



## A new basin management concept for Turkey: National basin management strategy

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### Abstract

Turkey has been divided into 25 hydrological basins and total average annual flow from these basins amounts to 186 billion m<sup>3</sup>. According to DSI data, 36% of the 112 billion m<sup>3</sup> available water resources in Turkey is utilized at present, of which 32 billion m<sup>3</sup> is used for irrigation, 7 billion m<sup>3</sup> for drinking and domestic purposes, and 5 billion m<sup>3</sup> for industrial purposes. The basin management approaches and projects implemented after the 1990s focused on the combination of conservation and rehabilitation of natural resources and development of low-income rural communities dependent on the use of these resources for their livelihood, by adopting a participatory planning and implementation approach. Basin Master Plans, River Basin Protection Action Plans and River Basin Management Plans are basic plans that are prepared and implemented in Turkey through integrated basin management approach. In the light of the above assessments, National Basin Management Strategy (NBMS) aims at defining a set of policies for sustainable management of Turkey's basins, as supported by results focused and concrete objectives, and the goals to be attained to achieve the objectives together with the agencies responsible for attaining these goals; and encouraging and supporting the public sector, private sector and non-governmental organizations to act in cooperation through a coordinated and participatory approach. NBMS will be implemented between 2015 and 2023. Objective and scope of NBMS; strengths, weaknesses, opportunities and threats of basin management; criteria for prioritizing basin areas and investments; spatial framework in basin management; institutional structure; adaptation of basin management to climate change and monitoring and evaluation systems were determined in NBMS. This article includes Summary of NBMS, criteria for prioritizing basin areas and investments and 2023 NBMS Goals and a key NBMS project "Sustainable Land Management and Climate Friendly Agriculture Project".

**Key words:** NBMS, sustainable land management, rehabilitation, restoration

### 1. Introduction

Basin is a basic water resource unit and a fundamental building stone of integrated land and water protection and use plans. The sustainable management of our system of basins which consists of 25 river basins and their sub-basins forms an important component of our country's sustainable development. Basin management aims at ensuring the sustainability of hydrological services in a geographically divided drainage area, integrated protection and use of land, vegetation, water and other natural resources in the interests of habitants in that area and sub-basin areas, and thus contributing to the socio-economic development of our country (Temiz and Erkmén, 2009).

Basin management activities in the world and in our country prioritized the conservation of lower basin assets, particularly dam reservoirs, and mainly adopted technical engineering solutions in the 1970s and 1980s.

This notification aims at defining a set of policies for sustainable management of our country's basins, as supported by results focused and concrete objectives, and the goals to be attained to achieve the objectives together with the agencies responsible for attaining these goals; and encouraging and supporting the public sector, private sector and non-governmental organizations to act in cooperation through a coordinated and participatory approach. The vision of National Basin Management Strategy has been established as "to conserve, improve and sustainably use the basin resources of our country through coordinated, participatory and ecosystem-based management of basins, thereby meet the society's need for the environmental, economic and socio-cultural services and benefits of basins, and to contribute to the improvement of quality of living and level of welfare as well as to national development".

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To achieve this vision, objectives of NBMS have been established as follows:

Objective 1: Strengthen the legal and institutional capacities for the sustainable management of basins, and ensure coordination and cooperation among institutions and stakeholders.

Objective 2: Ensure sustainable management and use of the water resources of basins.

Objective 3: Prevent destruction of basin areas and resources and erosion, rehabilitate and sustainably use degraded basin areas.

Objective 4: Conserve biodiversity and landscape of basins, ensure sustainable use of ecosystem services.

Objective 5: Improve the quality of living and level of welfare of people living in basins.

Objective 6: Develop and streamline the mechanisms of measures and responses to disasters occurring in basins and the damages caused by them.

Objective 7: Incorporate the potential impacts of climate change and adaptation to climate change into basin management, and develop mechanisms of adaptation (CEM, 2012).

NBMS involves related governmental organizations as a party. Most of these institutions have ongoing strategies or action plans on basin rehabilitation, management or basin resources development. The strategies or action plans are generally implemented for 5 years period. 2013-2017 Strategic Plan of the Ministry of Food Agriculture and Livestock, and 2013-2017 Strategic Plan of the Ministry of Forestry and Water Affairs are main strategies among on basin related strategies. NBMS is integrated related strategies focusing on basin rehabilitation, management and development. In addition to integration of related strategies, NBMS is a national legislation for all institutions and other related stakeholders.

Some of related strategies, sub-strategies or action plans are listed:

National Strategy Document for Combating Desertification (2013-2023), National Action Plan for Combating Erosion (2013-2017), National Forestry Strategy and Programme (2004-2023), National Action Programme for Combating Agricultural Drought (2008-2012), National Biological Diversity Strategy and Action Programme (2007), National Action Programme for Climate Change (2011-2023), National Strategy for Rural Development (2014-2020).

## 2. Materials and methods

The reports of National Basin Management Strategy preparation workshop and meetings used as material in this study. Beside the official documents of Integrated Project Division Directorate, Official Statements (2014, 2015) related NBMS and its action plan used as secondary material.

The National Basin Management Strategy preparation period, implementation arrangements, implementation arrangements, strengths, weaknesses, opportunities and threats on basin management approach analyzed in this study. Opinions and statements of strategy stake holders' representatives are considered for the study.

## 3. Results

### 3.1. Current State of Basins in Turkey

Turkey has been divided into 25 hydrological basins (Figure 1) and total average annual flow from these basins amounts to 186 billion m<sup>3</sup>. According to DSI data, the Euphrates-Tigris basin located in the east of the country accounts for approximately one third of this flow. While Kızılırmak and Sakarya basins follow in terms of area size, Eastern Black Sea, Eastern Mediterranean and Antalya Basins follow Euphrates-Tigris basin in terms of average annual flow (Temiz and Erkmen, 2009).



Figure 1. Map of river basins in Turkey

The ecological, social and demographic conditions of basins and the use of basin resources may vary significantly by different basin regions as well as horizontal and vertical distribution of basin areas. While the basins in the Eastern, Northern and Southern regions have a higher and steep topography, the topography in Central and Western Anatolia is softer. While Alpine pastures and forests concentrate in upper basins and Black Sea and Mediterranean regions, agricultural areas are mostly located in lower middle basin areas (Temiz and Erkmen, 2009).

36% of the 112 billion m<sup>3</sup> available water resources in our country is utilized at present, of which 32 billion m<sup>3</sup> is used for irrigation, 7 billion m<sup>3</sup> for drinking and domestic purposes, and 5 billion m<sup>3</sup> for industrial purposes. Thus, approximately 74% of water resources is used for irrigation, 11% for industrial and 15% for urban consumption purposes, whereas these rates are 70%, 22%, 8% in the world, and 33%, 51% and 16% in Europe, respectively (DSI, 2015). One of the most important problems of our basins is the destruction of our pastures, agricultural and forest areas and resources due to overgrazing for many years, and the resulting soil erosion that is observed at very large scales and very extensively in almost all basin areas. Incorrect soil cultivation and irrigation applications in agricultural lands are among the factors aggravating the severity of erosion. In Turkey, 54% of forest lands, 59% of agricultural lands and 64% of pastures are exposed to erosion (OGM, 2015).

Land degradation has substantially reduced the bearing capacity of rangelands and productivity of agricultural lands in upper catchment areas, and has thus negatively affected the livelihood of farmer families in uplands, leading to an increase in poverty rates in these areas. The reduction in vegetation has led to the reduction in soil humidity and raised the vulnerability of agricultural lands to drought to much higher levels. Land degradation has also resulted in more instable river flows, leading to recurring floods and the growing problem of sedimentation. Landslides have also become a growing issue (CEM, 2012).

Accordingly, significant progress has been achieved as a result of the efforts for management of water resources together with socio-economic development in ensuring sustainable development. As a candidate country for EU membership, Turkey has started aligning its legislation with the EU legislation. The diversification and increase in elements of pressure on water resources have required the management of river basins through an integrated approach. While studies concentrated on finding out where and how much water was available, today it has become imperative to jointly address the quantity and quality of water. It has become necessary to evaluate all factors affecting these two elements collectively (CEM, 2012).

In water catchment basins of our country, DSI constructed 706 dams and ponds, built irrigation systems for 3.2 million ha of agricultural land, 5,930 flood protection facilities protecting 1.4 million ha of land from floods, and systems for supply of 3.31 billion m<sup>3</sup> of drinking, domestic and industrial water in the last 55 years.

Gross irrigated land increased by 2.4 times during the 40-year period between the 1970s and 2011, from 2.3 million ha to 5.5 million ha. According to DSI data, technically and economically irrigable land amounts to 8.5 million ha in total, and approximately 65% of this land is irrigated as of end 2011. Overall, 85% of irrigation is performed using surface waters, and approximately half of this water is supplied from multi-purpose dams. Furthermore, while gravity canal irrigation is still the prevalent technology, water-saving pressurized sprinkling and drip irrigation systems are also introduced rapidly.

Basin management is globally recognized as a very crucial “no regret” approach for adaptation to climate change. Basin management establishes a linkage between potential climate change impacts on hydrological regime and diverse uses of resources, and thus would help planners and decision makers identify investments that are resilient to potential climate impacts.

It is essential that the water potential of a basin be primarily evaluated within the basin itself. However, the quantity and timing of precipitation varies across regions in our country; e.g. while Eastern Black Sea region receives 2,500 mm of precipitation per annum, Central Anatolia Region and particularly Konya and environs receive 250 mm of precipitation per annum. Low level of precipitation and the resulting drought affect almost all sectors and eventually lead to slowdown in regional growth, reduction in farmer income, shortages in supply of basic food products, serious losses in industries that are directly linked to agricultural production, and unemployment associated with reduced production. The elimination of these and similar undesired consequences require investment in water resources, careful use of existing resources and water transfer between basins as necessary. While transferring water between basins, the goals set out in basin management plans should be taken into consideration.

Many institutions have duties and responsibilities regarding the protection and use of watersheds and water resources in our country, and they carry out activities under their own mandate in basins. However, the work carried out by different institutions in different parts (upper and lower basins) and areas of basins (forest rehabilitation, afforestation, soil conservation, pasture rehabilitation, dam and pond construction, agricultural irrigation, energy generation, drinking, domestic, industrial water supply, biodiversity resources conservation and rehabilitation, rural development, etc.) result in lack of coordination, integrity, stakeholder ownership and participation in the programs and projects implemented. This leads to waste of resources as well as complementary nature, efficiency and sustainability of investments. However, a broad consensus has been reached on the idea that coordination, integrity and participation are top priority requirements for improvement of basin management, and efforts have been undertaken for institutional and legal arrangements and strengthening of integrated projects and practices to this end (CEM, 2012).

### 3.2. Stakeholders, Expectations and Requests relating to Basin Management

Summary information regarding the main public institutions (ministries and their primary units dealing with basins) and other stakeholders involved in management of basins in our country is provided below.

Public Agencies and Institutions: Ministry of Forestry and Water Affairs, Ministry of Food, Agriculture and Livestock, Ministry of Environment and Urbanization, Ministry of Energy and Natural Resources, Ministries of Culture and Tourism, Interior, National Education, and Health, Prime Ministry, Ministry of Development, Local Administrations.

Other Stakeholders: Non-Governmental Organizations (NGOs), Professional Organizations, Basin Unions, Rural communities living in basins, Urban communities, Universities, Research Institutes, Academic Institutions, Related private sector institutions and organizations.

Different stakeholders have different expectations from the various economic, ecological, social and cultural products and services of basins, and different demands and priorities in basin management (energy generation, drinking, domestic, agricultural irrigation, industrial water supply, benefiting from forests and rangelands, increasing productivity in agricultural lands, ensuring income and livelihood from basin resources, biodiversity conservation, prevention of air pollution, recreation, natural landscape, ecological tourism, hunting, protection of culture in basin areas, generation of national income and income for budgets of institutions, generation of earnings for private sector, etc.). Furthermore, significant variations are occurring in time in the expectations of our society, which is urbanizing rapidly and demographically evolving, from the basin and basin management. All these considerations have been taken into account during the NBMS process.

Table 1. Some of the NBMS Main Activities

PERFORMANCE INDICATORS / ACTIVITIES FOR GOALS	Unit	Quantity	
		2015	2023
Map of basin system (agreed by institutions, showing the boundaries and areas of basin, sub-basin and micro-catchment)	No	1	
Number of river basins with prioritization completed	No		25
Create a GIS-based “National Basin Management Information System (NBMSIS)”	No	1	
Number of institutions integrated to NBMSIS and Database	No	4	All
Prepare and implement Integrated River Basin Management Plans for basins.	No	4	25
Complete the planning of sectorial water allocations at basin level.	No	5	25
Identify the areas sensitive to nitrate and water pollution at basin level.	No	25	
Improve using rate of potential water resources	%	42	100
Achieving feed-discharge balance the ground water	%		100
Start periodic rain water isotope analyses	No	15	25
Increase irrigated agricultural land (now: irrigated 5,6 million, potential 8,5 million ha.)	m. ha	6,5	8,5

### 3.3. Strengths, Weaknesses, Opportunities and Threats in Basin Management

During the NBMS process, the related agencies and stakeholders have identified the main strengths, weaknesses, opportunities and threats in basin management as follows.

#### Strengths:

- The long background of institutions regarding basin projects and practices, and their concentration on investments and plans based on basin integrity recently.
- Basin protection action plans and river basin management plans being prepared.
- Increased financing resources provided for basin investments.
- Increased soil conservation and watershed rehabilitation activities.

#### Weaknesses:

- Inadequacies in policies and strategies regarding basin management.
- Inadequacies in coordination and cooperation among institutions; overlaps, gaps and uncertainties regarding the duties and powers of agencies; gaps in legislation on this matter.
- Inadequacies in ensuring stakeholder participation and local ownership.
- Inadequacies in informing the public about the projects and activities being executed, lack of transparency,
- Inadequacies in criteria and methodologies for prioritizing basin projects and activities.
- Inadequacies in completing and updating the high-level plans to form the basis for coordinated execution of basin activities.

- g) Inadequacies in methodologies, data and institutional capacity for the measurement and assessment of the social and ecological services and externalities of basins.
- h) Inadequacies in the calculation of the benefits and costs of basin projects and investments, and in their sharing among the affected stakeholders and beneficiaries.
- i) Inadequacy of national database for basin-level planning
- j) Inadequacy of knowledge and experience among institutions regarding the monitoring and evaluation techniques and methodologies using modern information technologies.
- k) Lack of scientific approach and R&D regarding basins, and lack of dialogue and cooperation between the researchers and practitioners.
- l) Lack of up-to-date and systematic soil surveys and land classification.

#### Opportunities

- a) Reduced human-sourced pressures in upper basins due to migration.
- b) Possibilities of access to information and benefiting from advanced information technologies (GIS, remote sensing, etc.).
- c) Rich natural resources, a significant potential of basin resources that is still untapped.
- d) Increased public awareness regarding protection of natural resources and environment.
- e) Increased contributions and engagement of non-governmental organizations.
- f) Increased political interest and support.
- g) Developing participatory approach among institutions.
- h) Creation of employment for local people in watershed rehabilitation activities.
- i) Place and importance of watershed management in EU harmonization process.
- j) Increased importance of watershed management at the global level.
- k) Increased capacity in scientific research and development.

#### Threats

- a) Impaired balance of population between lower and upper basins.
- b) Increase in the demand and expectations for products and services (water, energy, agricultural production, etc.) of basins in line with rapid population growth.
- c) Low income level of people living in mountainous areas in upper basins (rural poverty).
- d) Reduction in young population who would offer labor force in rural areas due to migration.
- e) Inadequacies observed in sensitivity and education among the public regarding the value of basin resources, dimensions of destruction in basins and their consequences.
- f) Ownership and usage right problems.
- g) Increased industrial pollution.
- h) Increased use of chemical pesticides and fertilizers in agriculture.
- i) Pressures on biodiversity.
- j) Negative impacts of climate change.
- k) Tough topography and soil conditions.

## **4. Conclusions and discussion**

National Basin Management Strategy (NBMS) aims at defining a set of policies for sustainable management of Turkey's basins, as supported by results focused and concrete objectives, and the goals to be attained to achieve the objectives together with the agencies responsible for attaining these goals; and encouraging and supporting the public sector, private sector and non-governmental organizations to act in cooperation through a coordinated and participatory approach. NBMS will be implemented between 2015 and 2023. Official Statement of Basin Management Committee's Organization, Services and Working Principles entered in force in 20 May 2015. Basin Management National Committee, Basin Management Committees, Water Management Coordination Committee were established by the Official Statement. These committees will be implementing the National Basin Management Strategy between 2015 and 2023 (Official Statements, 2014, 2015). Monitoring and Evaluation Unit established under the Ministry of Forestry Water Affairs General Directorate of Water Management. Progress reports of National Management Strategy is preparing by Monitoring and Evaluation Unit for each 6 months periods.

Monitoring is the systematic follow-up and reporting of the implementation of Strategy Document; and evaluation is the measurement of implementation results against objectives and goals as well as the analysis of the consistency and relevance of these objectives and goals.

### *5.1 Institutional Arrangements and Responsibilities*

Following the approval and effectiveness of the NBMS prepared, related ministries will jointly designate and commission a unit for the monitoring and coordination of implementation activities. The orientation and support functions

for these activities at the high level will be undertaken by the National Basin Coordination Committee comprising of high level representatives from the relevant agencies and institutions and stakeholders. In the relevant key institutions, a unit and a senior expert staff will be commissioned for monitoring, evaluation, and coordination of contacts and exchange of information within and outside the institution. The Technical Committee to consist of these expert staff members will be responsible for monitoring and supporting Strategy Document implementation activities at the experts' level. Experts will be invited from universities, research institutions, non-governmental institutions and private sector to participate in this Committee. At the local level, Basin Committees consisting of representatives from relevant agencies, institutions and stakeholders, or Basin Unions would be commissioned for monitoring and evaluation. The agencies and units with primary responsibility in the monitoring, coordinating and supporting the achievement of goals set out in the Strategy Document.

### 5.2 Preparation of National Basin Management Strategy Action Plan

National Basin Management Strategy Action Plan (NBMS-AP), which clearly lays down the actions required to be taken to achieve the NBMS objectives and goals (strategic goals) as well as the responsibilities and timeframe for the realization of these actions in detail. National Basin Management Strategy Action Plan identifies the actions, each institution involved in basin activities, required for goals with primarily responsibility assigned to them. The Action Plan prepared by various institutions involved in basin activities will be compiled under National Basin Management Strategy Action Plan will coordinate under the of Ministry of Forestry and Water Affairs.

### 5.3 Monitoring and Evaluation of Strategy Implementation

Regular reporting of progress achieved in objectives, sub-objectives and goals would contribute to the ability of related parties and authorities within and outside institutions to monitor and evaluate the process. Reports based on performance indicators are the basic instrument of monitoring activity and must be prepared objectively. The reporting system should involve the comments and evaluation reports of universities and research institutions based on research findings, in addition to the progress and assessment reports of related institutions. As a synthesis of all these reports, a "National Basin Management Progress and Evaluation Report" is prepared by General Directorate of Water Management every year

## References

- Hopur, B., Orhan, C., Acarturk, S. 2014. Monitoring and Evaluation System's Examination in Integrated Watershed Rehabilitation Projects (Sample of Murat River Watershed Rehabilitation Project), p. 422-437, Çankırı, Turkey.
- Orhan, C., Acarturk, S., Hopur, B., 2014. Göksu River Watershed Integrated Rehabilitation Project, I. National Basin Management Symposium, p. 159-176, Çankırı, Turkey
- Temiz, M., Erkmn, S. 2009. Watershed Rehabilitation Projects, International Workshop on Urbanisation, Land Use, Land Degradation, and Environment" p. 143,152, 28th Sept-01st October 2009, Denizli, Turkey.
- Temiz, M., Erkmn, S., Hopur, B. 2009. Watershed Rehabilitation and Turkey Implementations, I. National Western Black Sea Forestry Congress", p. 344-355, 5-7 October 2009, Bartın, Turkey.
- CEM 2012. National Basin Management Strategy preparation workshop and meetings reports, 2012, Integrated Project Division Directorate, General Directorate of Combating Desertification and Erosion Control (CEM).
- DSI 2015. Reports and institutional data of The General Directorate of State Hydraulic Works (DSI), 2015.
- OGM 2015. Reports and institutional data of The General Directorate of Forestry (OGM), 2015.
- Official Statement, Official Statement of National Basin Management Strategy, 2014 (Official Journal of Turkey Republic, 23.07.2014, No: 29050)
- Official Statement, Official Statement of Basin Management Committee's Organization, Services and Working Principles, 2015 (Official Journal of Turkey Republic, 20.05.2015, No: 29361).

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