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CASE STUDY

İlüh Stream Rehabilitation Programme: Urban Flood-Risk Reduction and Green Infrastructure Development (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

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1. INTRODUCTION

This case study has been analysed by [Ankara Intercultural Research Association \(AKAD\)](#). The organisation was established on February 18, 2021, in Ankara to enhance and develop civil society activities and conduct research for intercultural interaction. It was founded by seven individuals, including architects, engineers, dietitians, academics. The association has a total of 16 members, including five board members and three audit board members.

The İluh Stream Rehabilitation Programme in Batman, Türkiye, integrates two complementary interventions: the İluh Boulevard Urban Transformation (Phase I, completed in 2025) and the İluh By-Pass / Green Line Watershed Diversion Project under the DSİ investment programme. Together, they transform a degraded and flood-prone urban stream into a resilient green-blue infrastructure corridor. The programme combines urban ecological restoration, flood-risk reduction, and social improvement by restoring stream functions, creating public green spaces, reducing exposure in vulnerable neighbourhoods, and improving water management at catchment scale. Through nature-based solutions, the project addresses environmental degradation, informal development pressures, and recurrent flooding. Its multi-level governance model—linking Municipality, Governorship, DSİ, national authorities, and TPAO—provides a transferable approach for medium-sized cities facing climate risks, rapid urbanisation, and degraded waterways. Embedded in the Mavi Yeşil Batman (Blue-Green Batman) vision, the programme demonstrates how a single urban corridor can become a catalyst for wider ecological and climate-resilient transformation.

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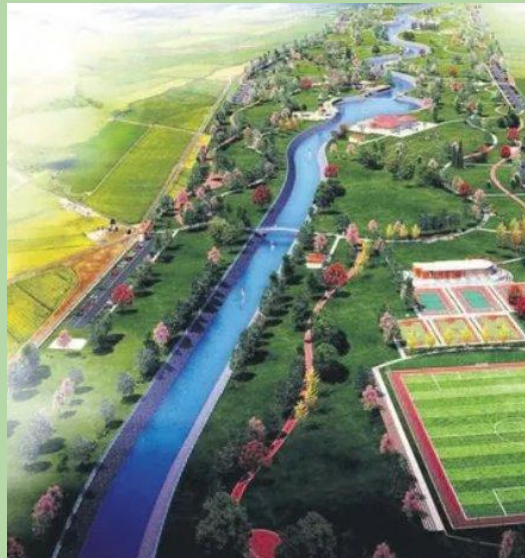
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[Iluh Stream before the intervention: degraded concrete channel with pollution, illegal encroachment, sealed banks, and solid-waste accumulation - Source: Batman Provincial Special Administration]



[Completed boulevard reach (2025): continuous water flow, arched-style railings, and integrated children's play area along the rehabilitated channel - Source: Batman Provincial Special Administration]



[Vision rendering of the rehabilitated Iluh Stream corridor under the "Blue-Green Batman" master plan, integrating riparian planting and public space - Source: Batman Provincial Special Administration]

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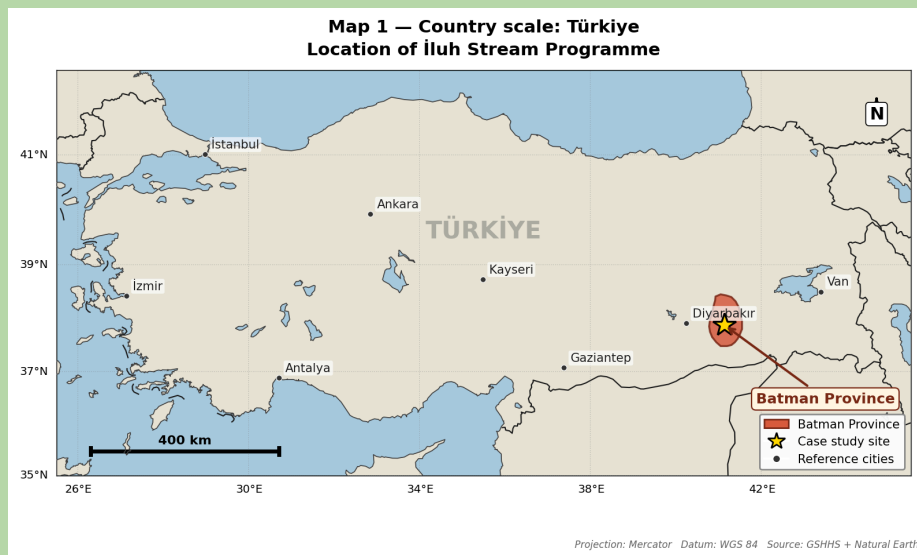


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2. CONTEXT

2.1 LOCATION

Country: Türkiye. Region: Southeastern Anatolia Region. Province: Batman Province. Site: İluh Stream corridor within the city of Batman, extending through the urban centre from east to west for approximately 6.5 km within the municipal boundary and crossing 12 neighbourhoods before joining the Batman River. The intervention area focuses on the rehabilitated boulevard reach of the stream within the city centre. Approximate GPS coordinates: Latitude 37.880° N – Longitude 41.130° E.

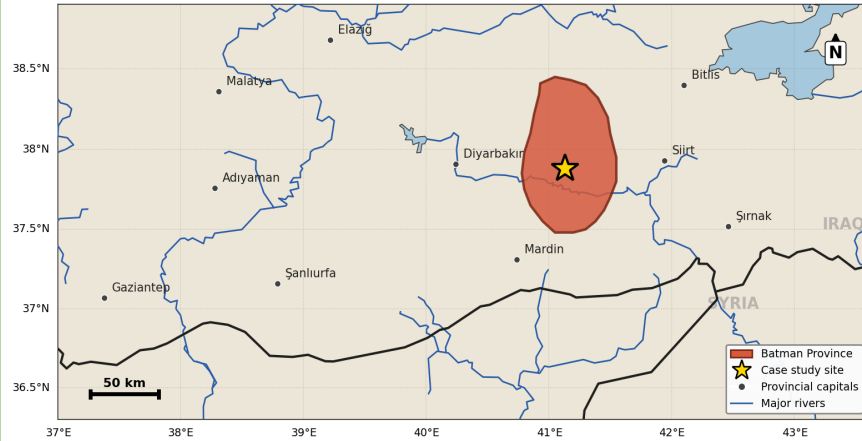


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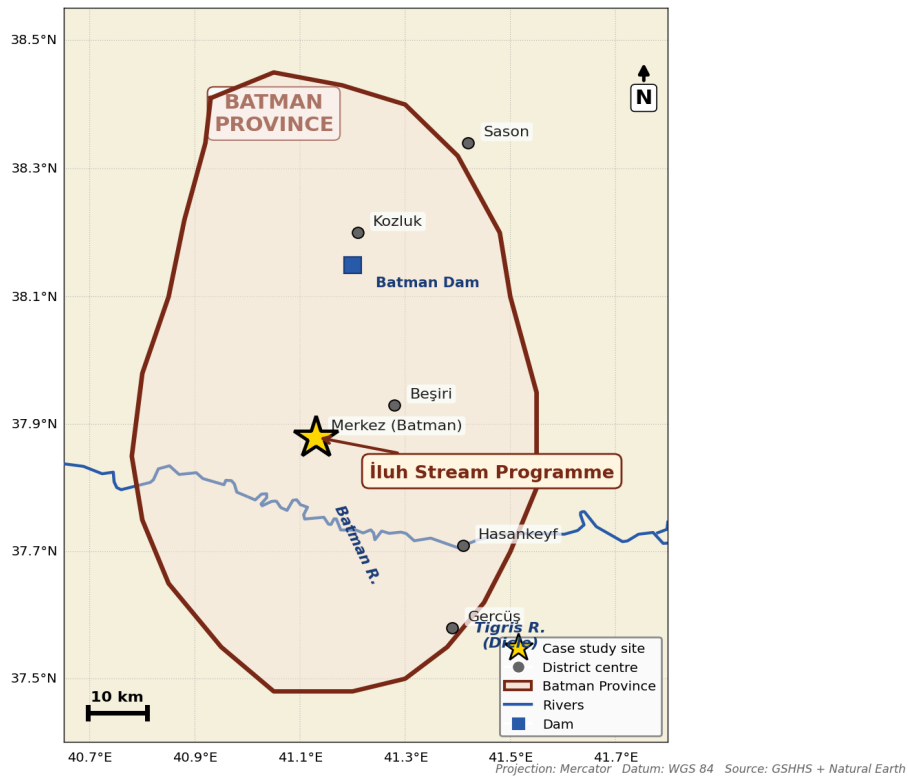
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Map 2 — Regional scale: Southeastern Anatolia
Location of İluh Stream Programme within the regional context



Projection: Mercator Datum: WGS 84 Source: GSHHS + Natural Earth

Map 3 — Provincial scale: Batman Province
Location of İluh Stream Programme within the province

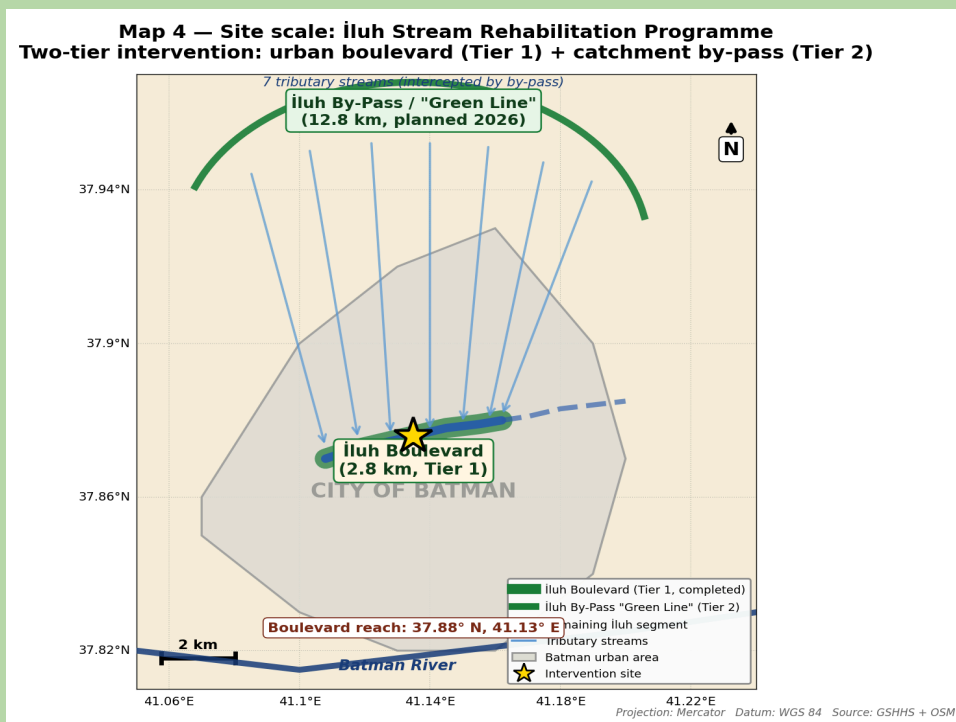


Projection: Mercator Datum: WGS 84 Source: GSHHS + Natural Earth

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2.3 LANDSCAPE TYPE

Urban watercourse / urban stream corridor. Disaster-prone urban land.

2.4 LAND DEGRADATION CHALLENGE

Soil erosion. Vegetation degradation. Poor land management. Climate change vulnerability.

2.5 BASELINE DATA

Land condition	- Site: urban corridor of the İluh Stream within the city centre of Batman, extending through 12 neighbourhoods before discharging into the Batman River. Prior to rehabilitation, the stream channel was heavily encroached upon by unauthorised development and had lost much of its natural form and function. - Soil: predominantly sealed and compacted urban soils with limited infiltration capacity due to extensive built development along the stream corridor. - Vegetation cover: very sparse. Riparian vegetation had largely disappeared as a result of channelisation, urban encroachment, and pollution.
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	• Erosion status: severe channel degradation and bank instability caused by prolonged encroachment, channel narrowing, inadequate hydraulic capacity, and recurrent flood events.
Environmental context	• Climate: continental semi-arid climate, with average annual precipitation of approximately 450–500 mm, mainly concentrated in autumn and spring. Climate change has increased the frequency and intensity of short-duration storm events. • Hydrology: Batman is located in a topographic depression surrounded on three sides by mountains. Runoff from the Western Raman Mountains drains rapidly through seven tributary streams that historically converged into the İluh Stream before flowing into the Batman River. The stream corridor has been highly susceptible to flash flooding. • Biodiversity: the urbanised stream corridor exhibited very low biodiversity, with most riparian habitats and ecological functions severely degraded or lost. • Ecological pressures: wastewater discharge, hydrocarbon pollution associated with the petroleum industry, unauthorised construction within the floodplain, channel encroachment, and extensive surface sealing.
Socioeconomic context	• Population: the project area passes through 12 of Batman's 43 neighbourhoods, including several densely populated and socio-economically disadvantaged districts. Batman has an estimated population of approximately 654,000 inhabitants. • Livelihoods: urban service activities, petroleum-related industries, small-scale commerce, and public-sector employment constitute the main sources of income. • Land management: land use within the corridor was characterised by widespread informal and unauthorised construction; approximately 80% of the surrounding building stock lacked formal permits. • Resource dependency: local communities depended on the corridor for urban connectivity but lacked access to safe public open spaces. Residents were highly exposed to recurrent flooding, pollution, and associated health and safety risks.
Policy and governance	• Institutional framework: the İluh Stream corridor was designated a disaster-prone area in 2008, but implementation was delayed for nearly 15 years due to fragmented responsibilities among the Batman Municipality, Batman Governorship, TOKİ (Housing Development Administration), the Ministry of Environment, Urbanisation and Climate Change, DSİ (State Hydraulic Works), and TPAO (Turkish Petroleum Corporation). Major flood disasters in 2006 and 2023 provided

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	the political impetus for coordinated rehabilitation and flood-risk reduction measures.
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3. INTERVENTION

3.1 TIMEFRAME

Disaster trigger: 2006 (11 fatalities) and 2023 (4 fatalities). "Disaster-prone area" designation: 2008 (Council of Ministers Decree). First demolitions: 18 March 2022. Boulevard launch event: March 2025. Construction: 20 November 2024 – September 2025 (~10 months). Boulevard opening: 28 September 2025. Catchment-scale by-pass: 2026 DSI investment programme.

3.2 TYPE OF INTERVENTION

Urban green infrastructure. Flood-risk reduction through ecological engineering (channel restoration, peripheral diversion). Integrated green-blue infrastructure combining: urban transformation with green corridor creation along the rehabilitated stream, and (catchment-scale stormwater diversion to remove disaster pressure from the urban core.

3.3 IMPLEMENTING ORGANISATIONS

The programme has a complex multi-level governance architecture. Batman Municipality (Belediye) is the lead implementer of the İluh Boulevard urban transformation, responsible for expropriation, demolition, construction, and operation of the new green-blue corridor. Batman Governorship provides strategic coordination (Governor Ekrem Canalp, also serving as Mayoral Deputy), inter-institutional alignment, and political sponsorship. State Hydraulic Works (DSİ) is the technical authority for the 12.8 km İluh By-Pass watershed diversion, included in the 2026 national investment programme. The Ministry of Environment, Urbanisation and Climate Change provides financial support and the regulatory framework for the urban transformation component. The Ministry of Treasury and Finance provides central fiscal support (Minister Şimşek officiated the September 2025 opening). TPAO (Turkish Petroleum Corporation) entered into a protocol with the Municipality to retract its 2.5 km perimeter wall by 20 m, releasing the land that enabled the boulevard alignment.

3.4 FUNDING SOURCES

The Phase I urban transformation was financed by Batman Municipality with central-government support from the Ministry of Environment, Urbanisation and Climate Change. The TPAO land release was secured through inter-agency protocol rather than direct purchase, substantially reducing land acquisition costs. The 12.8 km İluh By-Pass diversion is financed through DSİ's national hydraulic-works investment budget under the 2026 investment programme. Operations and maintenance are carried out by Batman Municipality (urban corridor) and DSİ (peripheral diversion infrastructure).

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3.5 IMPLEMENTATION ACTIONS AND MEASURES

- 1) 31 October 2006 — Catastrophic İluh Stream flood: 11 fatalities (8 children, 3 adults), approximately 3,000 housing units rendered uninhabitable, ~100,000 people affected (about one-third of Batman's then population). Initiates the long-term rehabilitation agenda.
- 2) 2008 — Council of Ministers declares the corridor a "disaster-prone area"; first-stage protective concrete barriers installed.
- 3) 2018–2022 — Successive municipal initiatives prepare the demolition, expropriation, and urban-design framework for the first-phase intervention.
- 4) 18 March 2022 — First demolitions on a 35-decare pilot zone along the stream (81 structures planned, 22 negotiated and demolished in the first wave).
- 5) 19 November 2023 — Second major flood event: 4 fatalities from a single family, hospital basement flooded with a 3-hour service interruption, severe damage city-wide. Reaffirms the urgency of catchment-scale measures.
- 6) March 2025 — Official launch event for the İluh Boulevard, Bridges and Landscape Works; demolition of the TPAO perimeter wall begins.
- 7) 20 November 2024 – September 2025 — Construction of the 2.8 km İluh Boulevard, including 34 decares (3.4 ha) of green/landscape area, 15 decares (1.5 ha) of park, two new bridges, a public square, a clock tower, a mosque, an arched (kemerli) lighting system, riverside railings, and continuous in-channel water flow with micro-cascades.
- 8) 28 September 2025 — Official opening of İluh Boulevard by Minister of Treasury and Finance Mehmet Şimşek, Governor Ekrem Canalp, and MP Ferhat Nasıroğlu.
- 9) October 2025 — Phase II preparation begins: corridor between DDY Railway Bridge and the historic İluh Bridge; approximately 50 additional structures planned for demolition.
- 10) Q1 2026 — DSI formally incorporates the 12.8 km "Batman – Merkez İluh 2. Kısım" by-pass project into its 2026 investment programme; reports approved.
- 11) 2026 onwards — Implementation of the by-pass and accompanying Çay Stream and Avşo Stream flood-prevention works; integration with the broader "Blue-Green Batman" master programme.

4. IMPACT

4.1 ENVIRONMENTAL IMPACT

☑ Improved soil health (de-sealing, riparian recovery). ☑ Increased vegetation cover. ☑ Improved biodiversity. ☑ Reduced land degradation. ☑ Improved water quality. ☑ Improved ecosystem services.

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The programme converts a previously sealed, polluted, and structurally degraded urban watercourse into a functioning green-blue corridor. The 100-decare area formerly occupied by informal construction is being progressively transformed into a landscape of riparian vegetation, public green space, and continuously flowing water, restoring ecological processes and at least part of the stream's natural channel functions. Approximately 3.4 hectares of new green space and 1.5 hectares of parkland are being created, complemented by riparian planting along 2.8 km of the stream corridor. These interventions promote soil recovery through de-sealing, increase vegetation cover, and provide suitable conditions for the re-establishment of riparian habitats and urban biodiversity.

The peripheral flood-diversion system will further restore hydrological functionality across a 4,830-hectare urban catchment, reducing peak flood flows and the chronic disturbance regime that historically prevented ecological recovery. Channel rehabilitation and the removal of illegal encroachments are reversing decades of land degradation, restoring channel morphology and improving hydraulic performance. At the same time, the establishment of a continuous flow regime and the separation of stormwater from wastewater discharges are expected to improve water quality. Together, these interventions re-establish a baseline level of ecosystem services that had been almost entirely lost, including flood-risk regulation, urban cooling and microclimate moderation, improved water quality, enhanced biodiversity, soil restoration, recreational opportunities, and increased environmental quality for surrounding communities. The project therefore represents both an urban resilience strategy and a significant ecological restoration initiative within the rapidly growing city of Batman.

4.2 COMMUNITY IMPACT

☑ Strengthened community resilience. ☑ Improved quality of life. ☑ Increased local capacity.

The programme directly addresses one of the most acute environmental justice challenges in Batman: the disproportionate exposure of low-income households along the İluh Stream corridor to flood hazards, environmental degradation, and inadequate public space. By 2025, approximately **2.8 km of the corridor has been transformed into a safe, accessible green-blue public space**, serving several of the city's most socio-economically vulnerable neighbourhoods while eliminating the immediate housing risks that contributed to the fatal flood events of 2006 and 2023. The project has improved residents' quality of life through the creation of new green areas, pedestrian spaces, recreational amenities, and a safer urban environment.

Beyond physical improvements, the rehabilitation programme strengthens community resilience by significantly reducing disaster risk and enhancing the city's capacity to cope with increasingly intense rainfall events. The complementary peripheral diversion system, once completed, will provide flood protection across approximately **4,830 hectares of urban area**, safeguarding residential districts as well as commercial, healthcare, educational, and public-service facilities from recurrent flood disruption.

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The programme has also generated opportunities for local employment and skills development through construction, landscaping, and long-term maintenance activities, thereby contributing to increased local capacity for environmental management. Furthermore, the restoration of the İluh Stream as a visible and functional urban feature helps reconnect residents with a historically significant element of Batman's landscape, restoring the corridor's role as one of the city's defining geographic and cultural assets. Together, these outcomes deliver substantial social, environmental, and resilience benefits for both current and future generations.

4.3 INSTITUTIONAL IMPACT

☑ Strengthened institutional coordination across multiple levels. ☑ Establishment of new public-public partnerships. ☑ Integration into provincial and national planning frameworks. ☑ Capacity building for urban disaster-risk governance.

The programme established a functional coordination model after nearly two decades of fragmented action. The Municipality–TPAO protocol on the perimeter wall is a particularly innovative example of inter-institutional negotiation that unlocked previously unusable urban land. Inclusion of the 12.8 km by-pass in DSI's 2026 national programme aligns local intervention with national hydraulic-works strategy, embedding the work in long-term institutional commitments.

4.4 SUSTAINABILITY OF THE RESULTS

☑ Long-term funding mechanisms. ☑ Integration into urban planning frameworks. ☑ Institutional support and partnerships. ☑ Local technical capacity for maintenance. ☑ Adaptive management.

Long-term sustainability rests on five complementary pillars: (i) secure funding through DSI's national hydraulic-works programme, complemented by municipal operation and maintenance budgets; (ii) integration into the city's long-term planning framework, particularly the *Mavi Yeşil Batman* ("Blue-Green Batman") programme, which connects the İluh corridor to a wider urban green network and supports the expansion of public green space; (iii) strong institutional support through multi-level cooperation among DSI, Batman Municipality, the Governorship, TOKİ, the Ministry of Environment, Urbanisation and Climate Change, and other stakeholders; (iv) growing local technical capacity for the maintenance and management of green and hydraulic infrastructure; and (v) an adaptive management approach shaped by lessons learned from the 2006 and 2023 flood disasters, culminating in the catchment-scale redesign implemented in 2025–2026. Together, these factors embed the project within both long-term governance structures and urban development strategies, increasing its resilience and durability over time.

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5. CONCLUSION

- **Community relevance:** fully.

The intervention directly addressed a critical environmental justice issue in Batman by reducing recurrent flood risk, improving environmental conditions, and creating safe public space in some of the city's most vulnerable neighbourhoods. The removal of unauthorised structures from high-risk areas and the implementation of catchment-scale flood protection respond to longstanding community needs.

- **Technical effectiveness:** mostly.

The project has successfully restored ecological and hydraulic functions along 2.8 km of the İluh Stream corridor through channel rehabilitation, continuous water flow, riparian planting, and the creation of new green spaces. Full technical effectiveness will be achieved upon completion of the peripheral diversion system, which will further restore catchment-scale hydrological processes and flood regulation.

- **Economic efficiency:** mostly.

Although requiring substantial public investment, the intervention is considered cost-effective due to its long-term reduction of flood-related losses, combined environmental and social benefits, and high potential for replication. Innovative institutional agreements also reduced land acquisition and implementation costs.

- **Institutional support:** fully.

The project benefits from strong multi-level institutional support and coordination among national, regional, and local authorities. Collaboration between DSI, Batman Municipality, the Governorship, relevant ministries, and other public stakeholders has provided a stable governance framework and secured long-term implementation commitments.

- **Innovation:** fully.

The intervention introduces an innovative two-tier approach that combines urban stream restoration with catchment-scale flood management. The integration of green-blue infrastructure, stream rehabilitation, and a peripheral flood-diversion system represents an advanced and transferable model for urban resilience in semi-arid environments.

- **Replication & Scaling Potential:** fully.

The project offers strong potential for replication in other medium-sized cities facing urban stream degradation, flood risk, and informal development pressures. Its modular design allows stream restoration and catchment-scale flood management measures to be implemented independently or together, while the governance model provides a transferable framework for similar contexts.

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