

Transformative Impacts of Mining on Rural Landscapes: a Case Study of Yatagan, Turkey

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**OLTRE LO
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THE GAZE**

6 TOMI
BOOKS

| 2

INSIGHTS

5

OLTRE LO SGUARDO BEYOND THE GAZE

a cura di
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1

La città prisma
The prism city

a cura di / edited by Francesca Romana Fiano

2

La città misurata
The measured city

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3

La città stratificata
The layered city

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4

La città corpo
The city as a body

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5

La città immaginata
The imagined city

a cura di / edited by Elena Dorato

6

La città rappresentata
The represented city

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TRANSFORMATIVE IMPACTS OF MINING ON RURAL LANDSCAPES: A CASE STUDY OF YATAĞAN, TURKEY

MELDA KAPLAN, SIBEL YILDIRIM ESEN, MESUT DINLER

Abstract

This study focuses on the landscape history, with a specific case study of Yatağan in the southwest of Turkey's Muğla province. The objective is to explore the significance of rural settlements in Yatağan. Drawing from literature, visual sources, and observations, it will assess the transformation brought about by coal mining activities on the rural communities and their surroundings within 4 main aspects; economic shift, environmental change, social impact, and cultural loss in Yatağan's rural areas.

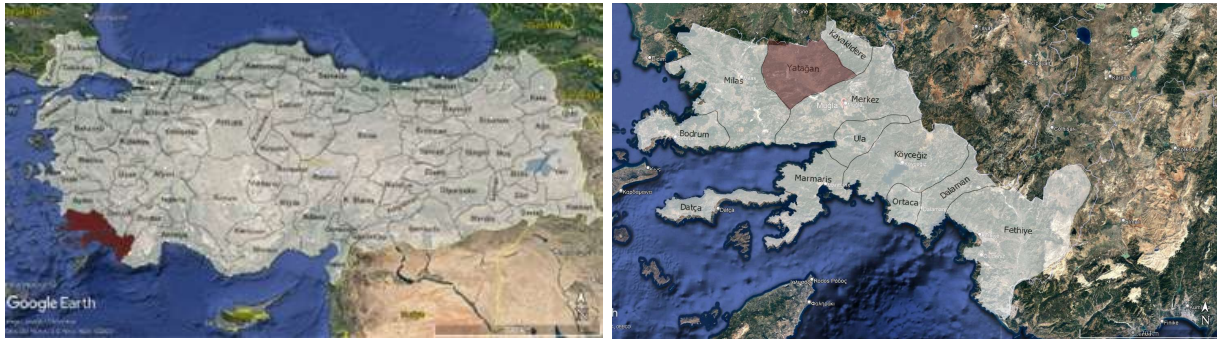
Keywords

Yatağan, Rural Communities, Natural Resources, Coal mining, Socio-Economic Frameworks.

Introduction

This study explores the landscape history, centering on the case of *Yatağan*, a county situated in Turkey's *Muğla* province within the southwestern Aegean Region. (See Figure 1) The region is characterized by its historical significance and abundant natural resources, both above and beneath the earth's surface. Historically, the rural communities of *Yatağan* have thrived through agricultural production, intricately tied to the region's mild climate, fertile lands, and local resources.

The environment in *Yatağan* has been shaped over time through the interaction between human activities such as agriculture and settlement patterns, resulting in a distinctive landscape that reflects the historical influence of various civilizations. Local communities attribute cultural, economic, and historical meanings to their environment, which have been influenced by the interaction between natural resources, traditional practices, and community values. The relationships between resources, values, anthropisation dynamics, and the construction of meaning within landscapes have shaped the daily life practices, cultural formations, and the overall socio-economic framework of these communities.



1: The location of the province of Muğla, Yatağan in the southwest of Turkey.

However, significant changes have occurred in *Yatağan*'s historical trajectory with the emergence of coal mining activities in the 1980s. This industrial sector gained prominence, dramatically impacting both the landscape and the socio-cultural fabric of the region. The establishment of the Thermal Power Plant and subsequent coal mining operations have had direct and indirect effects on the environment, altering land use patterns and causing the relocation of local communities. As a consequence, some traditional rural settlements, including *Bağyaka*, *Kapubağ*, *Eskihisar*, and *Yeşilbağcılar* villages, which once bore witness to the local and landscape history, now either stand in ruins or have been abandoned. This has led to the loss of traditional buildings and settlement patterns, which could serve as invaluable documentary sources, providing insights into the historical context, architectural practices, and social dynamics over time.

This paper examines *Yatağan*'s rural settlements in the context of landscape history. Using literature, visual sources, and observations, it assesses the transformation brought about by coal mining activities on the rural communities and landscapes. By analyzing environmental changes and socio-economic shifts, the study reveals past dynamics and future implications. This exploration of the landscape history highlights coal mining's effect on resources, values, and meaning in *Yatağan*'s landscape. The assessment framework covers economic shift, environmental change, social impact, and cultural loss due to coal mining in *Yatağan*'s rural areas. The economic view considers the Thermal Power Plant's influence. Environmental change assesses altered land use, and ecosystem shifts, revealing the interplay of human activities and the environment. The social aspect delves into community dynamics, and relocations, influenced by mining-related displacement. The cultural loss theme addresses heritage impact, including settlement decline, and the loss of tangible and intangible values. This framework aims to unveil coal mining's varied consequences, offering insights into human-environment interactions in *Yatağan*.

The Significance of *Yatağan* as a Historic Rural Landscape

Yatağan boasts a geographical layout conducive to agricultural production. The presence of two plains – the *Yatağan* Plain (30 km²) and the *Kayırlı* Plain (50 km²) – serves as fertile ground for crops. These plains benefit from irrigation facilitated by water sources such as *Kocadere*, *Menteşe* Stream, *Kamış* Stream, and *Bencik* Stream, as well as *Ahiköy* Stream and *Kayırlı* Stream for the *Kayırlı* Plain. Comprising humus, clay, and sandy terrain [Yatağan Belediyesi 2023], these expansive plains offer an ideal setting for irrigated agricultural production. The Mediterranean climate, enveloping the *Yatağan* region – marked by warm, dry summers and mild, rainy winters – creates a conducive atmosphere for a diverse range of plant ecosystems. This Mediterranean character is evident in vegetation typical of the region, where the absence of freezing temperatures during winter and the high summer temperatures positively influence plant growth. Arid ecosystems like “*maquis*” or “*maki*” have developed in the region, manifesting adaptations to prevailing drought conditions.

The region’s flora consists of a blend of species, including blackberry, sycamore, ivy, thistle, and various others, while tree composition primarily comprises red pine (75%), larch (19%), pistachio (5%), juniper, radiata pine, cedar, and oak (1%). Meanwhile, secondary vegetation includes thyme, blackberry, sycamore, and poplar [Yatağan Belediyesi 2023]. These natural attributes converge to yield a landscape intertwined with agricultural products – olives, wheat, corn, oat, barley, common vetch, millet, tobacco, sesame, peanuts, cotton – ensuring a consistent harvest through the seasons. Beyond its agrarian heritage, *Yatağan* boasts a treasury of mineral resources encompassing bauxite (Bx), cement raw materials (Çmh), calcite (Cc), limestone, marble, emery, diasporic minerals, lignite, and geothermal resources [MTA 2010]. These valuable assets contribute to the region’s economic vitality and geological significance.

In addition to its rich geographical and natural attributes, the historical tapestry of *Yatağan* further adds depths to its significance, reflecting the interplay between human civilizations and the environment over time. This interplay is evident through region’s diverse historical journey. In ancient times, the Carian civilization reigned over southwestern Anatolia, including *Yatağan*, for approximately two centuries. As time progressed, control over the region shifted through the hands of the Lydians, Persians, Alexander the Great, the Kingdom of Pergamon, and the Roman Empire. Subsequently, following the division of the Roman Empire in 395, it became part of the Byzantine (Eastern Roman) Empire. The emergence of the *Menteşe* Principality marked a distinctive era at the turn of the century, maintaining autonomy until 1389 when the Ottoman rule was established under the reign of *Yıldırım Bayezid* (1391). Meanwhile, the *Ahi* community from the *Ankara* region dispersed to various regions of Anatolia, eventually founding *Ahiköy* within *Yatağan*’s boundaries. The Turkish Republic’s formation in 1923 led to the transformation of *Ahiköy* into a district within *Muğla*, later becoming the county center in 1944 and adopting the name *Yatağan* [Yatağan Kaymakamlığı 2023].

Yatağan's cultural heritage stands as a testament to the region's historical trajectory, with archaeological sites, historic rural landscapes, and architectural heritage all contributing to its significance. The roots of settlement in the Yatağan region extend deep into ancient times, and the historical continuity is mirrored by archaeological evidence within its rural landscapes. Archeological findings within the boundaries of Yatağan's rural areas provide tangible links to the past. Notably, Oğuzhanoğlu and Pazarıcı [Oguzhanoglu, Pazarci 2020] emphasize that the history of the region traces back to the Bronze Age, corroborated by the ruins discovered in *Çapalıbağ* – a site located between *Turgut* and *Yeşilbağcılar* villages. Additionally, the *Stratonikeia* Archeological site, situated within *Eskihisar* village, stands as a testament to the region's multilayered cultural landscape, reinforcing the significance of the past shaping *Yatağan's* present identity.

The rural settlements of *Yatağan* encapsulate its cultural heritage within their landscapes. These settlements, strategically situated on slopes or plains, offer insight into the historical relationship between the residents and their agricultural practices. Villages like *Turgut*, *Yeşilbağcılar*, *Bağyaka*, and *Kapubağ* are examples, reflecting a layout settled on the hillsides. In contrast, *Eskihisar*, *Madenler*, *Bozarmut*, and *Bozüyük* villages are situated on flat plains. Villages such as *Turgut*, *Bağyaka* and *Kapubağ*, display an organic layout that centers around a village square with essential facilities such as a mosque, bath, market, and coffeehouse. These historic rural settlements tell the story of sustainable living, showcasing the coexistence of human communities with their surrounding environment. The layouts of these villages echo a harmonious coexistence with nature, as dwellings are strategically positioned close to agricultural fields and olive groves.

Yatağan's architectural heritage is a tangible document to understand historical context and traditional knowledge that have been passed down through generations, reflecting the intertwined relationship between human life and the built environment. The monumental structures in the rural landscapes in *Yatağan* are mosques and baths. The oldest monumental structure is *Turgut Ilyas Bey Mosque*. *Kunduracı* [Kunduraci 2021] states that *Turgut Ilyas Bey Mosque* and *Bozüyük Hanyeri Mosque* were constructed with stone, brick, and spolia material and alternating brick technique with a rectangular plan and dome structure. Additionally, *Nebiköy Mosque* and *Eskihisar Şabanağa Mosque* have a rectangular plan with a gable roof structure. The mosques do not have ornamental architectural details. The *Eskihisar Seljuk Bath* and *Yeşilbağcılar Bath* are given examples by *Kunduracı* [Kunduraci 2021]. They are in ruin state, but *Eskihisar Seljuk Bath* has been recently restored. They both have rectangular plans and dome structures. Turkish triangles in *Eskihisar Seljuk Bath* and pendentive in *Yeşilbağcılar Bath* were used between walls and the dome.

Traditional dwellings in villages like *Yeşilbağcılar* and *Turgut* reflect the vernacular architecture of the *Muğla* region. Several dwelling examples from *Yeşilbağcılar* village were studied by *Ekmekçi* and *Atasoy* [Ekmekci, Atasoy 2010] and *Kunduracı*, *Bahargülü* and *Güven* [Kunduraci, Bahargulu, Guven 2018]. Constructed with stone

foundations, rubble stone masonry, and timber frame structures, these 19th and 20th century dwellings represent local materials and craftsmanship. The local *Molmemet* and slate stones were used in the construction. Moreover, the dwellings are located in a courtyard, with two-story buildings featuring an outer sofa and two rooms on the upper floor, along with storage and barn located on the first floor. The buildings have flat earth roofs and gable roofs. In contrast to their relatively simple façades, the interiors boast architectural elements such as doors, timber cupboards, cabinets, and *gusulhanes* adorned with intricate floral carvings on timber.

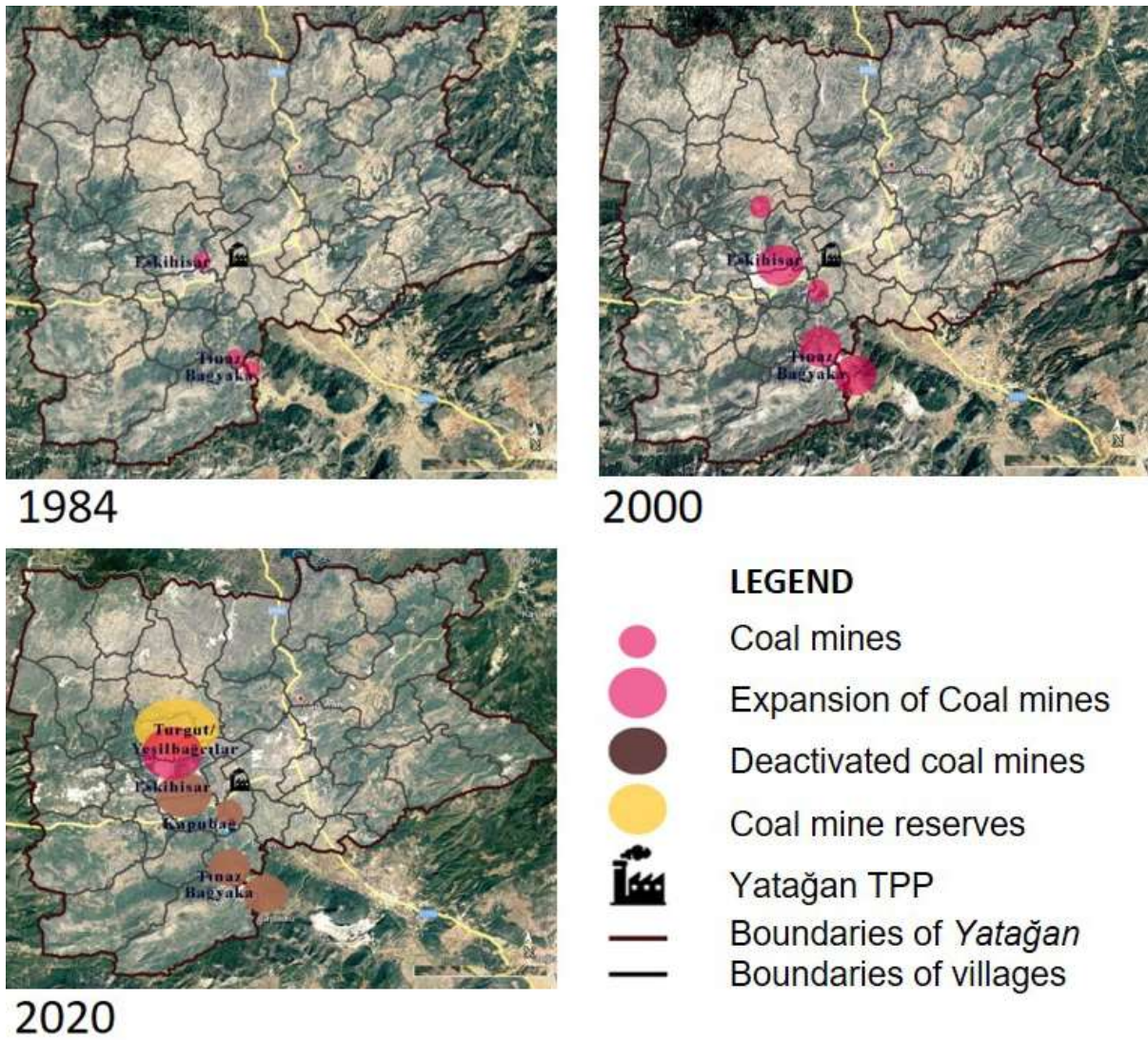
The Yatagan region's history is deeply intertwined with humans-nature dynamics in its rural settlements. Rooted in ancient times, the rural lifestyle based on agricultural production has been passed down through practical and traditional knowledge, bridging the gap between generations. Local community identity and sense of belonging have been fostered through traditions, practices, and cultural knowledge. For instance, diverse wedding ceremonies held with customs unique to each village highlight the region's rich cultural heritage. Crucial points in daily life like, such as local markets, thrive in village squares – a pivotal gathering space for villagers. The presence of monumental structures like mosques and baths further reinforces the interconnectedness of historical elements with daily life. Despite the absence of formal registration status, traditional dwellings, mosques, and baths collectively stand as cultural assets, vividly reflecting the accumulated knowledge of past generations. These tangible and intangible cultural heritage attributes collectively reveal the intricate ways in which human communities have thrived, adapted, and indelibly influenced the environment over time.

Unraveling Transformative Effects: Comprehensive Analysis

Economic Shift

The coal mining operations that commenced in Yatagan in the 1980s marked a significant turning point in the region's history. The construction of *Yatağan* Thermal Power Plant (TPP) in 1982, alongside coal mining activities in *Eskihisar* (1979), *Bağyaka*, *Tınaz* (1985-1986), *Yeşilbağcılar* and *Kapubağ* (2000) led to substantial changes in the area's socio-economic fabric. *Eskihisar*, *Bağyaka*, and *Tınaz* Coal mines continued to expand in the 1990s. However, the process was not without its challenges. In 1993, the *Muğla* radiation early warning system detected radioactive fallout from the Thermal Power Plant, resulting its temporary closure. Moreover, the disposal of ashes from the plant near *Kapubağ* village raised environmental concerns, as the rainwater accumulated on the ashes, Ash pond (*tr.Kül Göleti*), contained heavy metals [Gumusel, Gunduzelyi 2019].

In the 2010s, privatization of three Thermal Power Plants and continued expansion of coal mines further transformed *Yatağan's* landscape. Although a transfer agreement was signed, the transfer could not be realized in 2000 due to local struggles



2: Spatial distributions of Coal Mines from 1984 to 2020

and legal obstacles. In the 2010s, privatization issue came again to the agenda and realized in 2014. *Yeşilbağcılar* and *Eskihisar* coal mines continued to expand and eventually merged in the 2010s with involving *Turgut* olive gardens. New mining projects like *Turgut* and *Hacıbayramlar* were proposed. These developments led to legal disputes over environmental impact assessments (EIA), which was not required at that time, and the subsequent environmental consequences of mining activities. Therefore, NGOs sued in 2018, and the court decision required EIA for the mining project. Despite the decision of the court for the project, the Ministry's EIA was positive for another Project, the *Turgut* Closed Coal Mine Project, in 2022. [Gumusel, Gunduzelyeli 2019].

Environmental Change

Environmental change assesses altered land use and ecosystem shifts, revealing the interplay of human activities and the environment. *Algan and Özdemir* [Algan, Özdemir 2023] analyzed the change in land use in *Yatağan* from 1984 to 2022. According to the results of the research, maquis 25%, agricultural lands 28%, forestry 45%, physical resource extraction sites 0.1%, settlement areas 0.7%, and dams 0% covered the landscape of the *Yatağan* in 1984. However, 4.09% in forest areas (5,611.9 ha), 2.44 % in maquis (3,343.6 ha) areas were decreased but 2.32% in agricultural areas (3,183.2 ha) and 2.97% in mining areas (4,097.5 ha), 0.82% settlement areas (1,118.67 ha), and 0.42% in water surfaces (572.32 ha) were increased from 1984 to 2022. Although the ratio of agricultural lands increased from 1984 to 2022, physical resource extraction sites were opened and expanded on the rural landscapes and forest areas. The increase in the ratio of agricultural lands due to the expansion of rural landscapes on maquis is bigger than physical resource extraction sites. The major decrease in forestry area is a result of physical resource extraction sites. Additionally, coal mining sites were mainly located on agricultural lands, and marble quarries are located on the forest areas.

Surface mining activities are destructive to the environment and this technique is used in coal mining and marble quarrying activities in *Yatağan*. It causes the total extinction of flora and fauna on the mining site and the breaking of the ecosystem. According to deeper analysis through aerial maps and observations; the physical resource extraction activities had an influence on the landscapes especially on the rural landscapes; such as *Kozağaç, Gökgedik, Köklük, Eskihisar, Yeşilbağcılar, Turgut, Hisarardı, Kapubağ, Bağyaka, Elmacık* and *Kavak* villages. However, any kind of rehabilitation activities were not conducted to rehabilitate the environment and ecosystem. Even though rural life was based on agricultural activities, the agricultural lands were turned into mining areas. Moreover, marble quarrying is one of the important physical resource extraction activities in the county. Because the closest to *Güllük Harbour, Bodrum* where makes trade easy. There are 50 Marble Quarries and 45 Marble Factories/operations within the boundaries of *Yatağan*. Coal mining is another significant physical resource extraction industry in *Yatağan*. Since *Yatağan TPP* is producing from coal mines to electricity, coal mining activities are continuing actively, especially in rural landscapes. The villages where coal mining activities were conducted or continuing are *Bağyaka, Kapubağ, Eskihisar, Yeşilbağcılar, and Turgut*.

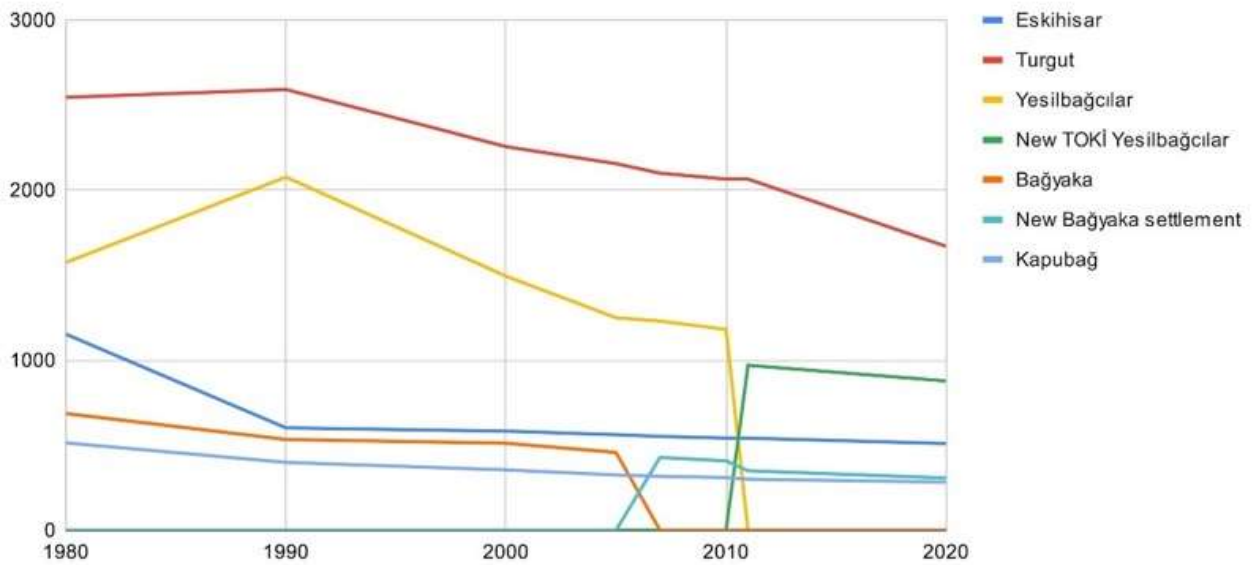


3: Bağyaka Coal Mine and Yeşilbağcılar Coal Mine Yatağan

Social Impact

The impact of these physical resource extraction activities extended beyond the environmental realm, significantly affecting the region's demographics. There is not a big change in the total population of Yatağan from 1980 to 2021. Presently, *Yatağan* has a population of 45,077 people, distributed among 50 neighborhoods (*tr.mahalle*), with a significant proportion residing in rural areas (the Turkish Statistical Institute (TUIK) 2021 census information). Six neighborhoods with the total population of 19,738 are located in the city center, while 44 rural neighborhoods have 25,339 residents. But there is a big change in where people live in the city center or rural neighborhoods. The city center population increased 2 times from 1980 to 2021 and rural districts population are generally decreased. The population of *Yatağan* showed shifting patterns, with urban centers seeing growth while rural areas, especially those directly impacted by mining, experienced depopulation and community relocations. The major decrease occurred in Bağyaka, Kapubağ, Eskihisar, Yeşilbağcılar, Nebiköy, Yava and Hisarardı villages that villages have lost %50 and more than %50 of their population from 1980 to 2020. In contrast, major increase observed in *Yatağan* city center, *Madenler*, *Bozarmut*, and *Akgedik* villages where the population increased almost 2 times from 1980 to 2020. Moreover, *Yeşilbağcılar*, *Eskihisar*, and *Bağyaka* villages have been under the influence of coal mining activities and their communities relocated. The community of *Bağyaka* relocated from the old settlement to a new settlement in the 2005s. *Yeşilbağcılar's* community was relocated in 2011s from old settlements to new TOKI settlements. The district where the first coal mining activities started *Eskihisar's* community was relocated before 1980 and the population continued to decrease afterward. *Turgut* and *Kapubağ* did not have to relocate but coal mining activities have occurred in the boundaries and their population also decreased slightly.

Despite being a district of tourism-focused *Muğla* Province, *Yatağan*'s economy is diversified, encompassing industries like marble quarrying, mining, energy production, lignite coal, agriculture, forestry, animal husbandry, and transportation. Additionally, in terms of its geographical location, it serves as a bridge to touristic districts. According to *Yatağan* District Governorship, approximately 50% of the population is workers, 20% are civil servants, 10% are tradesmen, and 20% are engaged in agriculture and animal husbandry. Moreover, the most important industrial establishments of the district are *Yatağan* Thermal Power Plant, 50 marble quarries, 45 marble factories, 2 coal furnaces, 9 olive oil factories, one olive oil plant, and one milk processing plant.



4: Population Change Graph of 5 villages in Yatağan

Cultural Loss

The physical resource extraction activities caused the loss of tangible and intangible cultural assets. The depopulation of *Yeşilbağcılar*, *Bağyaka*, and *Eskihisar* villages due to coal mining activities caused a loss of social, and cultural values and a sense of identity in the community. The destruction of settlements and the opening of coal mines caused the loss of documentary and historical values in these settlements. Even though depopulated villages had not been demolished, it resulted in the loss of the authenticity and integrity of these villages. Moreover, the abandoned villages' mosques, tombs, and baths caused a loss of age and religious values.

Yeşilbağcılar village is also known as *Gibye* where was depopulated and half of the settlement demolished due to coal mining extraction, vibration and landslides. *Yeşilbağcılar* has symbolic buildings like; Pirli Bey Mosque which is dated end of the 19th century, the Pirli Bey tomb, and a *Yeşilbağcılar* Turkish bath (tr. *Hamam*) which is dated 14-15. century. [Kunduraci 2021]. They are abandoned and ruin state now. Ekmekçi and Atasoy [Ekmekci, Atasoy 2009] described traditional dwellings of *Yeşilbağcılar* village as two story with outer *sofa* plan type. They were constructed with rubble stone masonry and timber frame and earth roofs. The dwellings have simple façades and decorated doors and cupboards in the inside which are dated 19th and 20th centuries. Presently, more than half of the traditional dwellings of *Yeşilbağcılar* demolished and others are in ruin state.



5: Pirli Bey Mosque and Yeşilbağcılar Turkish bath in May 2022



6: Yeşilbağcılar traditional dwellings in May 2022

Discussion

These dynamics underscored the intricate relationships between mining, resource allocation, and community livelihoods within *Yatağan's* landscape. The transformations induced by coal mining activities reverberate across *Yatağan's*

environmental and socio-economic context. By systematically analyzing these shifts, we gain a comprehensive understanding of the intricate relationship between human activities, natural resources, and the landscape. This examination not only captures the historical course of change but also highlights the potential paths that these transformations could take in the future.

Central to this analysis is the concept of landscape change driven by resource extraction. The extraction of mineral resources, such as lignite, and their conversion into energy through the *Yatağan* Thermal Power Plant have reshaped the very fabric of the region. The landscape, once characterized by its agrarian nature, now bears the imprint of industrial processes. The transformation of the landscape due to mining operations, coupled with the alteration of land use patterns, has led to shifts in spatial arrangements and a redefinition of community interactions with their environment. The displacement of communities due to mining activities has led to the abandonment of traditional settlements and their accompanying cultural assets. The mosques, and baths that once formed the heart of these villages now stand as witnesses to the changing dynamics. This shift has effects beyond the physical landscape, impacting social structures, traditions, and the transmission of cultural knowledge across generations. The evolving landscape serves as a tangible marker of these changing dynamics, offering insights into the intricate interplay between human interventions and natural processes.

As we delve deeper into the analysis, it becomes apparent that the ramifications of mining extend beyond the temporal horizon. The socio-economic shifts triggered by these activities pose complex challenges for the future. The intersections between resource allocation, economic sustainability, and community well-being emerge as critical nodes for examination. Moreover, the evolving values and meanings attached to the landscape shape the identity of the region, further underlining the need for a comprehensive understanding of the dynamics at play.

Conclusion

All in all, *Yatağan's* physical environment and intangible values have been shaped as a result of human and nature relationships that have been changing rapidly due to physical resource extraction activities' domination in the region since the 1980s. Its agriculture and animal husbandry-based dynamic life has been changed to an industrial production-based economy and daily life. Thus, inhabitants of the rural settlements immigrated to the city center due to the depopulation of their villages and the physical impacts of physical resource extraction activities on the natural environment. The land-use pattern has been changing parallel to physical resource extraction activities in the region. As a result of this change, the area of the natural environment is decreased and the area of extraction sites is increased. Additionally, deactivated extraction sites are not rehabilitated. As a result of coal mining activities in rural landscapes, the villages' mosques, tombs, baths, and traditional dwellings

were abandoned and demolished. Local communities of the depopulated villages got lost their sense of belonging and identity. Physical resource extraction activities of *Yatağan* caused to loss of tangible and intangible values in rural settlements.

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