

# A mine closure case study: Aidu oil shale open cast as a centre for future rowing champions after closure

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## Abstract

*The Aidu oil shale open cast mine in Estonia has transformed remarkably from an industrial extraction site into a world-class rowing channel. After closing the mining activities, extensive rehabilitation efforts reshaped the post-mining landscape into a sustainable water sports facility. The former mine site's unique geological and hydrological conditions enabled the creation of a long, deep, and calm water body, ideal for competitive rowing and recreational water activities. This case study explores the environmental, engineering, and socio-economic aspects of repurposing Aidu as a rowing venue, highlighting the challenges and opportunities of post-mining land use. The project demonstrates how industrial landscapes can be revitalised for ecological restoration and community development, contributing to regional tourism and economic diversification. Aidu's transformation sets a precedent for sustainable post-mining rehabilitation, balancing environmental recovery with new public and sports infrastructure.*

**Keywords:** open cast, mine closure, responsible social planning, rowing channel

## 1 Introduction

Mine closure is a critical phase in the lifecycle of a mining operation, carrying significant environmental, social, and economic implications. While traditionally focused on environmental risk mitigation and land rehabilitation, there is a growing recognition that closure can also serve as a catalyst for regional regeneration. Innovative post-mining land uses that align with local needs and values can transform former industrial sites into productive and culturally meaningful landscapes.

This paper presents a case study of Aidu's post-closure transformation, focusing on the process of converting the site into a competitive rowing and recreational facility. The study examines how environmental rehabilitation was integrated with infrastructure development, and how this repurposing effort contributed to ecological restoration, community identity, and regional economic diversification.

Estonia is known as oil shale mining country. Oil shale mining has a crucial meaning for Estonian economy. It has been main energy source for more than 100 years. The oil shale deposit is located in the northeastern part of Estonia (Figure 1) (Karu 2012). Aidu open cast mine is located on the west side on the mined oil shale mining area. The oil shale bed descends 3 m per kilometre towards the south (Figure 2) and the oil shale seam consists of interlayered limestone (Figure 3) which is a waste rock stored in waste rock heaps. Oil shale is mined using two methods: underground (room and pillar mining method) and from the surface (open cast mining method).

The Aidu oil shale open cast mine in northeastern Estonia presents a compelling example of this transformation. Operated from 1974 to 2012, Aidu was one of the largest surface mining sites in the region, leaving behind a deeply altered terrain upon closure. However, rather than returning the land to a natural or neutral state, local stakeholders envisioned a bold alternative – converting the post-mining voids into a world-class rowing venue.

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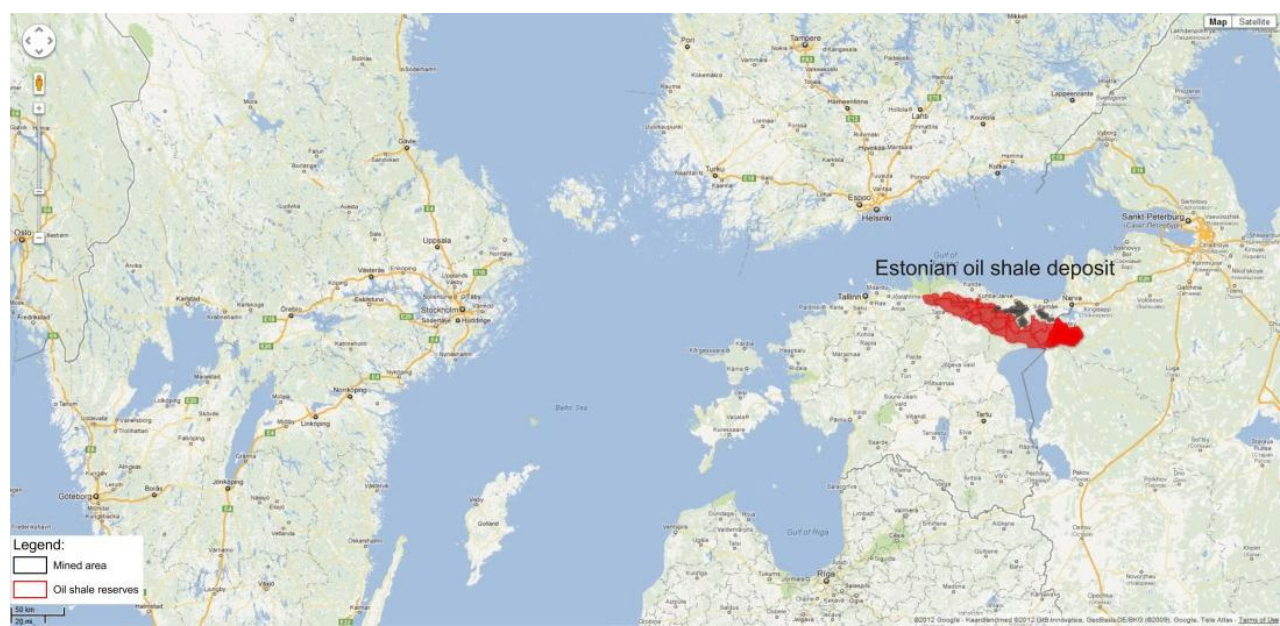


Figure 1 Location of Estonian oil shale deposit (Karu 2012; Google Maps 2011; Estonian Land Board 2011)

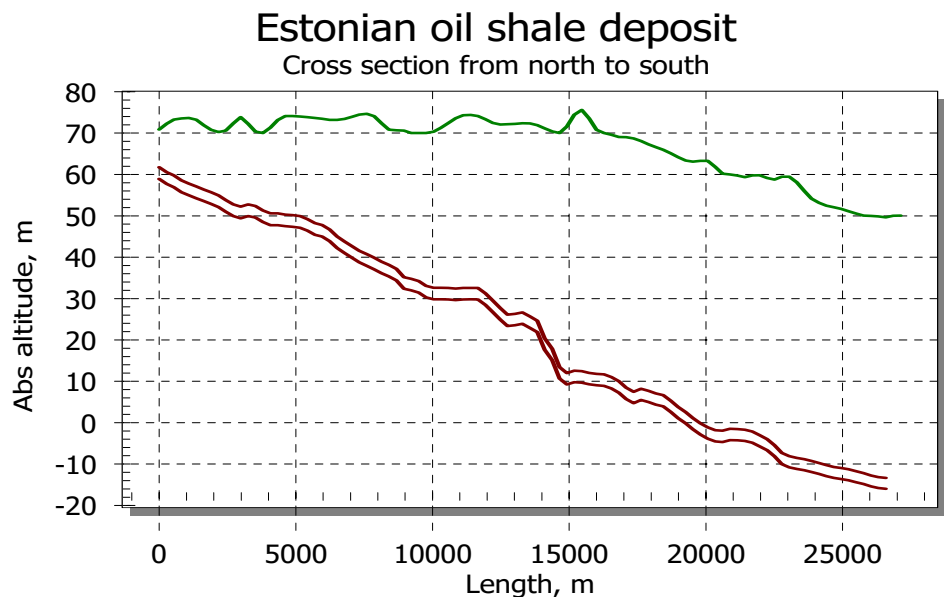


Figure 2 Cross-section of Estonian oil shale deposit (Karu 2012)

By exploring the challenges, strategies, and outcomes of the Aidu project, the paper contributes to the broader discourse on sustainable mine closure and land repurposing. The Aidu case demonstrates the potential for post-mining landscapes to support multifunctional futures that go beyond compliance and create enduring public value.

| Lithology                                                                          | Layer | Layer thickness, m | Height from layer A, m |
|------------------------------------------------------------------------------------|-------|--------------------|------------------------|
|  | F2    | 0.30               | 3.03                   |
|                                                                                    | F1    | 0.34               | 2.73                   |
|                                                                                    | E     | 0.59               | 2.39                   |
|                                                                                    | D/E   | 0.10               | 1.80                   |
|                                                                                    | D     | 0.07               | 1.70                   |
|                                                                                    | C/D   | 0.29               | 1.63                   |
|                                                                                    | C     | 0.45               | 1.34                   |
|                                                                                    | B/C   | 0.08               | 0.89                   |
|                                                                                    | B     | 0.37               | 0.81                   |
|                                                                                    | A/B   | 0.21               | 0.44                   |
|                                                                                    | A     | 0.23               | 0.23                   |

**Figure 3** Oil shale stratum (Karu 2012; Kattai et al. 2000)

## 2 Methodology

This study adopts a qualitative case study approach to examine the post-mining transformation of the Aidu oil shale open cast mine into a competitive rowing centre. The research combines multiple sources of data to explore environmental, engineering, and socio-economic dimensions of the project. Data was collected through document analysis, field observations, and media reviews.

Relevant project documentation, including mine closure plans, environmental assessments, and design reports, was analysed to understand the planning and rehabilitation processes. Site visits were carried out to observe the current conditions of the area, assess the physical transformation of the landscape, and document the infrastructure developed for rowing and recreation. In addition, publicly available sources such as news articles, promotional materials, and social media content were reviewed to capture broader public engagement and perception.

A thematic analysis was used to interpret the collected data, focusing on the interaction between environmental restoration, technical feasibility, and community development. This methodological approach allows for a holistic understanding of the Aidu case and supports the identification of lessons applicable to similar mine closure contexts.

### 3 Site history and closure planning

The Aidu oil shale open cast mine, located in northeastern Estonia, was part of the country's larger oil shale industry, which has historically played a central role in national energy production. Operations at Aidu began in 1974 and continued until closure in 2012 (Figure 4). During its active years, the mine employed large-scale surface mining methods that left behind a heavily altered landscape characterised by deep excavation voids, disrupted watercourses, and sparse vegetation. By the time mining ceased, the site covered approximately 30 km<sup>2</sup> and had significantly altered the local environment and hydrology. Total production of the Aidu open cast was 90 Mt oil shale.



**Figure 4 Mining operations at Aidu open cast. Photo by Peeter Lilleväli**

Following the cessation of mining, the site entered the mandatory closure and rehabilitation phase under Estonia's national mine closure framework, which emphasises environmental recovery and risk reduction. The initial closure plan focused on securing slopes, managing residual water flows, and re-vegetating disturbed areas. However, due to the site's scale and specific physical characteristics – particularly its depth and capacity for controlled water retention – the Aidu mine presented an opportunity for more ambitious post-closure land use planning.

A concept for transforming the former mine into a water sports centre emerged during the early closure phase. This idea aligned with regional development goals and aimed to shift the site's identity from a post-industrial scar to a recreational and tourism asset. Another case study from Kiviõli area (oil shale waste heap) gave the support that the tourism can be a viable strategy (Figure 5).





**Figure 5** Kiviõli Adventure Centre at the old oil shale waste heap location. Photo by Kiviõli Seikluskeskus (<https://seikluskeskus.ee>)

Rehabilitation efforts were thus redesigned to accommodate the requirements of a rowing course, including controlled flooding of mining voids, slope stabilisation, and landscape engineering to ensure safety and accessibility. Closure planning evolved into a multi-stakeholder process involving engineers, environmental consultants, and regional authorities. This shift marked a transition from traditional mine rehabilitation toward a multifunctional, community-oriented redevelopment model.

## 4 Transformation into a rowing centre

The transformation of the Aidu oil shale open cast mine into a rowing centre began as a visionary initiative aimed at repurposing the vast, water-filled excavation voids into a functional and attractive sports venue (Kruuse 2009). The concept was driven by the site's unique geological and hydrological features which made it especially suitable for water-based activities. The linear shape, depth, and sheltered nature of the former mine voids offered the potential to create long, calm stretches of water ideal for rowing competitions and training (Figure 6).



**Figure 6** Aidu rowing channel. Photo by Eesti Sõudeliit

The idea was first proposed by local sports advocates in collaboration with regional authorities in 2008, when it was clear that the mining operations at Aidu open cast mine will cease in near future. Early feasibility assessments confirmed the site's potential and a revised rehabilitation plan was developed to align environmental recovery with infrastructure development.

The design phase was informed by international rowing standards with the aim of making the venue suitable for high-level competition, including potential international events. The rowing channel was designed to meet FISA (world rowing) regulations, featuring a straight, 2-km-long course with consistent depth and minimal water current. In addition to the main course, auxiliary facilities such as training lanes, warm-up areas, and boat storage were integrated into the master plan (Figure 7).

Implementation was carried out in phases, starting with design of the rowing channel area, combined with hydrological engineering to control water levels and ensure water quality. Slope stabilisation and erosion control measures were put in place to secure the newly formed banks. Infrastructure development followed, including the construction of access roads to the site. The project also incorporated nature-based solutions to improve biodiversity and landscape aesthetics, such as planting native vegetation and creating buffer zones to separate recreational and ecological areas.

Throughout the transformation process, stakeholder engagement played a critical role. Local residents, sports associations, educational institutions, and environmental groups were consulted to ensure the project addressed both community needs and ecological considerations. Funding was secured through a mix of national development programs, EU structural funds, and local contributions.

The result is a multifunctional venue that serves not only as a rowing course but also as a public space for recreation, education, and tourism (Gaškov 2014). The Aidu Rowing Centre ([www.aidu.ee](http://www.aidu.ee)) stands as a symbol of post-industrial renewal, demonstrating how mine closure can lead to long-term regional benefits through strategic land repurposing.



**Figure 7** Aidu Rowing Centre development. Photo by Rainer Oras

## 5 Outcomes and impacts

The transformation of the Aidu oil shale open cast mine into a rowing centre has resulted in significant environmental, social, and economic outcomes. These impacts highlight the potential of innovative mine closure practices to contribute to regional development, ecological restoration, and community wellbeing. The transformation is still in progress and under development, but it's open for visiting and activities on site.

- Environmental outcomes have been substantial. The controlled flooding of the former mining area created a large, stable, freshwater body, which has supported the gradual recovery of local ecosystems. Revegetation efforts along the area have reintroduced native plant species, contributing to soil stabilisation and increased biodiversity.
- Social impacts include the revitalisation of community identity and the creation of new opportunities for public engagement with nature and sport. The rowing centre has become a focal point for local activities, offering regular training, competitions, and events. It has also attracted national interest, with elite rowing teams using the facility for seasonal training. The site's transformation has fostered local pride and contributed to a positive narrative around the region's post-mining future.
- Economic benefits have emerged through increased tourism, new employment opportunities, and enhanced regional visibility. Events hosted at Aidu, including regattas and cultural festivals, have brought visitors from across Estonia and beyond. Local businesses, such as accommodations, restaurants, and outdoor service providers, have seen growth in demand. The rowing centre has also created jobs in construction, maintenance, sports management, and event coordination, offering alternative livelihoods in an area previously dependent on extractive industries.

In addition, the site has received international attention as a model for creative land reuse and has been featured in discussions on sustainable mine closure and regional innovation. Aidu's transformation demonstrates that post-industrial landscapes, when reimagined with long-term vision and stakeholder collaboration, can evolve into assets that support ecological resilience and social cohesion. Aidu open cast reclamation is mentioned also in the MineHeritage project database and map (MineHeritage project).

## 6 Lessons learned

The Aidu case presents valuable insights into the opportunities and challenges associated with post-mining land reuse, particularly when projects aim to serve both environmental and community objectives. Several key lessons emerged from the transformation process, which can inform similar efforts elsewhere.

First, visionary planning and a clear long-term purpose were essential for success. From the outset, the transformation of Aidu was driven by a bold idea – to turn a former industrial site into a world-class sports venue. This clear vision helped align stakeholders, attract funding, and sustain momentum through various technical and administrative phases.

Second, the project highlights the importance of leveraging site-specific advantages. The physical characteristics of the mine void – its length, depth, and sheltered conditions – made it uniquely suited to rowing, and this natural compatibility reduced the need for extensive modification. Recognising and building upon existing features of a post-mining landscape can lead to cost-effective and sustainable solutions.

Third, multi-stakeholder collaboration was a decisive factor in overcoming challenges. The involvement of local municipalities, sports organisations, environmental experts, and community groups ensured that the project was inclusive and responsive to different interests. Engaging stakeholders early and consistently helped build trust and legitimacy, particularly during moments of uncertainty or resistance.

However, the project also faced notable challenges. Administrative complexity, funding delays, and evolving regulatory requirements slowed progress at times. Navigating the transition from a rehabilitation plan focused on risk reduction to one centred on public infrastructure and recreation required adaptive



governance and strong local leadership. These challenges underscore the need for flexible planning frameworks that can accommodate evolving goals and integrated land use outcomes.

Finally, the Aidu experience demonstrates the broader potential of mine closure as a platform for regional renewal. Rather than treating closure as the end of an industrial lifecycle, it can be seen as a beginning – a chance to redefine land use, reconnect communities with nature, and spark new forms of economic and cultural activity.

## 7 Recommendations

For practitioners and policymakers involved in mine closure planning, the following recommendations are proposed:

- Start with a clear, place-based vision that identifies long-term opportunities beyond traditional reclamation goals.
- Engage stakeholders early and continuously, including local communities, technical experts, and potential future users of the site.
- Adapt closure frameworks to allow for multifunctional land use and ensure regulatory flexibility to support creative redevelopment.
- Leverage the natural characteristics of the site to reduce costs and enhance the sustainability of the transformation.
- Promote integrated funding strategies, combining public investment, EU support, and private sector involvement where appropriate.

The Aidu Rowing Centre stands as a successful model of post-industrial renewal – proof that with commitment and cooperation, mine closure can lay the foundation for vibrant, future-oriented landscapes.

## 8 Conclusion

The transformation of the Aidu oil shale open cast mine into a competitive rowing centre demonstrates how post-mining landscapes can be repurposed in ways that deliver long-term environmental, social, and economic value. Through a combination of vision-driven planning, stakeholder collaboration, and context-sensitive engineering, the project has successfully converted a former industrial void into a multifunctional asset for the region.

Aidu's case illustrates that mine closure does not need to focus solely on risk mitigation and environmental compliance. Instead, it can offer an opportunity to reimagine landscapes as spaces for recreation, education, and cultural regeneration. By integrating ecological rehabilitation with sport and tourism infrastructure, the Aidu project sets a precedent for innovative, community-oriented mine closure strategies.

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