EPRA International Journal of Agriculture and Rural Economic Research (ARER)- Peer-Reviewed Journal
Volume: 12 | Issue: 11 | November 2024 | Journal DOI: 10.36713/epra0813| Impact Factor SJIF(2024): 8.391| ISSN: 2321 - 7847

# SUSTAINABLE AND HOLISTIC MANAGEMENT APPROACH IN WATER BASINS

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**ABSTRACT----------**
*Among the most important environmental problems of our age; changes in global climate and the reflections of this situation, the negative impact of developing industry on the natural environment, environmental pollution resulting from the increasing population and unplanned and unconscious consumption of natural resources are the leading problematic areas. These types of elements and activities that have a corrosive effect on nature open the door to serious problems affecting all biosphere, atmosphere, hydrosphere and lithosphere elements, especially air, water and soil pollution. In this context, the pressure on the ecosystem is especially serious due to its size and prevalence. Therefore, it is of great importance to use ecosystem resources, which are renewable but polluted and consumed at a rate above the rate of renewal and are at the basis of many natural and human problems due to their sometimes excess and sometimes deficiency, since they do not show a regular distribution on the earth, within the scope of sensitive planning. In this respect, basins should be considered together with all ecosystem components and evaluated with holistic and sustainable approaches.*
**KEY WORDS:** *Watershed, holistic management, sustainability, Global extinction, Climate changes----------*

## INTRODUCTION

Water basins are among the areas occupied by humans due to their assets in terms of lithosphere, hydrosphere, biosphere and atmosphere. In terms of sustainability, holistic field management requires a correct approach to address the relationships of soil, water, air, plants and animals with their environment, each other and humans in a broad sense (Guney, 2004).

Especially the global climate change that is being experienced has made this even more necessary (Ekinci, 2024). Water resources and streams that provide the formation of basins are affected by climate change. Increased carbon use, reduction of forests, use of chemical fertilizers in agricultural areas, population and construction are perceived as an example of global extinction processes in basins (Ekinci, 2024).

If the world is made livable by considering plants and animals affected by polluted air and water, this situation becomes ecological. It is of great importance for the earth to remain in a state of balance (Robert and Lambach, 2010). This balance, events that concern living things ecologically occur in the atmosphere, hydrosphere, lithosphere and biosphere. The atmosphere, hydrosphere, lithosphere, biosphere, sun and moon, which are the systems that geography science emphasizes today, create life togetherness with human beings. Because human beings are polluting beings. They disrupt the balance at any moment (Ekinci and Bayrak, 2016).

Flora and fauna are shaped according to the climate, topography, soil and main material characteristics of any environment. Balance occurs with living things over a long period of time. The balance must be protected or sustainable. It becomes sustainable by organizing and directing it according to the natural resources in the environment. When there is no human intervention in the world, everything happens in balance and order. What falls to humans is to learn how to keep this in balance and protect it (Sonnenfeld and Mol; 2002).

The rational use method and precaution of existing resources are possible with holistic and sustainable basin planning. Although planning is defined as preparations made now to carry out a future action, environmental planning cannot only aim to meet human demands.

Natural features and their sustainability must also be within this scope. The evaluation of the suitability of existing natural and human resources for the activities proposed in the planning, the protection and increase of their productivity and the preservation of their stability are included in the scope of holistic and sustainable planning.

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Therefore, the findings of many professional disciplines such as geography, geology, oceanography, limnology, potamology, biology, zoology, botany, ecology, meteorology, demography, archaeology, sociology, agriculture and economics should also be included in the planning (Ekinci and Akkaya, 2013).

Basin management is a system approach that takes into account the needs of humans and other living beings and the balance between these needs in terms of benefiting from the environment, has clearly defined goals and priorities, uses sound information and techniques, chooses effective management alternatives, develops innovative education and training programs, requires strong leadership, is the result of the collaboration of many professions, includes all segments affected by the decisions taken during planning and implementation, and integrates all concerns and struggles in the environment (Ekinci and Sonmez, 2006).

Basin management; sustainable planning of the use of resources within the basin and efforts to develop existing resources in the basin and find new resources to be used in order for people to be raised from their current socio-economic level to a better level. Thus;

- To renew and protect water and related resources
- To provide scalable integrated basin management
- To ensure that decision makers understand the function and status of the ecosystem
- To balance economic sustainable status, development and environmental events
- To recommend appropriate resource management, correct spatial planning and land use changes.

It is impossible to fulfill these goals without human understanding, support and cooperation. The operation and coordination of programs on a basin basis makes good sense for environmental, financial, social and administrative reasons. Cost-reducing savings can also be achieved with the willingness of the people in the basin, the establishment and strengthening of economic resources (Shrivastav, 2001).

Rational use of limited potential and resources against unlimited demands is only possible with integrated basin management.

## PURPOSE AND SCOPE

Water basins are generally large populations and densely populated areas. This has caused constant pressure and degeneration on ecosystem resources. On the other hand, settlements that are intertwined with dense industrial zones have many problems. The most important of these are air pollution, water pollution, and soil pollution. As a result, a geography emerges in basins where all kinds of environmental problems are encountered. As a result of all these, the water quality of the receiving environment deteriorates and the ecosystem structure changes accordingly. The meso-zooplankton community in basins shows itself with low species diversity and the extraordinary dominance of one or two species (Arnell et al., 2019).

The protection of natural life and area is one of the most rational approaches in holistic sustainable basin management. Living species, including humans, cannot exist without living spaces of appropriate quality and size. Area protection protects living environments on the one hand and enables the protection of different living species from plants to birds and humans together, thus ensuring the protection and sustainability of biological diversity as a whole.

When the geographical potential in the basin and their areas are protected together, species are affected more indirectly by new situations and changes since they are in the ecosystem they are formed in, and they have more opportunities to adapt to changes. On the other hand, these areas are also important for understanding and seeing the conditions and rules that dominate life on our planet. The ever-increasing population and the unplanned savings they make without slowing down allow us to realize the threat in water basins much more strikingly.

Due to the unplanned increase in population density and the rapid destruction and misuse of natural resources, the effects of ecosystem degradation that occur are increasing day by day accordingly. Against these problems, where humans have a great effect on the formation of damages, determining what people living in the field and in the basin belonging to this field or affected by this basin should do to combat the problems and reduce the damages can also be counted among the objectives.

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As a result, the aim is to eliminate the problems that all elements of the ecosystem, especially humans, face or are at risk of encountering in basins or to reduce their negative effects to the lowest possible levels.

## BASIC COMPONENTS OF HOLISTIC WATERSHED MANAGEMENT

### Spatial Planning and Management

Spatial planning must be done to ensure sustainable development, to evaluate urban and rural developments as well as sectoral developments such as industry, agriculture, tourism, and transportation, to establish a protection-use balance, and to determine strategic decisions and land use decisions (Sjoberg, 1965).

Settlement areas are the areas where the natural system is least effective functionally and structurally. This situation alienates people from their environment due to socio-economic reasons. Problems are even greater in spontaneous settlements that do not take into account other needs of the society and the characteristics of the natural structure (Sayar, 1998).

Population and settlement rates are high in basins. In these areas, mesohemerobic areas with a semi-natural semi-anthropogenic structure, euhemerobic centers with landscape characteristics that have deteriorated from nature, and metahemerobic areas with anthropogenic/artificial landscape characteristics are more common, while ahemerobic (natural landscape) and oligohemerobic (slightly modified landscape) are generally less common. When planning basins, the primary goal should be to maintain the naturalness of meso-hemerobic areas in particular.

Land use, settlement and construction should be in accordance with planning, science, art, health and environmental conditions, should include reducing disaster effects and protecting, sustaining and developing natural, historical, cultural environment and environmental systems. If possible, cittaslow settlements should be created in basins (Ekinci, 2024).

Planning should be determined as the formation of the space in accordance with health and environmental conditions, including living, working, resting, activities and agriculture, industry, service sectors and all activities, in order to improve the health and living standards of today and future generations, in addition to the protection, use and development of land and natural resources in rural and urban areas (WHO. 2018).

EIA decisions should be taken and actions should be taken especially for areas requiring sustainability. Likewise, employees of institutions and organizations that will perform work and operations that have an ethical impact on the environment such as wastewater discharge, noise, air emission, packaging, paper, recycling, waste, vegetable oil, storage, scrap, tanker cleaning, hazardous waste, medical waste, battery collection must be ensured to obtain Environmental Permit/Environmental Permit and License Documents.

### Atmosphere and Air Quality Planning and Management

Air quality is the atmospheric quality that decreases with the increasing number of pollutants that are indicators of air pollution in the ambient air that affects humans and their environment. Air quality limit values are the levels expressed in concentration units determined by taking into account the changing harmful effects of air pollutants when they are together in order to protect human health and prevent short and long-term negative effects on the environment. Air quality limit values are defined in the regulation in two ways: long-term limit values (UVS) and short-term limit values (STL).

As it is known, winds have a great effect on the transportation, diffusion and dilution of air pollutants. Such turbulences formed in the atmosphere ensure the transportation and dilution of pollutants. The more mobile the atmosphere is and the more unstable it is, the more pollutants are diluted. Atmospheric environments such as instability also depend on meteorological conditions such as wind speed, solar radiation and cloudiness and relief.

Air pollutants emitted from industrial facilities, houses and vehicles rise to a certain height. The mixing height varies daily and seasonally and is affected by landforms and high-pressure systems.

Atmospheric processes that cause the transport, distribution, chemical transformation and removal of pollutants released into the atmosphere in basins and the emission status of existing facilities and possible future sources are variables that determine air quality.

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Air quality analyses are determined according to two elements, inputs and outputs. The inputs section includes emission amounts of pollutant sources, meteorological data and mathematical data related to atmospheric chemistry if chemical mechanisms in the atmosphere are also taken into account.

There are two different air pollutant groups in basins: fixed and mobile. Pollution originating from factories, residential areas, quarrying and mining activity areas constitute the source of fixed pollutants. Traffic-related pollution is mobile sources (Weckwerth, 2001).

Local plans should be prepared in accordance with the Global Protocol on Local Greenhouse Gas Emissions (GPC) prepared in 2014 by the Intergovernmental Panel on Climate Change (IPCC) based on the IPCC National Greenhouse Gas Inventory Guidelines, in coordination with the C40 Cities Climate Leadership Group (C40), the International Council for Local Environmental Initiatives (ICLEI) and the World Resources Institute (WRI). Again, reduction targets should be determined according to the Greenhouse Gas Inventory and implemented. The following practices should be fully implemented for short-term and urgent targets for sustainable clean and high-quality air. In the long term, fossil energy sources should be reduced and abandoned within the target years and a rapid transformation to renewable energy sources should be ensured (Bilginoğlu, 1991).

**Water Resources Management and Planning**

Water waste and pollution in basins are among the leading problems. All domestic and industrial liquid wastewater should be connected to collector lines and treated in wastewater treatment plants. It is a known fact that population density in basins. Then agricultural fields and eventually agricultural-based industrial facilities and other industrial branches become widespread. This expansion should be limited and especially should not be included in drinking water protection zones (Adalı, 2014: Jarup, 2003). Construction in the absolute and short-range protection areas of these locations should be prevented urgently and existing ones should be eliminated. In agricultural areas, drip, sprinkler or pressurized irrigation applications should be switched to instead of flood irrigation. Existing streams in basins experience siltation and eutrophication due to domestic and industrial pollutants. A sufficient number of advanced biological wastewater treatment plants should be put into practice to reduce the impact of domestic waste on water resources. In places where there are no wastewater treatment facilities, modular wastewater treatment facilities are established and the surrounding wastewater is collected with the sewer line, and the wastewater of subscribers using septic tanks should be transported to modular wastewater treatment facilities with sewage trucks and treated there. Water used for recreational purposes such as watering parks and green areas should also be completely recycled. The current use of network water should also be terminated for this purpose.

**Land, Soil Protection and Management**

The basin is a geomorphological unit. Its integrity is also worth attention. Especially some of these landforms may have great tourism potential or natural heritage elements, so their protection is of greater importance. In the context of restoring lands degraded by mining activities in basins to nature, the restoration of existing mines to nature should be ensured (Ekinci and Doğaner, 2014: 2016).

The control of soil pollution in basins is carried out within the scope of approaches to Point Source Contaminated Areas. In this context, the prevention of pollution of the soil, which is the recipient environment, the determination of areas and sectors where pollution exists or is likely to exist, the cleaning and monitoring of contaminated soils and areas in line with sustainable development goals, the prevention of soil pollution, the determination of areas and sectors where pollution exists or is likely to exist, the recording of these areas, the cleaning and monitoring of contaminated soils and areas are ensured (Karaca and Turgay, 2012: Akova and Tapan, 2022).

Nitrogen, phosphorus, potash-containing chemical fertilizers and agricultural drugs such as insecticides, herbicides, fungicides, rodenticides, nematocides, acaricides used in agricultural lands also cause damage to the soil. Instead, natural animal manure should be preferred as much as possible (Yalcinkaya and Bilgin, 2021).

In addition to these, soil erosion is also experienced in water basins due to deforestation and improper land use. Planting activities should be carried out urgently in these areas. Their evaluation is important in terms of land use and sustainability (Yalçınkaya and Bilgin, 2021).

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**Biodiversity Protection and Management**

Natural ecosystems located in water basins host plant and animal species that humans and other organisms use as food. Some of these may even be endemic and relict. Marshes and wetlands where basins meet surface waters such as the sea and lake are very special areas. There are many fish and birds in these areas. In this respect, these locations, which are their spawning and reproduction areas, should be carefully protected (Ekinci and Ekinci, 2006).

International and national agreements, regulations, especially the Bern Convention, and the European Union Natura 2000 Habitat directives should be strictly implemented. Therefore, the protection of the habitats of protected species should be ensured.

The continuation of human life is related to the sustainability of ecosystems and biodiversity with intact regulatory and restorative features. Forest ecosystems play an important role in regulating the climate, cleaning the air and regulating the carbon balance. In addition, the more diverse life in these ecosystems, the healthier it is and the cleaner the products we receive for free will be. Forest areas, lagoons and deltas must be protected without fragmentation.

Within the scope of conservation biology, the necessary methods and practices should be developed to identify the threats to biodiversity caused by human activities in basins and to protect and restore biodiversity. Programs should be developed to protect endemic and protected species together with their habitats, and the knowledge of the local people on this subject should be increased.

**Harmonizing the Human with Nature**

When there is no human intervention in the world, everything happens in balance and order. What falls to humans is to learn how to keep this in balance and protect it. Humans should not forget that they are also a link in the chain in nature. Although they have a wise and changing role, they should not forget that they will also be affected if they disrupt the whole. For this, environmental awareness should be developed. In fact, the brain neocortex structure should be shaped in this context (Ekinci. 2022).

## RESULT

In order to provide water basins with a resource-efficient, competitive and modern economic structure, a radical transformation plan that is environmentally friendly, sustainable, participatory and has a widespread impact and covers many areas holistically from production to trade, from energy to transportation, from agriculture to taxation should be implemented. For this, the following general principles and priorities should be taken into consideration:
Environmental practices in areas such as air quality, water quality, waste management, nature protection, industrial pollution control, chemicals, noise and climate change should be addressed in a participatory and holistic manner in harmony with energy, transportation, economy and other relevant sectors.

In the dilemma of development and environmental protection, natural resources should be saved prudently and rationally, based on precaution. The requirements of the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the Paris Agreements should be fulfilled.
In this direction;

- Border Carbon Adjustment
- A Green and Circular Economy
- Green Finance
- Clean, Economic and Safe Energy Supply
- Sustainable Agriculture
- Sustainable Transportation
- Combating Climate Change
- Diplomacy
- The targets and actions under the Information and Awareness Activities should be implemented urgently and away from all kinds of impacts.

The requirements for meeting the 2030 greenhouse gas emission reduction target and transitioning to a climate-neutral system by 2050 should be implemented.

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In terms of climate change, greenhouse gas emissions should be monitored, the emission trading system, the reduction of greenhouse gas emissions originating from sectors outside the emission trading system, carbon capture and storage, control of F-gases and protection of the ozone layer, the reduction of greenhouse gas emissions originating from transportation, and the reduction of emissions related to land and land use change should be ensured.

Adaptation capacity and resilience to climate change should be increased and vulnerabilities should be reduced. A serious reduction in greenhouse gas emissions should be achieved in the field by 2030 and then studies should be carried out for carbon neutrality.

The total CO2 emissions in the field should be limited and the quota system should be implemented. A Green Transformation Fund should be established to finance the transformation of sectors in this location, which is an industrial center. Projects should be developed for technological transformations that will facilitate the transition to a low-carbon and sustainable transportation system.

A transition to a regenerative growth model should be ensured. A circular economy should be adopted in basins. Data-based Environmental and Climate Policies should be developed and implemented. States should activate their regulatory and supervisory duties in a fair manner, away from all kinds of influence. The effectiveness of public institutions and organizations should be increased in line with quality, accreditation and standards. Collaborations with the public-private sector-academia - Local People should be developed, and common sense and synergy should be created.

The opinion of the local people should be sought in decisions on energy, mining and agriculture. In a way that will not harm the ecological balance, priority should be given to the high level of protection of biodiversity, especially relict, endemic and agricultural production specific to the field, ensuring the continuity of endangered wild animal and plant species, preserving environmental quality, protecting human health, in short, the sustainability of the ecosystem as a whole, including people, plants, animals, soil, air, climate, landforms, material assets and cultural heritage, and only resources should be saved.

The goal of zero pollution in air, water and soil should be achieved and the health and well-being of citizens should be protected. All kinds of pollution, especially industrial pollution, should be prevented at the source as much as possible, and existing problems should be reduced and eliminated on site. Natural capital should be strengthened. Biodiversity should be protected and strengthened.

The pressure of production and consumption activities, especially energy, industry, infrastructure and construction, and transportation and food sectors on the environment and climate should be reduced.

Positive discrimination and incentives should be provided for environmentally friendly companies, especially institutions that reduce the current deficit by providing renewable energy production and protect nature.

In order to implement the sustainable investment that will be needed in the coming period for the transition to a circular economy, to achieve the 2050 targets on environmental protection and for the harmonization process of the environmental sector, the renewable energy to be provided by green energy companies, the surpluses to be obtained by reducing the current account deficit due to energy, the contributions to be obtained from mass investors by including them in environmentally friendly companies and the resources to be provided by recycling should be realized urgently.

The principle of reusing waste materials as much as possible, and recycling them if they cannot be reused, should be followed. Potential resource areas such as wind, sun, water, air and energy production station points should be determined and possible risk management should be designed. Integrated basin management should be taken into account in utilizing water and soil resources and River Basin Protection Action Plans should be completed and implemented.

Civil protection systems should be developed and expanded in terms of being prepared for human and natural disasters and preventing disasters and reducing their damages.

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Data on climate change in basins should be strengthened and priority should be given to the design of sustainable economic and environmental policies suitable for the region based on data. Incentive policies that will protect and increase the competitiveness of producers should be given priority in plans for climate and environmental protection.

Uninterrupted, clean and local energy should be provided to all households and producers. The transition to renewable energy sources should be ensured and incentives and investments should be provided in this regard. Eco-designed systems that will increase energy efficiency should be established.

A more efficient and cyclical system should be created where waste energy is collected and reused. A cleaner fuel system should be created for sectors where electrical energy is more difficult to use, such as heavy industry or transportation.

A transition from coal, liquid fuels and natural gas to electricity and low rates of green hydrogen should be ensured for heating.

Soil, water and air sampling should be carried out and businesses should be encouraged to produce clean energy with the lowest tolerance level. Sustainable land management practices that will ensure the protection of soil and water should be implemented. Agricultural supports should be reshaped to include intensive/protective/restorative agriculture techniques.

A fair, healthy and environmentally friendly food sector should be built for food security and a direct farm-to-table system should be established.

In order for sectors to create less waste, tools such as life cycle analyses and green labels should be widespread. Organized industrial zones should be moved away from productive agricultural lands and river basins and these lands should be transformed into integrated agricultural organized agricultural enterprises.

Reuse and recyclability of all waste should be ensured for zero waste. Designs should be implemented in such a way that rainwater is retained, absorbed and reused where it falls through sustainable urban drainage systems, which are a fundamental part of green infrastructure.

The eco-design directive should be expanded to include products other than energy products and sustainable/eco design awareness should be developed.

A comprehensive Nature Restoration Plan should be prepared to restore ecosystems in poor condition and reduce pressures on biodiversity. Thus, with the Nature Restoration Plan, which will be one of the fundamental elements of the biodiversity strategy in the study area with damaged ecosystems, the extinction of many land and sea species and habitats will be reversed and brought back to a healthy state. Protection statuses and areas should be expanded.

Work should be initiated to stop the decrease in the population of birds, insects and pollinating creatures in agricultural lands and to reverse this situation.

A long-term “Water Management Strategy Plan” should be created for possible water pressure and scarcity. Infrastructure services such as cadastral operations, land consolidation, irrigation and in-field development should be implemented with effective and appropriate engineering applications.

GIS and UA based modeling should be developed in soil reclamation, erosion control and drainage management. Healthy and abundant products should be obtained by making inspections and planning with the producer at every stage of production without harming natural resources by switching from traditional extensive agriculture to intensive agriculture.

Zero Waste agricultural land project should be implemented. Modern agricultural techniques should be used, smart agricultural applications should be expanded, and a transition to Agriculture 4.0 should be ensured. A sustainable food chain should be built in the production, distribution and consumption cycle.

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Drip irrigation system should be used in many areas, and precautions should be taken regarding wild irrigation in agricultural lands. Agricultural production should be saved from the pressure of natural processes. Systems should be developed to ensure that wastewater from showers, sinks, bathtubs and kitchens, called gray water, can be used in toilet tanks and cleaning with recycling systems, and this application should be made mandatory in new buildings.

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Systems should be developed to provide hot water needs of buildings with solar collectors. Railway transportation should be expanded, a smart Railway Transportation Network with high-speed connections should be developed and infrastructure works should be carried out in this direction.

Infertile forests should be made productive with a sustainable forest management approach within the ecological balance.

Public awareness should be raised for civil environmental initiatives.

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