



Co-funded by
the European Union



CASE STUDY

Integrated Micro-Watershed Rehabilitation Projects (Turkey)



Project full title: Enhancing Technical and Vocational Skills for Implementing Nature-Based Solutions (NbS) to Combat Land Degradation

Project acronym: NbS4LD

Project number: 2025-1-TR01-KA220-VET-000357096

Project activity: WP2 Developing Educational Resources on NbS for Combating Land Degradation

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union

1. INTRODUCTION

This case study has been analysed by [The General Directorate of Combating Desertification and Erosion \(GDCDE\)](#), the lead organization of NBS4LD project. GDCDE is a Turkish central organization, operating under the Ministry of Environment, Urbanization and Climate Change. GDCDE carry out wide range of actions at national level in order to combat desertification, land degradation, erosion as well mitigate the consequences of natural disasters such as flood and landslides. GDCDE is also a national focal point organization to United Nations Convention to Combat Desertification (UNCCD), one of the internationally recognized environmental convention. GDCDE, in close cooperation with relevant institutions, fulfill the national and international obligations within the framework of the strategy and action plan to combat desertification for the period of 2024-2030. Over dacede, GDCDE has realized hundreds of projects aiming to combat desertification, land degradation and mitigate the natural disasters such as floods and landslides. Furthermore, GDCDE has very close cooperation with UNCCD, particularly under the Land Degradation Neutrality Target Setting Programme (LDN TSP). Türkiye is one of the advanced country in the progress of LDN TSP and sharing its expertise and experiences with other countries.

The Çameli Micro-Watershed Rehabilitation Project (2017–2021) restored a highly degraded 28,216 ha watershed in Denizli Province, Turkey, where severe erosion, deforestation, overgrazing, and uncontrolled runoff threatened ecosystems and local livelihoods. The intervention combined nature-based land restoration with livelihood support through an integrated watershed management approach. Key measures included the construction of gabion check dams and dry-stone structures to reduce runoff and trap sediment, the establishment of shrub-supported and brushwood terraces to stabilize slopes, and the rehabilitation and afforestation of degraded forest and pasture lands. These actions improved vegetation cover, reduced soil erosion and flood risk, enhanced water retention, and increased carbon sequestration.

To strengthen local resilience, the project also supported greenhouse cultivation, beekeeping, livestock production, irrigation infrastructure, solar heating systems, and home insulation improvements. Participatory planning processes involving local communities, including women's groups, ensured strong local ownership and informed decision-making. Benefiting 2,280 households across eight neighborhoods, the project delivered environmental restoration alongside improved incomes and living conditions. It also strengthened institutional coordination by integrating forestry, agriculture, water, pasture, and rural development activities under a single micro-watershed framework. The intervention demonstrates how combining ecosystem restoration with socio-economic development can effectively combat land degradation while creating sustainable and resilient rural landscapes.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union



[Before the intervention severe erosion had removed most of the topsoil, leaving the hillside bare, unstable, and highly vulnerable to further land degradation - Source: GDCDE]



[After the intervention contour terraces and vegetation measures reduced erosion, stabilized the slope, and supported vegetation recovery and soil regeneration - Source:GDCDE]

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.

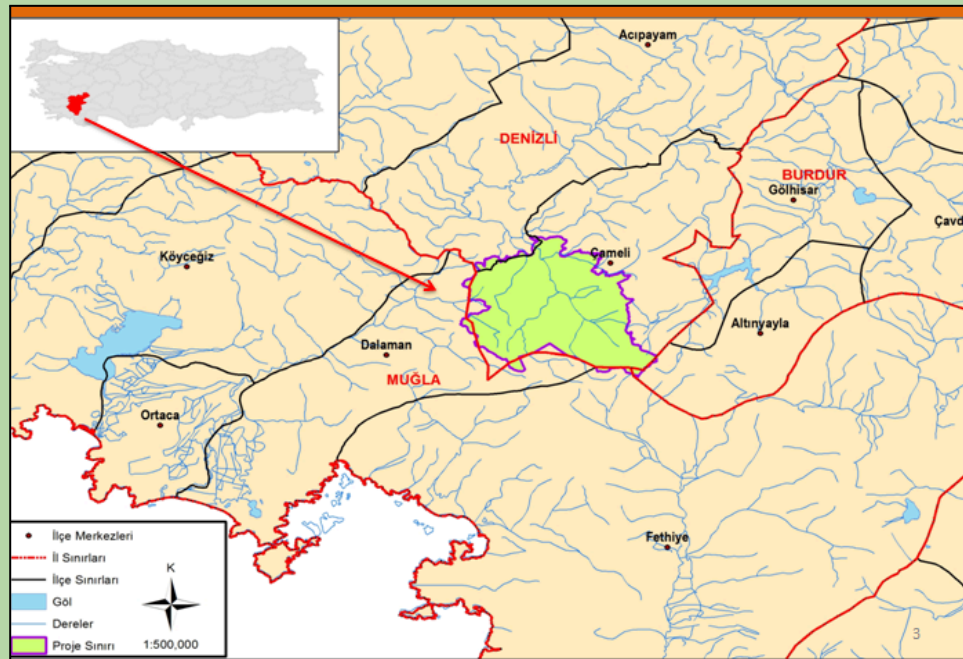


Co-funded by
the European Union

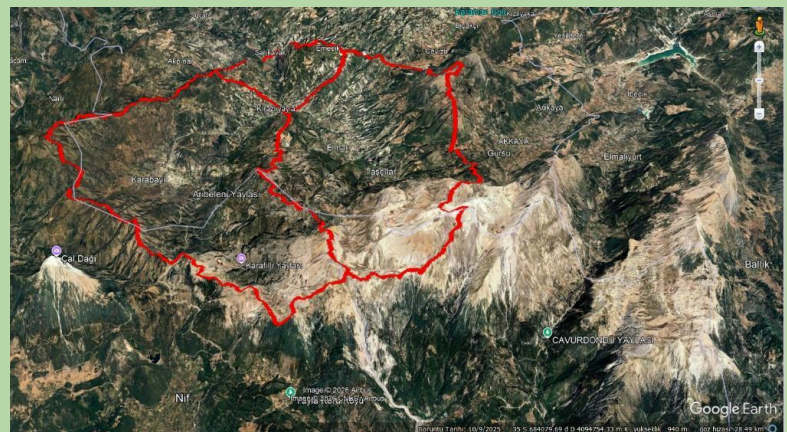
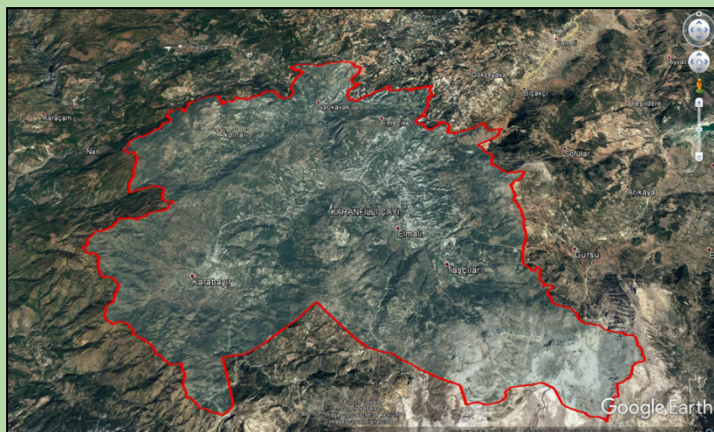
2. CONTEXT

2.1 LOCATION

Country: Turkey Region: Western Mediterranean Basin. Province: Denizli Province. Site: Çameli District. Approximate GPS coordinates: Latitude 37.09° N - Longitude 29.35° E.



[Çameli District of Denizli Province - Source: GDCDE]



[Project area - Source: Google Earth]

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union

2.3 LANDSCAPE TYPE

Forests. Grasslands.

2.4 LAND DEGRADATION CHALLENGE

Deforestation. Desertification. Poor land management. Population pressure on land.

2.5 BASELINE DATA

Land condition	• Site: sloping lands within a 28,216 ha micro-watershed exposed to intense surface runoff and gully formation. • Soil: shallow, erosion-prone soils with low organic matter due to continuous soil loss and uncontrolled grazing. • Vegetation cover: widespread degraded forest areas, weak natural cover development zones, and overgrazed pastures. • Erosion status: severe gully erosion and surface erosion causing sediment transport into streams and damaging trout production facilities.
Environmental context	• Climate: the project area is located in the transition zone between the Mediterranean and continental climate regimes. Annual precipitation is high (approx. 700–900 mm) and occurs mostly as short-duration, high-intensity rainfall events, especially in spring and autumn. These storm-type precipitations generate rapid surface runoff on sloping terrain and significantly increase erosion and flood risk. • Hydrology: the micro-watershed is characterized by steep slopes, short flow concentration time, and ephemeral stream behavior. Due to low infiltration capacity of shallow soils and degraded vegetation cover, rainfall rapidly converts into surface flow, leading to gully formation and sediment transport into Karanfilli Stream. Seasonal peak flows have historically caused flood damage to downstream trout production facilities. • Biodiversity: the natural vegetation structure has been severely degraded due to overgrazing, fuelwood collection, and past land use pressure. Degraded forest stands, weak natural regeneration zones, and overgrazed pastures dominate the landscape. Loss of vegetation cover has disrupted habitat continuity and reduced ecosystem resilience. • Ecological pressures: uncontrolled grazing, fragmented land management practices, deforestation, and the absence of integrated watershed planning have accelerated land degradation processes. These pressures weakened natural water retention capacity, increased sediment yield, and

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union

	reduced the ecosystem's ability to regulate floods and erosion.
Socioeconomic context	• Population density: 8 neighborhoods, 2,280 households, population of 5,639 people. • Livelihoods: livestock breeding, greenhouse cultivation, beekeeping, trout production. • Land management: fragmented, sector-based management without integrated watershed perspective. • Resource dependency: high dependency on soil, water, pasture, and forest resources for livelihoods.
Policy and governance	• Institutional framework: before the project, forestry, agriculture, pasture, and water management activities were carried out independently without ecosystem-based coordination.

3. INTERVENTION

3.1 TIMEFRAME

Project design: 2016. Implementation: 2017–2021.

3.2 TYPE OF INTERVENTION

Afforestation. Gabion (wire mesh) check dams for sediment retention and flow regulation. Shrub-supported terraces. Brushwood bundle/woven fence terraces.

3.3 IMPEMETING ORGANISATIONS

Involved Organizations: Çameli District Governorship; Çameli Municipality; Denizli Regional Directorate of Forestry; Beekeepers' Association; District Directorate of Agriculture and Forestry; Agriculture and Rural Development Support Institution (Provincial Coordination of Denizli); State Hydraulic Works (DSİ) 21st Regional Directorate.

Lead implementing organizations: Denizli Regional Directorate of Forestry and Çameli Municipality.

3.4 FUNDING SOURCES

The construction of the project was carried out using the internal resources of the General Directorate of Environmental Protection; the implementation was carried out using the internal resources of the relevant implementing units.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union

3.5 IMPLEMENTATION ACTIONS AND MEASURES

The project was implemented between 2017 and 2021 through an integrated package of watershed rehabilitation, erosion control, livelihood improvement, and rural welfare measures.

- Flood control measures:
 - Construction of galvanized wire mesh check dams (gabion check dams) across small stream channels and runoff pathways.
 - Installation of drywall thresholds to stabilize channels and reduce erosion.
 - These structures slowed water flow, trapped sediment, reduced gully formation, and improved watershed stability.



[Galvanized wire mesh check dam (gabion threshold) constructed across a small stream channel to slow water flow, trap sediment, and prevent gully erosion. This nature-based watershed rehabilitation measure helps stabilize channels and reduce land degradation - Source: local units of the project]

- Erosion control and soil conservation measures:
 - Establishment of shrub-supported terraces on vulnerable slopes.
 - Construction of woven fence (brushwood bundle) terraces using locally available vegetation materials.
 - These nature-based solutions reduced surface runoff, retained soil moisture, trapped sediment, and prevented slope degradation and gully erosion.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union



[Erosion control and soil conservations works - Source: local units of the project]

- Afforestation and land rehabilitation:
 - Rehabilitation of degraded forest and rangeland areas.
 - Afforestation using both native and income-generating tree species.
 - Improvement of vegetation cover to enhance soil protection, biodiversity, and watershed resilience.



[Shrub-supported (brushwood bundle) terrace constructed on a hillside to reduce surface runoff, trap sediment, and prevent soil erosion. This low-cost, nature-based measure helps stabilize slopes and improve watershed resilience - Source: local units of the project]

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union

- Income-Generating activities:
 - Support for greenhouse cultivation, enabling year-round vegetable production (e.g., tomatoes and cucumbers) and increasing household income stability.
 - Support for beekeeping activities, creating supplementary income opportunities and enhancing pollination services.
 - Support for livestock breeding, aimed at improving forage productivity, reducing grazing pressure, and increasing rural livelihoods.



[Greenhouse supporting (tomato and cucumber green-houses) in 2018 - Source: local units]

- Welfare-Enhancing activities:
 - Installation of solar energy-based heating systems to reduce dependence on fuelwood and lower household energy costs.
 - Implementation of household insulation improvements to increase energy efficiency and reduce winter heating expenses.



[House before and after the implementation of isolation - Source: local units]

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union

- Small-scale irrigation infrastructure:
 - Construction and improvement of irrigation water network systems.
 - Enhanced reliability and accessibility of irrigation water for agricultural production.

4. IMPACT

4.1 ENVIRONMENTAL IMPACT

☒ Improved soil health or reduced soil erosion. ☒ Increased vegetation cover or habitat restoration. ☒ Reduced land degradation. ☒ Increased carbon sequestration or storage.

The activities carried out have contributed to increasing carbon sequestration in the ecosystem. The rehabilitation of degraded forest areas has supported forestation. In natural cover development areas, vegetation cover has significantly increased, thereby reducing erosion and soil loss. In addition, forage yield in pasturelands has been enhanced, and overgrazing has been reduced.

4.2 COMMUNITY IMPACT

☒ Increased household income. ☒ Job creation or new livelihood opportunities. ☒ Improved food security. ☒ Strengthened community resilience. ☒ Increased local capacity or skills. ☒ Improved gender equality.

Integrated micro-watershed rehabilitation activities have created direct and indirect socioeconomic impacts on 2,280 households and a population of 5,639 across 8 neighborhoods. Of the total implementation budget, 55% was allocated to income-generating activities and 35% to welfare-enhancing activities.

In 8 neighborhoods, Ask-Track-Solve/ Rapid Rural Appraisal meetings were held with the participation of 342 people. Women-focused group meetings were conducted, and their requests were incorporated into the project. This process transformed participation from a consultative level into a joint decision-making mechanism.

4.3 INSTITUTIONAL IMPACT

☒ Strengthened institutional coordination. ☒ Increased community participation in decision-making. ☒ Capacity building for institutions or communities.

The integrated micro-watershed rehabilitation process has produced not only ecological and economic outcomes but also significant institutional transformations within a multi-stakeholder governance structure. The basin-based integrated planning approach has been institutionalized

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union

at the local level. For the first time in the region, forestry, agriculture, pasture, water, and rural development activities were integrated under a single micro-watershed plan. Rehabilitation, income-enhancing, and social support components were implemented within the same project framework. This represents a shift from sectoral interventions to ecosystem-based planning.

4.4 SUSTAINABILITY OF THE RESULTS

☑ Strong local community ownership. ☑ Institutional support or partnerships, ☑ Local technical capacity for maintenance, ☑ Monitoring and adaptive management systems.

In the project, by allocating approximately 90% of the total budget to income-generating, welfare-enhancing, and educational activities, the aim was not only to achieve a lasting increase in household incomes but also to integrate socio-cultural activities into the sustainability mechanism.

5. CONCLUSION

- **Community relevance:** mostly.

The intervention addressed key local challenges including soil erosion, flood risk, land degradation, low agricultural productivity, and rural livelihood constraints. A participatory approach was adopted, involving public institutions, local authorities, and community stakeholders throughout the planning and implementation process, ensuring that project activities responded to local needs and priorities.

- **Technical effectiveness:** mostly

The project effectively combined afforestation, flood and erosion control measures, irrigation improvements, and livelihood-support activities. By addressing soil, water, vegetation, and biodiversity interactions simultaneously, it promoted ecosystem restoration, reduced land degradation, improved watershed functions, and strengthened long-term ecosystem resilience.

- **Economic efficiency:** mostly.

The intervention combined environmental rehabilitation with economic development objectives. Income-generating activities such as greenhouse cultivation, beekeeping, and livestock support contributed to household livelihoods, while erosion and flood control measures helped reduce future environmental and economic losses, enhancing overall cost-effectiveness.

- **Institutional support:** partially.

The project benefited from the participation of multiple institutions and regular stakeholder consultations. However, no centralized governance mechanism was established. Each participating organization remained responsible for implementing and

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.



Co-funded by
the European Union

managing activities within its own mandate, resulting in a decentralized coordination structure.

- **Innovation:** mostly.

The project applied an integrated micro-watershed management approach rather than traditional sector-based interventions. By combining ecosystem restoration, water management, climate-sensitive planning, and rural development objectives within a single framework, it introduced a holistic and adaptable Nature-based Solutions approach.

- **Replication & Scaling Potential:** mostly

The implemented measures are based on Nature-based Solutions principles and rely on proven, locally adaptable techniques such as afforestation, erosion control structures, water management interventions, and livelihood support activities. These approaches can be readily adapted, scaled, and replicated in other watersheds with similar environmental and socio-economic conditions.



Co-funded by
the European Union

6. BIBLIOGRAPHY

- General Directorate of Forestry (OGM). Karanfilli Stream Micro-Watershed Rehabilitation Project – Project reports, intervention photographs, location maps, and implementation documentation. Internal archive of the implementing unit.
- General Directorate of Forestry (OGM). Forest Villager Support and Rural Development Activities. Institutional information on livelihood support measures, greenhouse cultivation, beekeeping, and rural welfare improvements. [Link](#).
- General Directorate of Forestry (OGM). Official institutional website. Information on watershed rehabilitation, afforestation, erosion control, and forestry activities in Türkiye. [Link](#).
- General Directorate of Combating Desertification and Erosion (ÇEM). Model Projects for Combating Desertification and Erosion. Technical information on watershed rehabilitation and land restoration projects. [Link](#).
- General Directorate of Combating Desertification and Erosion (ÇEM). Afforestation and Erosion Control Measures to be Implemented in Watersheds. Technical guidance document supporting watershed restoration and erosion control interventions. [Link](#).
- General Directorate of Forestry (OGM). Upper Basin Flood Control Action Plan (2024–2028). Technical guidance on flood control structures, watershed management, and erosion control measures. [Link](#):

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Union Education and Youth Programmes Centre Presidency (Turkish National Agency). Neither the European Union nor the granting authority can be held responsible for them.