

**IMPACT OF ABRATION ON LAND USE IN COASTAL AREA BULELENG REGENCY****Luh Putu Gita Ari Parwati, Ngakan Ketut Acwin Dwijendra, Ni Ketut Agusintadewi**

Program Perencanaan dan Manajemen Pembangunan Desa dan Kota (PMDK), Program Magister Arsitektur; Universitas Udayana Bali, INDONESIA

E-mail: [acwin@unud.ac.id](mailto:acwin@unud.ac.id)**ABSTRACT**

Coastal damage due to abrasion and wave erosion in Buleleng Regency is very potential, even information from the Buleleng Regency Marine Service released information that the length of the coast in Buleleng Regency which has been damaged is not less than 5 km. Abrasion and wave erosion resulting in erosion of the coastline and will continue to affect land use. In this study using quantitative methods with analysis stages consisting of, among others, land use and analysis of the impact of abrasion on land use. The analysis carried out is a Geographic Information System (GIS) based analysis in accordance with the needs of the research in spatial terms. The conclusions obtained from this study are the types of land use that exist in the Coastal District of Buleleng Regency are in the form of airports, lakes / reservoirs, forests, mangroves, stretches of beach sand, ports, plantations/gardens, paddy fields, rivers, moor and shrubs. The abrasion that occurs in the Coastal Zone of Buleleng Regency every year with vulnerability during 2013 - 2019 has an impact on land use changes. This can be seen through the results of overlapping overlay analysis and seeing the area of land use that has changed.

**Keywords:** abrasion impact; coastal area; land use; erosion; overlapping.

<b>Received:</b>	<b>Revised:</b>	<b>Accepted:</b>	<b>Available online:</b>
2021-12-21	2022-02-17	2022-05-05	2022-05-13

**INTRODUCTION**

In Law Number 1 of 2014 the coastal area is a transitional area between land and sea ecosystems which is filled with changes on land and sea. Given its geographical position, coastal and coastal areas are very strategic areas. Coastal areas are developing so fast for various human needs including as residential areas, ports, industry, fisheries, agriculture and also as recreational areas or tourist areas. As a transitional area, the coast gets quite a lot of influence from the two areas it borders. The influence of various physical activities of the ocean such as waves, currents and tides can cause changes in coastal landscapes. The threat of disasters that often occur in coastal areas, apart from sudden threats such as earthquakes, tsunamis, tidal waves and others, is also a slow but sure threat, namely coastal abrasion.

Coastal abrasion is damage to the shoreline as a result of the release of coastal materials, such as sand or clay that is continuously hit by ocean waves or due to changes in the balance of sediment transport in coastal waters (Cakrawijaya C et al, 2014; Fajrin F, et al, 2016). Coastal abrasion or erosion is caused by the transport of sediment along the coast, resulting in the movement of sediment from one place to another. Sediment transport along the coast occurs when the direction of the incoming wave forms an angle with the normal line of the coast. Coastal abrasion not only makes coastlines narrow, if left unchecked can become even more dangerous. This can threaten the settlements of residents in the coastal area. From the point of view of the balance of interaction between land origin forces and sea origin forces, Abrasion occurs because sea origin forces are stronger than land origin forces. The main factor for abrasion is wave activity on the beach which occurs continuously and cannot be resisted by coastal materials. Abrasion does not occur immediately, but occurs over a long period of time, due to continuous waves, the beach will gradually narrow and get closer to settlements around the coast. Not only the strength of the waves, it will be the edges of the waves that continuously cause abrasion (Pananrangi P, Idham A, 2009; Prameswari P et al, 2014; Wijaya W et al, 2017). One area of Indonesia that has the potential for abrasion is Buleleng Regency.

Buleleng Regency is located in the northern part of the island of Bali with a fairly high marine potential. This is evidenced by the beach length of 157.05 Km. According to data from UURI (2014)

and PD Kabupaten Buleleng (2013), the highest eroded coastline from the threat of sea level rise occurs in the coastal area of Buleleng Regency which reaches 54,830 meters or about 45% of the length of the Buleleng Regency coastline.

Nusabali (2020) says coastal damage due to abrasion and wave erosion in Buleleng Regency is very potential, even information from the Buleleng Regency Marine Service released information that the length of the beach in Buleleng Regency that has been damaged is not less than 5 km. Abrasion and erosion of waves which result in erosion of the coastline and will continue to affect land use. Therefore, this study was conducted to see how the land use changes in coastal areas in Buleleng Regency.

According to Prameswari P et al (2017) coastal abrasion is damage to the shoreline as a result of the release of coastal materials, such as sand or clay that is continuously hit by ocean waves or caused by changes in the balance of sediment transport in coastal waters. This happens because the coastal area is a specific area, because it is between two influences, namely the influence of land and the influence of the sea. In accordance with its position the coastal area is a very strategic area. Land use can be interpreted as human intervention on land, either permanently or periodically to meet the needs of life, both material and spiritual. Land use is any form of human intervention (intervention) on land in order to meet the needs of life, both material and spiritual.

The current abrasion problem will increasingly affect community-owned land on the coast of Buleleng Regency. The existing beach conditions are not optimal in efforts to protect the coast and the problem of handling beaches is not comprehensive. The importance of this study is to determine the extent to which the impact of abrasion affects the land in the Coastal District of Buleleng Regency.

In applying the conditions on the coast to increase the level of comfort in carrying out the form of handling erosion that is very influential on the environment. This effect will result in reduced marine biota that are always producing (Alam MP, Lutfi M, 2016; Vianthi YL, Widiastuti W, 2021).

If left unchecked, this condition will result in the scarcity of marine biota development and along with that the mainstay of tourism as a form of environmental care will be reduced. So it is hoped that public awareness to maintain beach conditions, beach cleanliness and beach infrastructure conditions to be more clean and comfortable. The cleanliness of conditions in this field will affect the form of environmental care for the surrounding community (Satriadi I, 2017; Erwanto et.al, 2021; Vianthi NPYL, Putra IDGAD, 2022; Putri NNS, Dwijendra NKA, 2021).

Next, support from the local government is needed to preserve the coast. Sustainability is meant to protect every activity that will harm the community, harm marine life, unwanted abrasion and the occurrence of unfavorable conditions. This results in the scarcity of coastal infrastructure positions. The beach will be clean if it is well cared for and well maintained. Maintenance of this area requires the cooperation of the community and local government on an ongoing basis (Kusuma IGW, et.al, 2021; Astoeti DR, Dwijendra NKA, 2021).

## RESEARCH METHODS

### Research Area

Buleleng Regency is one of the regencies in the north of Bali Province and is located at a position of 8°03' 40" - 8°23'00" south latitude and 114°25' 55" - 115°27' 28" east longitude. Buleleng Regency has 9 sub-districts and 148 villages/kelurahan. The following is the administrative boundary of Buleleng Regency. Buleleng Regency Buleleng Regency is one of the regencies located in the northern part of the island of Bali bordering the Bali Sea, so that most of the district is a coastal area with a beach length of 157.05 km with a variety of potential marine resources (319,680 ha).

North side: Bali Sea

East : Karangasem. Regency

South : Badung, Gianyar, Bangli, and Tabanan Regencies

West side : Jembrana Regency

**Method of collecting data**

The data used in this study consisted of primary and secondary data, where primary data was obtained based on primary surveys and field observations to validate land use maps and obtain an overview of field conditions. Meanwhile, secondary data is obtained from satellite imagery, previous research, and related agency documents.

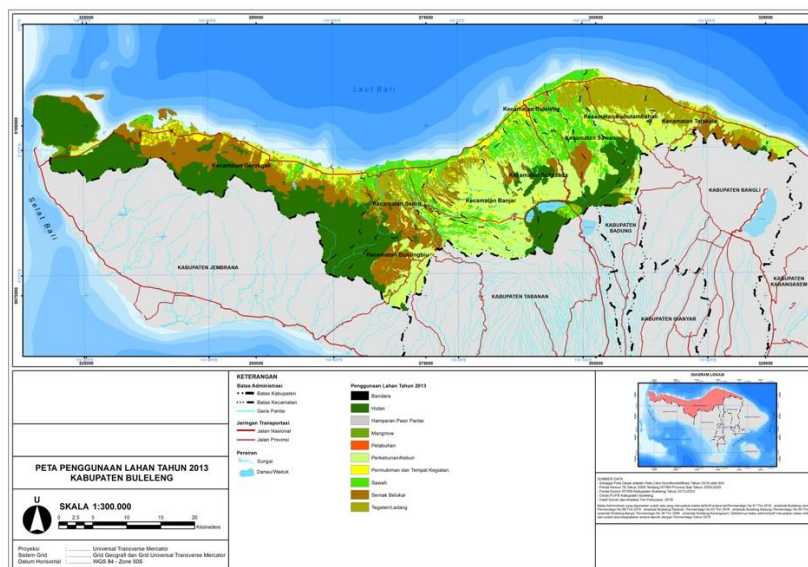
**Analysis Method**

In this study using quantitative methods with the stages of analysis consisting of land use and analysis of the impact of abrasion on land use. The analysis carried out is an analysis based on Geographic Information System (GIS) according to the research needs in terms of spatial. Overlay analysis is one of the analytical techniques that can be done with the help of ArcGIS spatial data processing software. The overlay analysis technique is done by placing a map and all the attributes in it on top of another map and then displaying the results. The result of this overlay analysis process is a map of land use changes in the research area due to the impact of abrasion. A land use change map is a map that shows spatial data of changing and unchanged land use. The map produced in this study is an overlay map for the period 2013 – 2019. From this land use data, it is known the type of land use and the extent of land use in the Coastal Area of Buleleng Regency. The output of this overlay analysis will answer the research objective, namely the impact of abrasion on land use in the coastal area of Buleleng Regency.

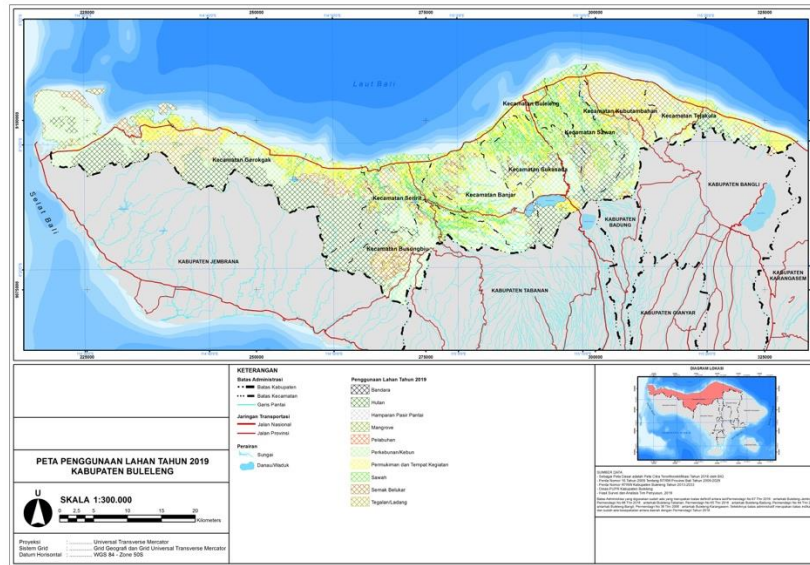
**RESULTS AND DISCUSSION**

**Types of Land Use in the Coastal Area of Buleleng Regency**

Land use mapping in this study is to identify land use in the coastal area of Buleleng Regency and measure its changes due to the impact of abrasion in different time periods. The first stage in this research is to identify land use in the coastal area of Buleleng Regency in different time dimensions. This study uses land use in 2013 and 2019 obtained from the interpretation of satellite images which are then classified for land use.



**Figure 1.** Land Use Map of Buleleng Regency in 2013. Source: Survey Results & Analysis 2020



**Figure 2.** Land Use Map of Buleleng Regency in 2019. Source: Survey Results & Analysis 2020  
 Based on the results of the research on the types of land use in the Coastal Area of Buleleng Regency, it can be seen in table 1.

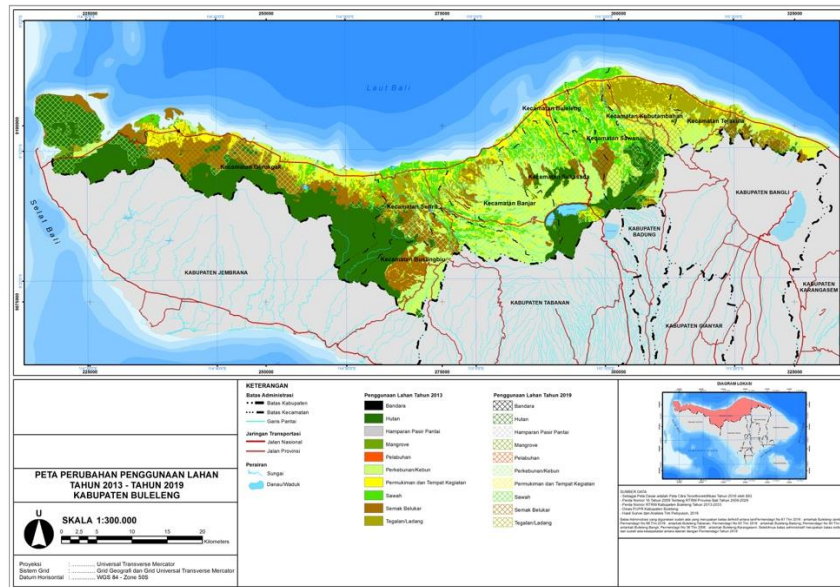
**Table 1.** Types of Coastal Land Use in Buleleng Regency in 2013 & 2019

Types of Coastal Land Use in Buleleng Regency
Airport
Lake/ Reservoir
Forest
Mangroves
Sand Beach
Harbor
Plantation/ Garden
Settlement
Ricefield
River
Moor
Shrubs

Source: Survey Results & Analysis 2020

**Analysis of the Impact of Abrasion on Land Use in the Coastal Area of Buleleng Regency.**

The coastal land use of Buleleng Regency in 2013 and 2019 which had been previously identified was then calculated for the area of each type of land use and overlapped (overlay) between time periods (2013 and 2019). Overlay between maps is done using GIS so that it can be known for changes in land use due to the impact of abrasion. The following are statistics on land use area in the Coastal area of Buleleng Regency based on GIS calculations for the period 2013 and 2019.

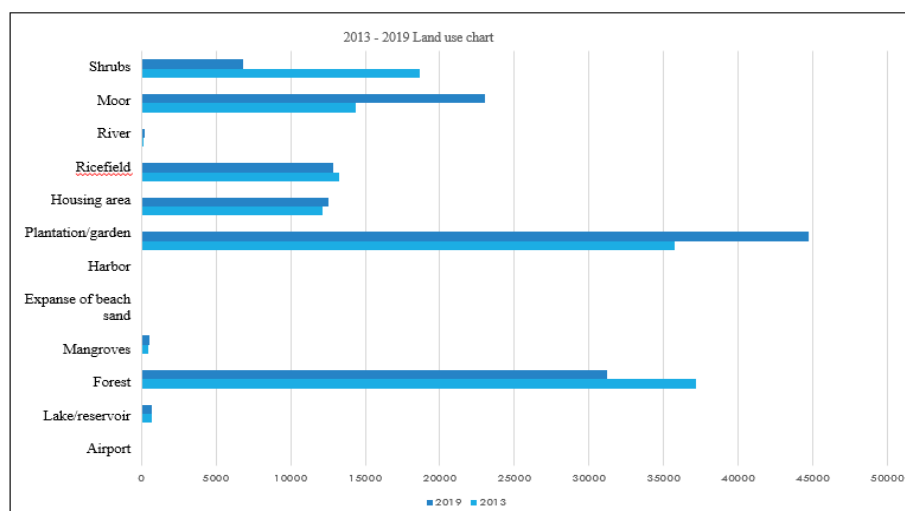


**Figure 3.** Map of Land Use Overlay of Buleleng Regency in 2013 – 2019. Source: Survey Results & Analysis 2020

**Table 2.** Types and Areas of Coastal Land Use in Buleleng Regency in 2013 & 2019

No	Land use	Area (Ha)		Change (Ha)
		2013	2019	
1	Airport	15.76	15.76	0
2	Lake/Reservoir	695.46	720.11	24.65
3	Forest	37171.12	31217.6	-5953.52
4	Mangroves	420.53	548.87	128.34
5	Sand Beach	37.08	19.1	-17.98
6	Harbor	25.83	10.91	-14.92
7	Plantation/ Garden	35760.2	44738.23	8978.03
8	Settlement	12162.74	12540.94	378.2
9	Ricefield	13271.74	12831.13	-440.61
10	River	141.65	202.35	60.7
11	Moor	14371.02	23038.7	8667.68
12	Shrubs	18646.33	6851.44	-11794.89

Source: Survey Results & Analysis 2020



**Figure 4.** Comparative Diagram of Buleleng Regency Land Use in 2013 – 2019. Source: Survey Results & Analysis 2020

From the results of the above analysis, it can be seen that the impact of abrasion on coastal land use in Buleleng Regency. Every type of land use that exists undergoes changes in the form of an increase in area or a reduction in area, except for the type of land use in the form of an increase in area or a reduction in area, except for the type of land use, namely airports. Changes in use in the Coastal Area of Buleleng Regency can be seen in several areas of bushland land use that have turned into mangroves, and there are some residential land uses that are increasing towards the plains.

## CONCLUSION

The conclusion obtained from this research is that the types of land use in the coastal area of Buleleng Regency are airports, lakes/reservoirs, forests, manholes, stretches of beach sand, ports, plantations/gardens, rice fields settlements, rivers, fields and shrubs. Abrasion that occurs in the Coastal Area of Buleleng Regency every year with a vulnerable time of 2013 - 2019 has an impact on changes in land use. This can be seen through the results of the overlay analysis by overlapping and seeing the area of land use that has changed. Changes in use in the Coastal Area of Buleleng Regency can be seen in several areas of bushland land use that have turned into mangroves, and there are some residential land uses that are increasing towards the plains.

## ACKNOWLEDGEMENT

The process of writing this journal cannot be separated from those who have helped and supported either directly or indirectly. The author expresses many thanks to Mr. Dr. Ir. Ngakan Ketut Acwin Dwijendra, ST., SDs., MA. and Mrs. Ni Ketut Agusintadewi, ST., MT., Ph.D. as supervisors who have guided, provided input and direction during the article preparation process.

## REFERENCES

- Cakrawijaya, Bambang Riyanto dan Nuroji, 2014. Evaluasi Program Pembangunan Infrastruktur Perdesaan di Desa Wonokerto, Kecamatan Turi, Kabupaten Sleman. Institut Teknologi Bandung, Bandung. (Indonesian).
- DR Astoeti, NKA Dwijendra. 2021. GREEN SUPPLY CHAIN PERFORMANCE BASED ON GREEN BUILDING ASSESSMENT (Case Study of Sukawati Art Market Construction Stage, Gianyar Regency). ASTONJADRO: CEAESJ 11 (1), 94-107.
- Fajrin, Fadhilah Maharani, Max Rudolf Muskananfola. 2016. Karakteristik Abrasi dan Pengaruhnya Terhadap Masyarakat di Pesisir Semarang Barat. Universitas Diponegoro, Semarang. (Indonesian).

- Fajri, Feril Rifardi. 2012. Studi Abrasi Pantai Padang Kota Padang Provinsi Sumatera Barat. Universitas Riau, Sumatera Barat. (Indonesian).
- I Satriadi, 2017. ANALISIS HIDROGRAF BANJIR SALURAN IRIGASI CIBALOK BOGOR. ASTONJADRO: CEAESJ 6 (1), 49-59. (Indonesian).
- IGW Kusuma, NKA Dwijendra, NM Yudiantini. 2021. DEVELOPMENT STRATEGY PORT OF BIAS MUNJUL IN TOURISM RECOVERY AT THE POST COVID-19. ASTONJADRO: CEAESJ 11 (1), 108-117.
- MP Alam, M Lutfi. 2016. ANALISIS TREND HIDROGRAF TERHADAP SIMULATOR HUJAN SATU MODEL DAS DENGAN METODE HSS GAMA I. ASTONJADRO: CEAESJ 5 (2), 58-66. (Indonesian).
- NPYL Vianthi, IDGAD Putra. 2022. EVALUATION OF ARCHITECTURAL COMPONENTS IN BAYUNG GEDE VILLAGE SETTLEMENT, BALI AS A TOURISM OF SPECIAL INTEREST. ASTONJADRO: CEAESJ 11 (1), 174-197.
- NNS Putri, NKA Dwijendra. 2021. DOMINANT FACTORS CHANGE OF LAND FUNCTION IN RAPUAN ROAD CORRIDOR UBUD BALI DUE TO TOURISM ACTIVITIES. ASTONJADRO: CEAESJ 11 (1), 118-129.
- NusaBali.com. (2020, 8 April 2020). Abrasi Pantai, Krama Tegallengga Kesulitan ke setra (2017, 10 Maret 2017). Krama Desa Pakraman Tegallengga, Desa Kalisada, Kecamatan Seririt, cukup lama tidak punya akses jalan menuju setra (kuburan) adat setempat. (Indonesian).
- Pananrangi, Andi Idham. 2009. Pemanfaatan Lahan Kawasan Pesisir Galesong Berbasis Analisis Resiko bencana Abrasi. UIN Alauddin Makassar, Makassar. (Indonesian).
- Peraturan Daerah Kabupaten Buleleng Nomor 9 Tahun 2013 tentang Rencana Tata Ruang Wilayah Kabupaten Buleleng. (Indonesian).
- Prameswari, Siti Rahmi dan Agus Anugroho D. 2014. Kajian Dampak Perubahan Garis Pantai terhadap Penggunaan Lahan berdasarkan Pengindraan Jauh Satelit di Kecamatan Paiton, Kabupaten Probolinggo Jawa Timur. Universitas Diponegoro, (Indonesian).
- Undang – Undang Republik Indonesia Nomor 1 Tahun 2014 tentang Perubahan Atas Undang – Undang Nomor 27 Tahun 2007 tentang Pengelolaan Wilayah Pesisir dan Pulau – Pulau Kecil. (Indonesian).
- Wijaya, Ali dan Cahyono Susetyo, 2017. Analisis Perubahan Penggunaan Lahan di Kota Pekalongan Tahun 2003, 2009, dan 2016, Institut Teknologi Sepuluh Nopember ( ITS), Surabaya. (Indonesian).
- YL Vianthi, W Widiastuti. 2021. COMPATIBILITY STUDY AND SUPPORTING CAPACITY OF TOURISM AT PERERENAN BEACH BADUNG, BALI. ASTONJADRO: CEAESJ 11 (1), 130-143.
- Z Erwanto, A Holik, AW Sanjaya. 2021. IDENTIFICATION AND PREDICTION OF COASTLINE CHANGES IN BANYUWANGI REGENCY DUE TO CLIMATE CHANGE USING GRASS QGIS. ASTONJADRO: CEAESJ 10 (2), 333-345.