattern that covers the soil throughout the year should be encouraged; the fertilizer and chemicals to be used in the agricultural production should be less, and structural elements such as agricultural industry and barns should not be allowed in these areas. There might be some degradation in the landscape. The principal objective should be the recovery of such degradations in order to “increase the landscape value/recover the landscape”.

Controlled landscape use defines the microbasins where the use-predominant protection takes place. Necessary protection measures should be taken so that landscape may be inherited to the next generations. This covers the areas where recovery and rehabilitation of the landscape character should take place according to the preference of the stakeholders as well as current landscape activities. Existence of an efficient control mechanism on the agricultural production is very important, especially regarding the underground waters and the water process. In this scope, the attention must be paid to the use of the fertilizer from shed in such areas, and one should avoid storing the fertilizer randomly in such areas. Use of fertilizers should not be allowed without performing the necessary soil analyses. In case of fertilizer use, the attention should be paid to the use amount and time. Otherwise, the fertilizer, used in the wrong times and amounts, may easily contaminate the surface and underground waters due to the drainage channels and high level of permeability. The chemicals and pesticides and combating



diseases and pests, etc. should be used in a controlled manner by obtaining technical support from the Provincial Directorate of Food, Agriculture and Livestock. In the grasslands, the grazing plans should be prepared and the soils should be compacted and the permeability should be decreased. In addition, the attention should be paid to the frequency of current recreational activities such as picnics, etc., land use, wastes after the activity in such areas, and the action plans should be prepared related to the use of such areas in cooperation with the village heads/mukhtars. There might be some problematic areas in the landscape, the principal objective should be “recovery of landscape/recover it for the nature” through the landscape recovery activities in such use predominant areas.

Potential landscape use area defines the areas where the current agricultural activities may continue normally in the microbasins that qualify for utilization. Those are that areas where the “current activities may continue in a way to damage the environment least way possible”.

**Settlement areas:** Ecologic vulnerability of all microbasins is determined according to the map that is prepared with the method. 4 areas and potential landscape areas were found to have very low ecological vulnerability, 144 microbasins have low and that the controlled landscape use area/use predominant protection strategies are determined, 358 microbasins where the ecologic sensitivity is medium and the controlled landscape use area/use predominant protection strategies, 193 microbasins where the ecologic vulnerability is high, and 27 microbasins where the ecologic vulnerability is very high and that the limited landscape use area/balanced protection and use strategies.

The limited use shall be included in the limited landscape use area/balanced protection and use areas and the use in a balanced protection shall be provided. They are the areas requiring the recovery and rehabilitation of landscape character according to the preference of the stakeholders and current land use activities. It is important that areas would not be opened to the settlement. The environmental analyses should be made for the settlement area if the settlement is a must, and the development alternatives may be applied to damage the environment as little as possible. There might be some degradation in the landscape. The principal objective should be the recovery of such degradations in order to “increase the landscape value/recover the landscape”.

The controlled landscape use areas/use predominant protection should be conserved with the necessary protection measures so that they can be inherited to the next generations. Those are the areas where it is preferred to develop the current landscape character. One should avoid changing the character as much as possible. Environmental analyses should be carried out in arbitrary cases, and the development alternatives may be applied to damage the environment as little as possible. There might be some problematic areas in the landscape, the principal objective should be “recovery of landscape/recover it for the nature” through the landscape recovery activities in such use predominant areas.

Potential landscape use area defines the areas where the current settlement activities may continue normally in the region. Those are that areas where the “current activities may continue to damage the environment as little as possible”. In some parts, the activities supporting the nature and forest should be carried out in order to renew the landscape.

6. The prepared guides include all locations in the urban and rural areas, and allow the concerned institutions and organizations to take the decision and to organize the activities based on the location.

7. The environment is the most important and difficult chapter in the European Union’s harmonization process. The landscape planning and landscape planning approaches in the sub-sections related to the spatial planning under this chapter are the important solution tools. A significant awareness has been created by the Ministry of Forest and Water Affairs on the importance of landscape planning and approaches, and it was provided that this was emphasized in the national and local meetings such as Forestry Council in 2013 and international meetings such as “Sustainable Landscapes and Economy” in 2014. It is expected that the necessary sensitivities would be determined in other Ministries during the future periods.

**The highlighted issues of Yeşilirmak Basin Landscape Atlas Project are summarized below.**

1. Turkey having progressed significantly on European Union accession process fulfills its obligations under the European Landscape Convention (ELC) as planned. Preparation of Yeşilirmak Basin Landscape Atlas Project is an important phase in fulfilling of such endeavor. With the Preparation of



Yeşilirmak Basin Landscape Atlas Project, it is provided that the obligations, fulfilled under ELC, are integrated with other conventions and directives.

“Yeşilirmak Basin Conservation Action Plan”, which became the basis for basin management plans that were one of the obligations which must be fulfilled under the European Union Water Directive, was implemented. Yeşilirmak Basin Development Plan (YBDP) of 2003-2007, which was named as TR83 and included the provinces of Amasya, Çorum, Samsun and Tokat as a region plan, was prepared for Level 2 Statistical Regional Unit (SRU). The project management is provided through “Yeşilirmak Basin Development Association” which is formed by the participation of representatives from 4 provinces within the basin, permitted to be established with Ministerial Cabinet’s Enactment, no. 97/9992 and dated 23 September 1997, and is officially active upon being published in the Official Journal, no. 23133 and dated 7 October 1997. The rehabilitation projects were prepared in some parts of basin within the scope of Anatolian Water Basins’ Rehabilitation Project. In addition, the agriculture master plan and nature tourism master plan were prepared for the provinces within the basin.

Some data from Preparation of Yeşilirmak Basin Landscape Atlas Project and afore said projects was integrated with the data from landscape planning approaches within the scope of project, and the conservation, management and planning approaches related to the landscapes were also integrated with the different sectors such as settlement, industry, agriculture, forestry.

**2.** Within the scope of project, the data related to the natural and cultural landscape elements was reported in the view point of landscape architecture in a dialog with relevant experts at the collection, compilation and mapping stages.

- The recommendations were made how the landscape would be defined at the national level, and the work by Erol (1983), titled “Turkey’s Natural Landscapes and Environments”, which were divided in 6 steps as Region, Subregion, Landscape, Environment, Complex, Habitat, was taken as basis. 58 landscapes were defined at the national level which was divided into 7 geographical regions for our country.
- The climate data was classified according to Thornwhaite method in order to define the landscapes at the basin/province level,
- Geomorphologic classes were presented within the basin considering how the geomorphologic data may be classified at the national level,
- In addition to the methods which were used in our country previously in landscape classification of soil maps, a new recommendation was made related to how it would be classified at Ordo and Sub-Ordo levels,
- Parameters on geology, geomorphology, climate, soil and land cover are used to identify the landscape character types on basin and sub-basin/provincial scale. Hence, basic data is derived for landscape type and landscape diversity in each microbasin.

**3.** The geomorphologic structure was taken as a basis for determining the landscape character areas and Yeşilirmak Basin was divided into 20 landscape character areas based on the visibility analyses. The landscape character areas, coming into prominence in the basin, are 11 lowlands, 3 plateaus, 5 mountains and 1 lake. 49% of project area consists of lowland, 41% mountainous, 9% plateau and 1% lake.

**4.** One of the most important innovations in the project is to direct the landscape planning approaches at the microbasins level, and to pass the decisions related to the conservation, management and planning on this basis. Thanks to this, it is aimed that the directors of public organizations and institutions and Non-Governmental Organizations may understand, interpret and use the Yeşilirmak Landscape Atlas in decision-making systems. “Landscape Management, Conservation and Planning Project” of Konya, Bozkır-Ahırılı-Yalılıhöyük Districts and Suğla Lake Location, which was implemented and supported by the ministry, and the mapping procedures, made in the Project of Landscape Character Analyses of Malatya Pilot Area at Tübitak Kamag “Assessment of Landscape Character Analyses of Tourism/Recreation Project” were left and interpreted at the polygons level. Reducing and mapping of all data from this project to the microbasins levels, which were the most bottom units of basin, allow the directors to get benefit from the atlas minimally in the decisions to be passed at the district level as an administrative unit. The applied method shows paralleling to the works at the basin level in country recently and facilitates the processes of both spatial planning of landscape planning approaches and integration of them with the sector plans.



5.The analyses related to the concept of ecosystem services were integrated within the scope of landscape function analyses, which became important recently. Thanks to this, it is aimed to create a common language with the different professional disciplines such as landscape architecture, urban planner, architect, civil engineer, natural sciences in the spatial planning works to be carried out in the rural and urban areas.

6.Presenting the some landscape indicators in the assessment of landscape and making the measurements in this direction give a new dimension to the work. In this scope, landscape atlas work by Jones et al. (2007) in Central America became guide in this section of Yeşilirmak Basin's Landscape Atlas.

**6.1.** Four indicators below were discussed under the heading of “Some Indicators Related to the Human Use - Socio-Economic Structure”.

- The landscape character of each microbasin was presented considering the agriculture, forest, settlement use that form the landscape pattern in each microbasin on the basis of rate of fundamental land use in the microbasins.

- The parts were shown with the population density (calculation of population per km<sup>2</sup>) where the population concentrate in each microbasin.

There are 22 microbasins where the population is 100-1000 persons/km<sup>2</sup>, 106 microbasins 30-100 persons/km<sup>2</sup>, 225 microbasins 10-30 persons/km<sup>2</sup>, 152 microbasins 3-10 persons/km<sup>2</sup>, 221 microbasins 0-3 persons/km<sup>2</sup>. When one considers in which districts the population concentrates in the microbasins where the population is dense, it is found that the population is dense in the upper-basin of Yeşilirmak Basin, Kelkit Sub-basin's source section and Yeşilirmak Sub-basin's source section. Similarly, it is observed that the population also increases in the part where Yeşilirmak flows into the Black Sea

- The population change was presented with population change (1980-2014 change in %) during 30 years. It was found that the population migrated from rural areas to the urban centers, especially to the city centers and important districts in Yeşilirmak Basin same as being in many rural areas of our country, and the village population decreased significantly in the rural areas. In this scope, the planning and development of important rural development policies are necessary.

- The settlement (artificial), forest and agriculture field cover are used under the heading “Human Use Indicator in Entire Basin” obtained from the satellite images of 1990 and 2013 in the human use indicator. In this analyses, the ratios of land use as the settlement, agriculture and forest to the total microbasin are calculated and the human use percentage is determined in those microbasins between 1990-2013. 56% of reduction was found in broad-leaved tree forests, and a transformation occurred 48% toward continuously irrigated areas, 18% toward the mixed tree forests, 11% toward the natural grasslands, 10% toward the non-irrigated agriculture fields. Conifer and coniferous tree forests increased 17%, and a transformation occurred from other land class and wetlands. The mixed tree forests increased 54% and a transformation occurred 18% from leaved tree forests, 7% from coniferous tree forests. Still existence of agriculture- and settlement-purposed transformation, especially in the provinces and districts where the forest villages are available, represents, especially that they are related to the rates of 2B fields in the region (as of 2013, most 2B fields are available within the Samsun province borders).

- The continuously irrigated areas decreased 59% and 30% transformation toward the non-irrigated agriculture fields and 15% toward the natural grasslands were occurred. Natural grasslands decreased 27%. However, it is told about gradually decreasing of cattle-breeding during the field works. 57% increasing of non-irrigating agriculture fields represents that the people change from labor-intensive irrigated agriculture toward the less labor-intensive agriculture activities.

- In particular, the ratio of road per km<sup>2</sup> in microbasins shows that roads concentrate in which microbasins. The road concentration, at the same time, shows us that the accession to that microbasin is higher and if there is not a good management, then the existence of natural areas would decrease.

**6.2.** 3 indicators are discussed under the heading “Some Indicators Related to the Assessment of Stream and Immediate Vicinity”.



- The ratio of total stream length within the forest in the microbasins shows that microbasins are more natural. It is important in reflecting the existence of microbasins that support the underground and surface waters with the clean waters. It is identified that 1 microbasin that the concentration is very high, 3 high, 20 medium, 448 low and 255 very low within the basin.

- Ratio of total stream length within the forest in the microbasins is important regarding the existence of microbasins that begin to lose their naturalness, especially problematic for common pollutants.

- The ratio of stream length in 50 m buffer zone of roads is an important indicator showing the regions where the gas and waste elements are transferred to the streams especially arising from salts used on the roads during the winter and from traffic. It is necessary to take the special measures at larger scales in such areas. In the basin, there is 1 microbasin where the concentration is very high, 479 medium, 101 very low, and 145 microbasins where the stream and road net don't intersect each other. When the maps of road length within 50 m buffer zone in the basin are examined, it is found that the 3rd group road concentrations are available throughout the basin.

- Mapping activity of the main river basins is carried on vegetative corridors which especially allow for passing of vertebrates among the patches in the rivers having the ecologic corridor qualification. It is found that the main river basins pass through about 45% of basin, namely 326 microbasins, and on this basis, the assessments are made.

### 6.3. Three indicators are discussed under the heading "Some Indicators Related to the Assessment of Basins".

- The ratio of water surfaces in the microbasin (dam, pond and lake) to the microbasin area is important to show which microbasins are important, especially regarding the potable water, utilization water. The dams, lakes and ponds throughout the area of Yeşilirmak Basin correspond to 0.5% area. When considering the microbasins where the water surfaces concentrate in the Yeşilirmak Basin, the concentration in Köse, Çamoluk, Gölova, Şabinkarahisar, Akıncılar, Suşehri and Zara in the upper-basin of Kelkit attracts the attention. Then, Almus, Reşadiye, Yıldızeli in the south, Akdağmadeni, north of Sorgun and Saraykent, Pazar, Zile districts, Ayvacık, Çarşamba and Terme districts in north come into the forefront. Alucra, Çorum, Mecitözü, Amasya, Merzifon, Gümüşhacıköy, Suluova, Havza, Ladik and Kavak in the west of area come into the forefront regarding the water surfaces. When considering the ecosystem services, those water surfaces, providing the drinkable, irrigation water, and upper-basins, feeding them, have the vital importance for the region people. The pollution, which may occur on the water surfaces, may affect the lives of many people.

- Ratio of agriculture fields in the locations, having slope more than 6%, to the microbasin area is important to show the distribution of fields, especially where the agriculture should not be applied within the basin. Analyses results show that the agriculture fields, having slope more than 6%, are available almost in every part of basin. In addition to it, the regions, where the population concentrates on the flat lands, are also frequently observed within the basin.

When examined at the microbasins level, it was found that the agriculture surface concentration in 64-81% is very high in 5 microbasins, 48-64% in 21 microbasins, 32-48% in 125 microbasins, 16-32% in 290 microbasins, and 0-16% in 242 microbasins. It was found that the agriculture was applied in the locations, having slope more than 6% in 10% of Yeşilirmak Basin.

- The existence of reeds and marshy areas in the microbasins provides the significant inputs in determining the microbasins important regarding the nature conservation. The areas where the wetlands, reeds and marshes are available, are determined and examined at the microbasin level in the analyses related to the wetlands in the basin. As known, the wetlands are the important assets regarding the ecologic loops, especially the water loop in the basin. For this reason, protection of existing wetlands, and carrying out the rehabilitation works for the wetlands that are dried or almost lost are important regarding the operation of ecologic processes in the basin.

7. The landscape impact-change-pressure analyses are important regarding the passing of decisions related to the landscape, developing the strategies and especially strategies related to the recovery of landscape. In this context, the data produced under the Basin Protection Action Plan in the basin, is



affective in guiding the analyses under this heading. 11 criteria were discussed under the landscape impact-change-pressure analyses.

**7.1.** The microbasins problematic regarding the discharging points in the basin show the microbasins where the domestic and industrial discharging points concentrate. Very problematic two microbasins are located in Tokat center district and Erbaa district in the basin, and the problematic 4 microbasins in Merzifon and Suluova districts. There are 10 microbasins that are moderately problematic, 43 little problematic, 100 very little problematic. There are also moderate problematic microbasins around Merzifon, Mecitözü, Ortaköy, Amasya Center and Kavak districts, and Samsun and the southern part of Kelkit Sub-basin have the non-problematic microbasins. 22% of 726 microbasins were found to have discharges. Especially when that discharges in the parts are considered, where the streams are available, spread to the sub-microbasins due to stream net, as stated in TÜBİTAK MAM (2010) report, it is necessary to operate the waste refinement plants as soon as possible at all discharging points.

**7.2.** The microbasins that are problematic regarding the solid waste storage areas in the basin are important to show that the wastes are stored irregularly in a significant part of basin. Besides that shows the risks of storage areas in the locations where the permeability is high.

**7.3.** The microbasins with settlement pressure on agriculture fields represent the microbasins that the agriculture must have been available normally, but are invaded by the settlements. There is 1 microbasin where there is very high pressure, 4 medium pressure, 3 little pressure and 287 very little pressure. It is found that the settlement pressure increases on the microbasins from east toward west in Yeşilirmak Basin. It is found that about 200 km<sup>2</sup> agriculture field is used for settlement and other purposes throughout the basin.

**7.4.** The microbasins, where the settlement areas are available with slope 40% and beyond; and the microbasins, where the settlement areas are available having the slope between 20-40%, show the appearance of areas that may be problematic for settlement in the basin. The areas with a slope more than 40% are attracted the attention as an extension of typical Black Sea settlement pattern. The areas, having the slope more than 40% cover 12% of basin. There are also areas with a slope more than 40% and settlements are available in 42 microbasins.

**7.5.** The water pollution and pressure in the microbasins represent the stream pollution, thus pollution of microbasins according to the A, B, C and D type parameters pursuant to the Water Pollution Control Directive. They are an important indicator to show the priorities in the rehabilitation works related to the water. Furthermore, indication of pollution with the biologic indicators of rivers in the basin management plans forms one of our national responsibilities (under the EU Water Directive) that must be fulfilled during the next periods. Considering the current measurement data, obtained by TÜBİTAK MAM (2010), there is one microbasin (class 1) involving the high quality water in the basin, 5 microbasins involving less polluted water (class 2), 13 microbasins involving polluted water (class 3) and 23 microbasins involving the very polluted water (class 4) according to the physical and inorganic parameters, group A and to the Water Pollution Control Directive. The most problematic microbasins regarding the group A pollutants are located in Çorum center, Alucra and Mecitözü, Amasya, Tokat center and Erbaa, Zara, Suşehri, Akıncılar and Gölöva. Similarly, there are 25 microbasins (class 2) involving the less polluted water in the basin, 3 microbasins involving polluted water (class 3) and 4 microbasins involving the very polluted water (class 4) according to the organic parameters, group B and to the Water Pollution Control Directive. The most problematic microbasins regarding the group B pollutants are located in Çorum center and Mecitözü district, Amasya and Tokat center districts. There are 15 microbasins (class 2) with the less polluted water in the basin and 13 microbasins involving polluted water (class 3) according to the inorganic pollution parameters, group C and to the Water Pollution Control Directive. The most problematic microbasins regarding the group C pollutants are located in Mecitözü, Amasya center, Turhal, Pazar and Sulusaray, Erbaa, Salıpazarı and Niksar districts.

**7.6.** Pressure of HEPPs on microbasins has a vital importance, especially in the microbasins where the potential erosion risk is high. In case of acting proper for the landscape recovery plans during the HEPP construction, it is unavoidable that the scar appearance in the nature would treat the microbasins for years. In addition, the ecologic-based designs such as some habitat bridges are necessary at the bottom



scales in order that the living beings reach to the water sources in those regions. There are 22 HEPP projects which are currently implemented in the Yeşilirmak Basin and 41 HEPP projects which are at the planning, feasibility and pre-examination stages within the basin. There is 1 microbasin where HEPPs concentrate, 5 in medium concentration, and 32 in low concentration in the project area.

**7.7.** The nitrogen and phosphor quantities transferred to the streams are important to show the situation of common pollutants in microbasins and to pass the decision about the landscape recovery measures related to the microbasins on this basis. In the work, carried out by TÜBİTAK MAM (2010), the quantities of nitrogen and phosphor, transferred to the streams, were calculated from the land use, agriculture, atmospheric convention, and it was also calculated the total nitrogen and phosphor sourced from cesspit and leakage water. When the annual total nitrogen concentrations are evaluated, there are 30 microbasins where the concentration very low, 239 low, 217 medium, 149 high and 91 very high. It was found that the nitrogen was higher in 32% of the microbasins in the basin and in this scope, it is necessary to take the steps at the different levels. When the total nitrogen load map is examined, Kelkit Sub-basin in the east of basin appears cleaner than entire basin regarding the nitrogen load. In addition to it, the microbasins in the very high concentration group are seen as Amasya, Tokat and Çorum city centers.

**7.8.** The microbasins where there are active fault lines with the earthquake risk provide valuable indicators to learn the lessons from the problems experienced in the past within the region. One should avoid the decision that may increase the risk and should act complying with directives and laws related to the construction sector, in the areas where the risk is higher. According to the data obtained from the environmental regulation plans in the region, it was found that the active fault lines were available in 76 microbasins. The special spatial planning areas were determined, especially for those regions where fault lines were available in the environmental regulation plans. There is an active fault line throughout Çorum, Tersakan and Yeşilirmak Rivers in the entire basin.

**7.9.** The Microbasins, having the settlement and agriculture areas in 300+700 m buffer zones of dams, lakes and ponds, show the importance given to the water resources that are used for potable water and daily activities. When it is considered that especially the domestic wastes are sent to the cesspits and the agricultural-sourced pollutants are higher in the basin, the special landscape management decision will be required in such areas. As there are 134 microbasins where both settlement and agriculture areas are available in 1000 m immediate surrounding of dams, lakes and ponds, there are 86 microbasins having only the settlement areas or agriculture fields around. Hence, it is found the human uses surrounding of dams, lakes and ponds in 30% of microbasins. When it is considered that especially the domestic wastes are sent to the cesspits and the agricultural-sourced pollutants are higher in the basin, the special landscape management decisions will be required in such areas.

**7.10.** The stone, sand and mine quarries cause the problems in the visual quality of the relevant microbasins. In this context, it is necessary to carry out the rehabilitation, recreation or reclamation activities based on the landscape recovery plans for the quarries that are expired. Based on the data obtained from the environmental regulation plans in the basin; 53 stone, sand or mine quarries were processed in Çorum, 82 in Samsun, and 55 in Tokat. It was found 83 microbasins having stone, sand or mine quarries less than 4, 4 microbasins microbasins having stone, sand or mine quarries between 4-8, and 1 microbasin having stone, sand or mine quarries between 8 -17

**8.** SWOT analyses were carried out under the scope of natural, structured, social and economical environment to support the development of landscape development strategies and landscape guides.

**9.** First of all, the factors, increasing the potential landscape quality/Landscape quality, were determined by considering the factors decreasing and increasing the landscape quality under the heading: "Landscape Quality and Landscape Quality Objectives". Then the current landscape quality was presented bringing the factors decreasing the landscape quality with those factors together. Considering the current landscape quality related to the basin, the landscape quality objectives were determined and mapped based on the microbasins. Thus, the objectives were determined spatially for each microbasin.



When one looks at the distribution of factors increasing the landscape quality within the basin, it was found the very little potential landscape quality in 38 microbasins, low in 245 microbasins, medium in 288 microbasins, high in 131 microbasins and very high in 24 microbasins.

**10.** The situation determination was made, especially related to the implementation of ecologic-based environment regulation plans and development plans which were discussed in the different environments under the heading, “Spatial Cohesion-Noncohesion and Conflict Areas”. The environmental regulation plans, prepared pursuant to the Development Law, No. 3194 previously in the region, was assessed specific to the concept of landscape quality developed within the scope of Yeşilirmak Basin Landscape Atlas. In this context, it was found that the decision taken in the relevant environmental regulation plans was contradictory with the landscape quality concept that was produced on the ecology basis in some microbasins. Samsun was determined as the city where the ecologic vulnerability was considered least among the provinces of Amasya, Tokat, Samsun and Çorum. The most powerful result from here is that the landscape plan or landscape planning approaches should be integrated to the spatial planning works officially in the legal and administrative aspects as soon as possible

**11.** The seven main functions were discussed in determination of sectors’ ecologic vulnerabilities: Landscape’s habitat function, biologic diversity function (total of vegetation, mammal, aquatic species, reptiles and insect biologic diversity), water infiltration, potential erosion risk, surface water flow, visual landscape quality and cultural richness which are evaluated within the scope of landscape functions. The functions, which are directly connected to the relevant sector, are selected among the landscape functions in order to determine the ecologic sensitivities for the agriculture, forest and settlement sector. Then, these functions are mapped each other and the vulnerability of each microbasin is scored from 1 to 5. Considering the ecologic sensitivities related to the microbasins and sector characters of microbasins, the landscape development strategies related to each microbasin is obtained. Then, using the population concentration data, the microbasins are defined as “1st, 2nd and 3rd degree hot zones requiring the special landscape management in landscape sustainability”.

**12.** Strategy and landscape guides produced regarding the landscape recovery: The microbasins that are vulnerable to erosion, (potential erosion risk, surface water flow, landslide and HEPPs), the microbasins that require the repairing due to the urban-sourced solid wastes and discharging points, the microbasins that require the repairing due to the agriculture-sourced common pollutants are determined and the microbasins, having the 1st, 2nd and 3rd degree priorities, are defined in the recovery as a result of each analyses. When the microbasins, vulnerable to the erosion, are evaluated according to the relevant method, it is found that 54 microbasins have very less ecologic vulnerability regarding the erosion, 185 microbasins less vulnerability, 346 microbasins medium, 128 microbasins high and 13 microbasins very high. The areas vulnerable to the erosion in Yeşilirmak Basin are located in the upper-basin sections of Kelkit and Yeşilirmak Sub-basins. Those areas include the areas that are vulnerable to the erosion. Those sections may be considered as the basins where the forestation and some repairing techniques may be applied. In such areas, the recommendation plans should be developed at the larger scales and should be integrated with the projects and plans prepared by the different bodies.

**13.** Management followed the “Notification on Principles and Procedures Related to the Establishing, Tasks, Working of Basin Management Commissions” which came into force upon being published in the Official Journal, no. 28681 and dated 18.06.2013 in the implementation of landscape plan. Furthermore, the stakeholder analyses related to the forestry, agriculture and tourism sectors were made and the remarks were provided under the sub-title of landscape management, and the short, medium and long-term objectives were determined.

**As a result;** Yeşilirmak Basin Landscape Atlas has the qualification to be a guide to all public organizations and institutions (governor, district governor, mayor, mukhtar, field services of departments, etc.), Non-Governmental Organization (NGO) representatives during the spatial planning and decision-making processes at the microbasin level. Since the atlas was issued in a language and mapping system that everybody may understand, it is easy-to-use. Furthermore, “Project of Issuing the Yeşilirmak Basin Landscape Atlas” is a project which will enlighten to remove the significant lacks in



spatial and sector plans in Turkey. Project is an important tool for integrating different scales of environmental, social and economic plans with the landscape plans.

Realization of the outputs of the landscape atlas can be achieved with the ratification of the landscape protection, management and planning laws and regulations by the Turkish Parliament as mentioned under the scope of the European Landscape Convention.

As the works to be carried out after the project, it is expected to

1. Conduct the landscape atlas works parallel to the water action plans and environmental regulation plans in all basins at the national level,
2. Prepare the National Landscape Strategy,
3. Enact a law and by-law related to the landscape protection, management and planning,
4. Integrate landscape planning and landscape planning approaches to the spatial planning and sector planning,
5. Develop the Landscape Conservation Office,
6. Discuss the projects related to the landscape protection, management and planning in the different platforms and attracting the attentions of different ministries and organizations.