

O 31. THE ANALYSIS OF THE CONSERVATION PROCESS AND THE USE OF THE GEDIZ DELTA FROM ECOLOGICAL AND ECONOMIC ASPECTS

Atakan Pirli¹, Bahriye Gülgün¹, Afaneh Javadpour^{2*}

¹ Ege University, Agriculture Faculty, Landscape Architecture Dept, Izmir, Turkey

² M.A. Research of Art, Tehran University of Art, Tehran, Iranian

E-mail: javadpourafsane@gmail.com

ABSTRACT: The Gediz River, which is approximately 401 km long, forms the Gediz Delta with an area of approximately 400 km² in the region where it flows into the Gulf of Izmir. Gediz Delta is one of Turkey's largest wetland ecosystems. It is also protected by the Ramsar Convention. Gediz Delta, which has both national and international value, is a major water resource and an environment with high biodiversity. In addition, it is a region where agricultural and industrial activities are carried out. This study aims to discuss the biological functions and economic importance of the Gediz Delta and to mention the preservation process and its current use.

Keywords: The Gediz River, Gediz Delta, biological function, economic importance, use of Gediz Delta, Izmir

INTRODUCTION

Gediz Delta is one of Turkey's most important wetland systems located in the Aegean Region. This Delta was formed when the alluvium carried by the Gediz River filled the Gulf of İzmir.

This delta, which has an area of approximately 400 km², is the largest delta on the Aegean coast in Turkey (Erinç, 1955 as cited in Tırıl, 2005). A large part of this area is Natural Site, some of it is in the status of Wildlife Protection Area (Tırıl, 2005). This delta, 8000 hectares of which was declared as a Wildlife Protection Area in 1982; It was declared a Ramsar Area in 1998, and then a First-Class (First-Degree) Natural Site in 1999. (Ünal, 2013).

Approximately half of this delta consists of urban and rural settlements and fertile agricultural areas threatened by industrial facilities, while the remaining half contain wetland systems (Tırıl, 2005).

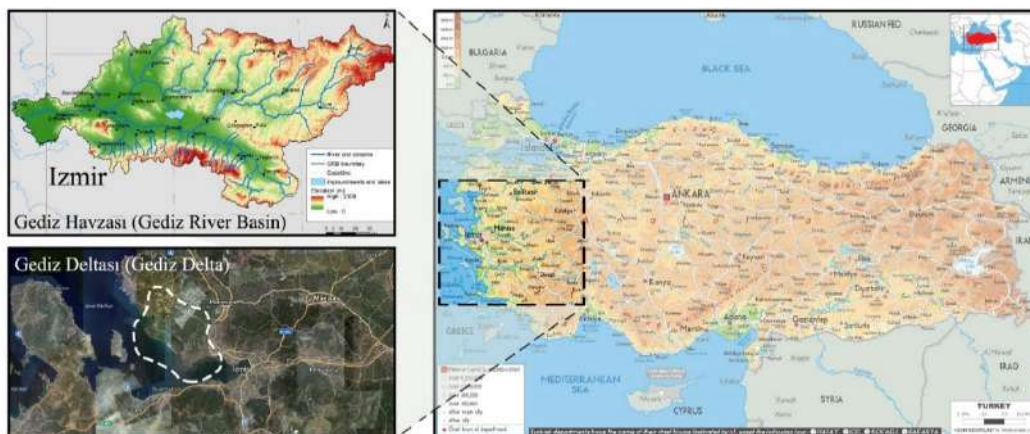


Figure 1. Gediz River Basin and Gediz Delta Map

USE OF THE GEDIZ DELTA

It is possible to see rapid industrial development in this area with high agricultural potential (Kocataş, et al., 2000 cited in Gündoğdu et al., 2007). In addition to having biological diversity and productivity, which are characteristics of wetlands, this area; It comes to the fore with its

Proceeding Book of ISESER 2021

hydrological functions, economic production, and recreation functions. It carries economic values through ways such as salt production, fishing, and ecotourism (Tırlı, 2005).

Biodiversity and Productivity

The delta is located where the Gediz River, passing through 4 cities, flows into the sea. It also hosts many creatures in the wetland ecosystem. The main environments that make up the habitat diversity of the area; shallow shores, salt pans, estuaries, old riverbeds and canals, salt-wet meadows, freshwater meadows and reeds, scrub and forested hills, agricultural lands, and rural settlements. In terms of species diversity, includes many living groups such as phytoplankton, zooplankton, aquatic plants, fish, amphibians, birds, and mammals. (Tırlı, 2005). The most important reasons for the delta to host many living creatures; rich minerals in the materials carried by the streams, nutrients, and providing suitable shelter conditions (Özkırlı and Ürker, 2012; Alevkayalı and Tağıl, 2018). Çamaltı salt marsh, Kırdeniz, Homa, Çilazmak lagoons and Kuş Cenneti (Izmir) of great importance are included in this ecosystem (Yılmaz and Erdem, 2011; Alevkayalı and Tağıl, 2018; Yazıcı, 2019). It is stated that the number of bird species in the delta has reached 290 (İZKUŞ, 2013; Alevkayalı and Tağıl, 2018). It is home to an internationally endangered Dalmatian pelican (*Pelecanus crispus*) and 142 endangered bird species (Sıkı, 2002; Alevkayalı and Tağıl, 2018). Due to the abundance and variety of birds, it has been known as Izmir Kuş Cenneti (Bird Sanctuary) since 1991. (Ünal, 2013). Ünal (2013), It emphasizes the richness of Gediz Delta in terms of species diversity as follows: “Most of the delta and the sea border consists of sand bands covered with sea beans (*Salicornia europaea*) and mussel shells. Every year in the delta, thousands of pairs of seabirds incubate in the sheltered mud islets. Sandwich tern (*Thalasseus sandvicensis*) only in the Gediz Delta in Turkey. In addition, the region is also one of the five areas where this species regularly breeds on the Mediterranean coast. Important mammal species in the area are jungle cats (*Felis chaus*), Mediterranean monk seals (*Monachus monachus*) and otter (*Lutrinae*).” In this regard, Yılmaz and Erdem (2011) stated the following: “There are many lagoons, saltwater and freshwater marshes, as well as the Bird Sanctuary, which is of great importance for ornithotourism, within the delta with a large salt. Having a rich variety of species in terms of flora and fauna, the delta is extremely important for the sustainability of natural life.” “Approximately ten percent of the world population of flamingos live in the Gediz Delta of Izmir. It is one of the rare areas where the Dalmatian pelican, Mediterranean monk seal and *Caretta caretta* sea turtle live together.” (Doğa Derneği, 2020). The high photosynthetic production value increases the efficiency of the delta; photosynthetic production increases the living environment value of the delta and provides abundance of nutrients (Tırlı, 2005).



Figure 2. Flamingos observed in the Gediz Delta (Hellio and Van Ingen akt. Doğa Derneği, 2020)

Preserving and Improving Water Quality

Flowing through Kütahya provincial borders, passing through Uşak and Manisa provinces and pouring

Proceeding Book of ISESER 2021

into Izmir Bay; Gediz River, which is approximately 401 km long, meets the water needs of the basin and Izmir. The river has a 17500 m² drainage basin. 12.4% of the water amount in Turkey is in the Gediz River Basin. (Gündoğdu et al., 2007; Ankaya et al., 2018; Gülgün et al., 2014; Gülgün et al., 2017). Delta provides protection and improvement of water quality, which is one of the tasks of wetlands. The Gediz Delta is important in filtering the pollution that does not exceed its carrying capacity, absorption of chemicals, sediment control, oxygen generation, absorption of nutrients and food chain, preservation and improvement of water quality. (Tırıl, 2005).

Providing Matter Loops

Due to the winds and high evaporation rate in the Gediz Delta, the delta has a different microclimate than the general area. In this respect, it provides the climate balance in the urban and industrial ecosystem. There are salty wet meadows that make up the shores of the delta. It also contributes to the cycle of the oxygen produced by green plants and the water evaporating from large water surfaces in the system. They are also important resources that contribute to the nitrogen cycle, sulfur, and carbon cycle by reducing nitrate-nitrogen (Tırıl, 2005).

Flood and Flood Risk Reduction

Wetlands absorb excess water, stabilize the water level and prevent floods. In addition, it has an important role in enriching groundwater by transmitting the water they absorb to the underground. (Tırıl, 2005). As seen in the Atatürk Organized Industrial Zone in the Gediz Delta, ground subsidence has been observed with the withdrawal of groundwater because of the damage to the area (Onmuş, et al., 2002; Tırıl, 2005).



Figure 3. Gediz Delta (İz Gazete, 2020)

Aquaculture and Salt Production

Due to factors such as the abundance of nutrients in wetlands, the rapid warming of shallow waters, and serving as a shelter for many living creatures, Gediz Delta; is a very suitable region in terms of aquaculture production. Fishing is an important source of income for the people in regions with high aquatic life (Tırıl, 2005). The second-largest salt production center in Turkey after Salt Lake is Çamaltı Salt marsh located in Gediz Delta. More than 500,000 tons of salt are produced annually here, and both table salt and industry salt needs are met (Tırıl, 2005).

Agriculture

Wetlands, especially deltas, are known for their agricultural richness. It is fertile soil for cotton (*Gossypium spp.*) and various vegetables. Viticulture and olive cultivation are important sources of income as one goes towards the inner parts of the deltas. Pasture areas play an important role in animal husbandry (Tırıl, 2005). Sea beans (*Salicornia europaeae*), grown in the delta are an important food in

Proceeding Book of ISESER 2021

Aegean cuisine. This delta, which provides a source of food to humans thanks to the sea beans, also creates a shelter for many creatures in areas where the plant is together and a breeding environment for many bird species. (Tırlı, 2005).

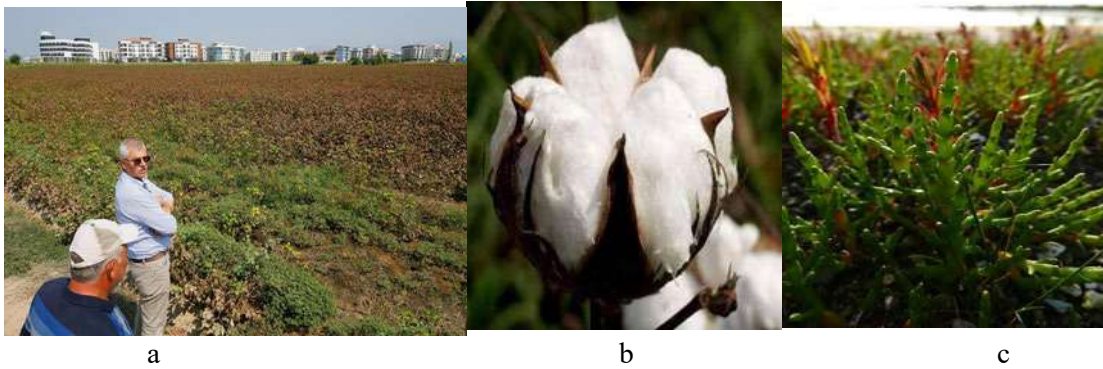


Figure 5. a Menemen Plain, **b** Cotton (*Gossypium* spp.), **c** Sea beans (*Salicornia europaeae*) (Url 1; Url 2; Url 3)

Recreation and Tourism

Gediz Delta has many recreational and tourism potentials such as hiking, cycling, horse riding, fishing, bird watching, photography, and agricultural tourism. This area, where urban people move away from daily stressful life, can interact with natural wealth, is a value that has the potential to provide physical and spiritual satisfaction. (Tırlı, 2005).



Figure 4. Gediz Delta (dogaaskina.org, 2020)



Figure 6. (İz Gazete, 2020) **Figure 9.** Mavişehir - Gediz Deltası proje görseli (İzmir Büyükşehir Belediyesi, 2018)

Proceeding Book of ISESER 2021

The following is stated on the website of Izmir Metropolitan Municipality about the Mavişehir - Gediz Delta project, which is planned to be realized within the scope of Horizon 2020 (2018):“Environmentally-friendly solutions will be developed to eliminate the negative effects of urban air temperature in and around Mavişehir Region, where urban development, which is thought to be most affected by climate change, is intense, reducing the risks of sudden floods and make Peynircioğlu Stream more accessible to the public.”

GEDIZ DELTA PROTECTION PROCESS AND USE STATUS

Çamaltı Salt Marsh, which is the first protected area in the delta, and the area that constitutes 1/3 of the wetland was obtained by the Ministry of Agriculture and Forestry General Directorate of Forestry as "Water Birds Protection and Breeding Site" in 1982. This area is currently in the status of "Wildlife Protection Area". In 1985, a small area in the Gediz Delta by the Ministry of Culture and Tourism; I. and II. It has been declared a Natural Site. (Tırıl, 2005). “İzmir Master Plan dated 1973 has chosen Gediz Delta as an urban-industrial development area (Kaplan, et al., 1997), The implementation of plan decisions accelerated in the 1990s.” (Tırıl, 2005).

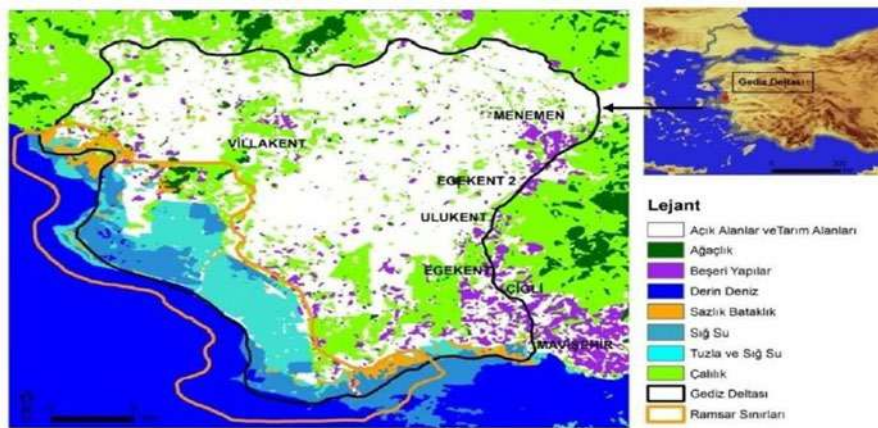
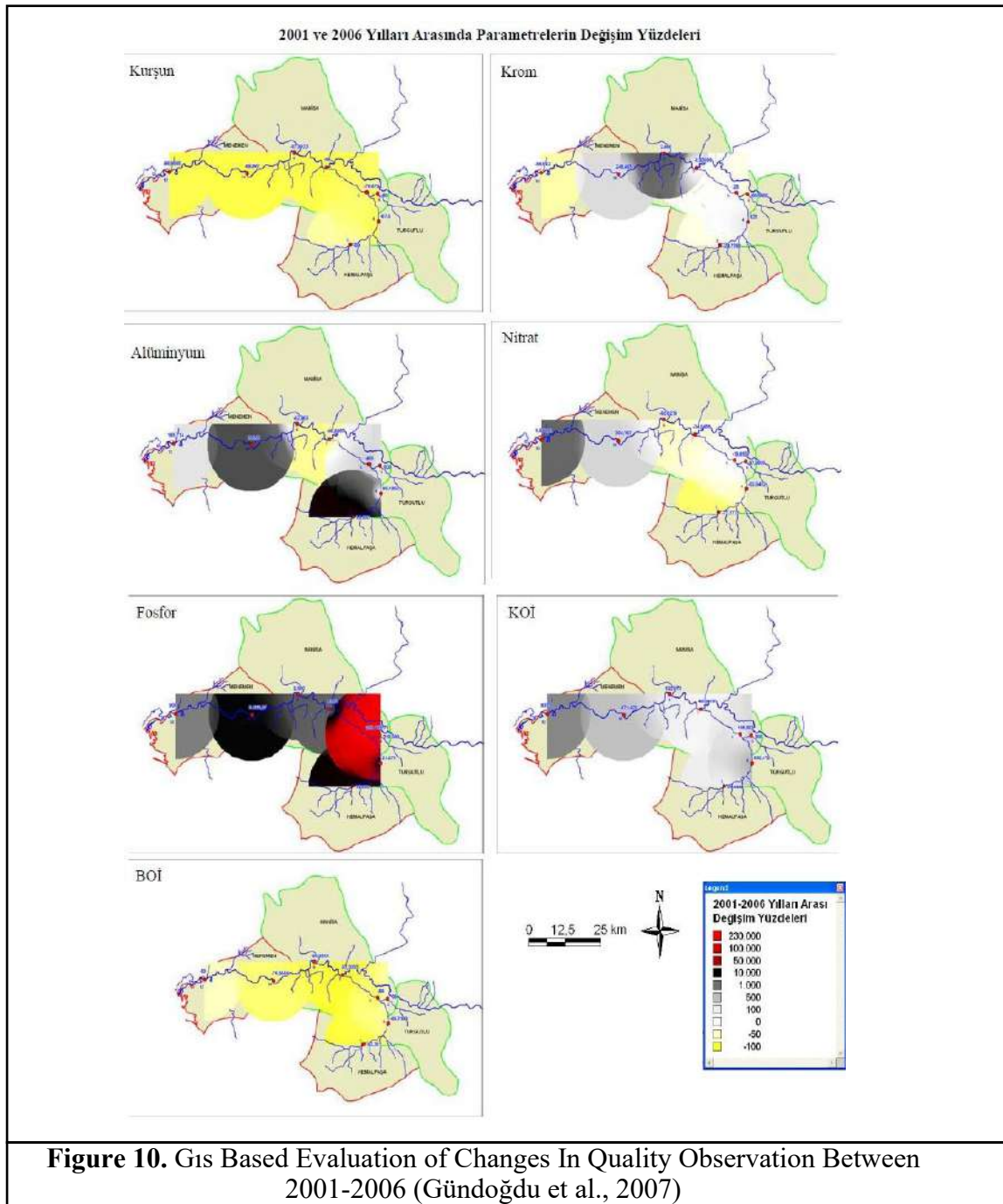


Figure 7. Gediz Delta area and borders of Ramsar (Alevkayalı and Tağıl, 2018)

Yılmaz (2011), Today's Gediz Delta has classified its usage areas as follows:

“It has been determined that the total area of urban structure, industrial, commercial, and transportation units constitutes 16% of the total area with an area of 12570 ha. The sum of irrigated agriculture areas and perennial vegetation areas, which constitute agricultural use, was determined to be 18107 ha. It has been determined that areas with sparse vegetation (frigana), which are extremely important for the continuation of natural life, cover an area of 7% with an area of 5218 ha. It has been determined that the total area of the terrestrial, salty, and coastal lagoons, which are important as wetlands, covers an area of 20020 ha. Considering that the amount of wetland, which constitutes 26% of the entire area, may change seasonally, it should be noted once again that these data are for September 2007.” The area was declared a Ramsar Area in 1998 and a 1st Degree Natural Protected Area in 1999 (Ünal, 2013)

Considering the historical process, it is seen that construction interventions towards deltas are also applied in Gediz Delta. Almost all the interventions such as changing the direction of the stream, drying works, and accumulation of dredging materials in the terrestrial environment has been implemented in the Gediz Delta. The river in the form of a residue that emerged because of changing the delta was filled, and Izmir Atatürk Organized Industrial Zone was established in this area in 1980 (Alevkayalı and Tağıl, 2018). The negative effects of the conservation efforts in the past on the area, as well as the industrialization and urbanization phenomena, continue today. This negatively affects the land and poses a threat.



Gündoğdu et al. (2007) The study concluded that:

“Inorganic pollution in the Gediz River is quite high, and the river water quality is around the worst quality, 4th class water quality. However, it has been determined that other pollution prevention works, especially treatment facilities and infrastructure, carried out by the Izmir Metropolitan Municipality IZSU General Directorate in the basin are effective. In addition, it has been proved by the decreases seen in pollution parameters in 2006.” Alevkayalı and Tağıl (2018), in their study, they talked about the tragic land losses in the area. They stated that land losses are seen in reeds, bare soil surfaces, and shrubs, emphasizing that this loss is 35% of the total area. Land losses occur in the form of extinction or turning into salt marsh.

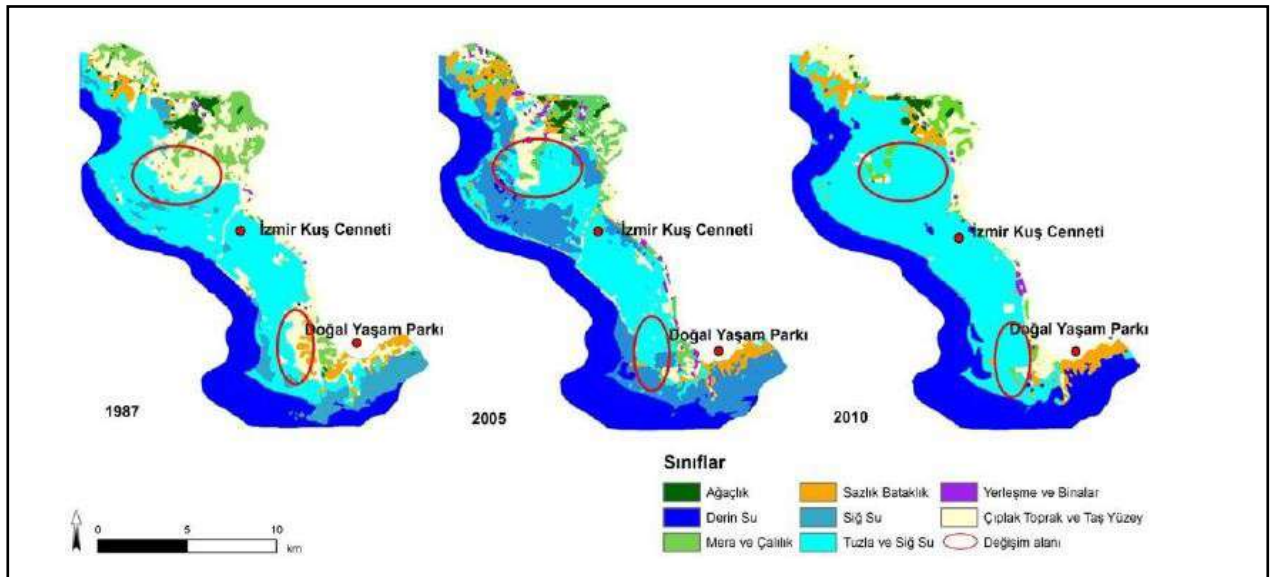


Figure 11. The change of the region in the Gediz Delta protected under the Ramsar Convention between 1987-2010 (Alevkayalı and Tağıl, 2018)

They stated that one of the uses that negatively affect the area is the high-rise buildings nearby Alevkayalı and Tağıl (2018). In addition, the presence of the Izmir Wildlife Park on the Gediz Delta has seen another factor threatening the continuity of the ecosystem in the delta.



Figure 12. Buildings close to the delta, a photo where flamingos can be seen (Alevkayalı and Tağıl, 2018)

CONCLUSION

Gediz Delta is an ecosystem of great value both nationally and internationally. The area, which hosts many living species, is also a water source. In addition to its ecological features such as keeping the climate balance in balance, it is important in terms of economy and production. In addition to production based on water resources such as fishing, salt production; agriculture is carried out in its fertile plains and livestock breeding in its pastures. Despite all these areas of use, the area has been subjected to many damages such as loss of land, salinization in the soil, water, and soil pollution. Since Gediz Delta is located near a big city like Izmir, it offers people the opportunity to integrate with nature.

Proceeding Book of ISESER 2021

The delta, which was declared a Ramsar Area in 1998 and a 1st Degree Natural Protected Area in 1999, is one of the leading wetland ecosystems that need to be protected in Turkey.

REFERENCES

- Alevkayalı, Ç. ve Tağıl, Ş., 2018, Ortak malların trajedisi üzerine teoriler: Gediz Deltası'nda arazi kullanımı - arazi örtüsü değişimi, SDÜ Fen - Edebiyat Fakültesi Sosyal Bilimler Dergisi, 43: 120-142 s.
- Ankaya, F., Yazici, K., Balık, G., and Gülgün, B., 2018, Ecotourism in Turkey and The World Social Cultural and Economic Benefits. Presented at the International Symposium for Environmental Science and Engineering Research 2018 .
- Anonim, 1997, Gediz Havzası Çalışmaları, T.C. Çevre Bakanlığı İzmir Çevre İl Müdürlüğü, İzmir.
- Doğa Derneği, 2020, “Gediz Deltası”, <https://www.dogaderneği.org/gedizdeltası/> (Erişim tarihi: 29 Mayıs 2020)
- Erinç, S., 1955, Gediz ve K. Menderes Deltalarının morfolojisi, 9. Coğrafya Meslek Haftası, 22-29 Aralık 1954, İstanbul, Türk Coğrafya Kurumu Yayınları: 2, Coğrafya Meslek Haftaları Serisi: 1, 33-66 s., İstanbul.
- Gülgün, B., Yazici, K., and Ankaya, F. 2017, Effects on Plant Growth of Agricultural Water Quality. Presented at the 2nd International Conference on Civil and Environmental Engineering .
- Gülgün, B., Yazici, K., and Öztürk, S. 2014, Escalating Water Problems in The World and in Turkey and Legal Social and Tecnical Measures. J.Int. Environnemental Application Science, 8(2), 280–287.
- Gündoğdu V., Akgün, G., Elele, M. and Piyancı, O., 2007, Gediz Nehri alt havzasında 2001- 2006 yıllarına ait kalite gözlemlerindeki değişimin CBS tabanlı irdelenmesi, Ulusal Coğrafi Bilgi Sistemleri Kongresi, 30 Ekim - 02 Kasım 2007, KTÜ, Trabzon.
- İzmir Büyükşehir Belediyesi, 2018, <https://www.izmir.bel.tr/tr/Haberler/adim-adim-2020/38865/156> (Erişim tarihi: 29 Mayıs 2020)
- İZKUS, 2013, İzmir Kuş Cenneti Koruma ve Geliştirme Birliği, Gediz Deltası ve İzmir Körfezi 2013 Ocak Ayı Kış Ortası Su Kuşu Sayım Raporu.
- Kaplan, A., Kılıçaslan, Ç., Kara, B. and Tırlı, A., 1997, İzmir Kuş Cenneti ve çevresi - kentsel gelişme ilişkileri. Türkiye'nin Kıyı ve Deniz Alanları I. Ulusal Konferansı, 24-27 Haziran 1997, Bildiriler Kitabı, s. 161-171, Ankara.
- Kocataş, A., Balık, S. and Ustaoglu, M. R., 2000, Gediz Deltası sulak alan yönetim planı alt projesi final raporu, T.C. Çevre Bakanlığı, Ankara.
- Onmuş, O., Tırlı, A., Durusoy, R., Eken, G., Arsan, Z. and Bilge, O., 2002, Gediz Deltası için katılımcı yönetim planı önerisi. Türkiye'nin Kıyı ve Deniz Alanları IV. Ulusal Konferansı, 5-8 Kasım 2002, İzmir, Bildiriler Kitabı, s. 271-282, Ankara.
- Özkırlı, B. and Ürker, O., 2012, İzmir Körfezi ve Limanı Rehabilitasyon projesi kapsamında, Gediz Deltası sulak alanı içerisinde yapılması planlanan tarama malzemesi depolanması ve işlenmesi sürecinin ekolojik ve hukuki olarak incelenmesi, İzmir Doğa Derneği Yayınları, İzmir.
- Sıkı, M., 2002, Gediz Deltası (İzmir Kuş Cenneti) kuşları, Ekoloji Dergisi, 11(44): 11-16 s.
- Tırlı, A., 2005, Bir koruma öyküsü - Gediz Deltası, Korunan Doğal Alanlar Sempozyumu, 8 - 10 Eylül 2005, SDÜ, Isparta.
- Ünal, B., 2013, Türkiye'de ve Dünyada sulak alanlar, Sulak Alanlar, Orman ve Su İşleri Bakanlığı, Doğa Koruma ve Milli Parklar Genel Müdürlüğü Yayını, Ankara.
- Yılmaz, O. and Erdem, Ü., 2011, Gediz Deltası'nın uzaktan algılama teknikleri uygulanarak alan kullanım kararları üzerine araştırmalar, Tekirdağ Ziraat Fakültesi Dergisi, 8(1): 53-64 s.
- Yazici, K. 2019, Almus Baraj Gölü Tokat Türkiye ve Yakın Çevresinin Rekreatiyonel Kullanım potansiyelinin Belirlenmesi. Presented at the 20. Ulusal Turizm Kongresi, ESKİŞEHİR

Figure References

Figure 11. Yılmaz, O. and Erdem, Ü., 2011, Gediz Deltası'nın uzaktan algılama teknikleri uygulanarak alan kullanım kararları üzerine araştırmalar, Tekirdağ Ziraat Fakültesi Dergisi, 8(1): 53-64 s.

Figure 1. 2021, Türkiye Fiziki Haritası. https://www.worldometers.info/img/maps/turkey_physical_map.gif (Retrieved: 21 Mayıs 2021)

Proceeding Book of ISESER 2021

- Figure 1. Reservoir, 2021. The Gediz River Basin Alluvial Aquifer (Turkey). <https://reservoir-prima.org/pilot-site-turkey> - https://reservoir-prima.org/uploads/editor/source/figure_1.png (Retrieved: 21 Mayıs 2021)
- Figure 2. Hellio ndVanIngen-DoğaDerneği,2020,“GedizDeltası”, <https://www.dogaderneği.org/gedizdeltası/> (Erişim tarihi: 29 Mayıs 2020)
- Figure 3, 8. İz Gazete, 2020, “Gediz Deltası’nda yaşam yeni türlere yuva oluyor”, <https://www.izgazete.net/cevre/gediz-deltasında-yasam-yeni-turlere-yuva-oluyor-h46625.html> (Retrieved: 29 Mayıs 2020)
- Figure 4. <https://dogaaskina.org/gediz-deltası/> (Retrieved: 29 Mayıs 2020)
- Figure 5. <http://www.egedesonsoz.com/haber/Menemen-Ovasi-nda-kirmizi-alarm/1017838> (Retrieved: 29 Mayıs 2020)
- Figure 6. <https://www.bahcebitkileri.org/pamukgossypium-spp.html> (Retrieved: 29 Mayıs 2020)
- Figure 7. <http://www.manxwildflowers.com/flowers/221-marsh-samphire-salicornia-europaea-lus-ny-gloinney.html> (Retrieved: 29 Mayıs 2020)
- Figure 9. İzmir Büyükşehir Belediyesi, 2018, <https://www.izmir.bel.tr/tr/Haberler/adim-adim-2020/38865/156> (Retrieved: 29 Mayıs 2020)
- Figure 10, 12, 15. Alevkayalı, Ç. and Tağl, Ş., 2018, Ortak malların trajedisi üzerine teoriler: Gediz Deltası'nda arazi kullanımı- arazi örtüsü değişimi, SDÜ Fen - Edebiyat Fakültesi Sosyal Bilimler Dergisi, 43: 120-142 s.
- Figure 13. Tırıl, A., 2005, Bir koruma öyküsü - Gediz Deltası, Korunan Doğal Alanlar Sempozyumu, 8 -10 Eylül 2005, SDÜ, Isparta.
- Figure 14. Gündoğdu V., Akgün, G., Elele, M. and Piyancı, O., 2007, Gediz Nehri alt havzasında 2001-2006 yıllarına ait kalite gözlemlerindeki değişimin CBS tabanlı irdelenmesi, Ulusal Coğrafi Bilgi Sistemleri Kongresi, 30 Ekim- 02 Kasım 2007, KTÜ, Trabzon.