BUKTI KORESPONDENSI
ARTIKEL JURNAL INTERNASIONAL BEREPUTASI

Judul Artikel	:	LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI
Nama Jurnal	:	Geo Journal
Penulis	:	Nyoman Utari Vipriyanti Ni Kadek Sri Arini Ernan Rustiadi

No	Perihal	Tanggal
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2	Bukti konfirmasi review dan hasil review pertama	9 Januari 2024
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1.
Bukti Konfirmasi Submit Artikel dan Artikel yang dikirim
28 Juli 2023 (Submit) dan 3 Agustus 2023 (revisi 1)

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From:em@editorialmanager.com
To: Utari Vipriyanti
Fri, Jul 28, 2023 at 7:03 PM
Dear Mrs Vipriyanti,

Thank you for submitting your manuscript, LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI, to GeoJournal.

The submission id is: GEJO-D-23-00899
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From: em@editorialmanager.com

To: Utari Vipriyanti

Thu, Aug 3, 2023 at 1:24 AM

Dear Mrs Vipriyanti,

We acknowledge, with thanks, receipt of the revised version of your manuscript, "LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI", submitted to GeoJournal
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Springer Journals Editorial Office
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Sat, Jul 29, 2023 at 12:39 PM

Dear Mrs Vipriyanti,

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You will be able to check on the progress of your paper by logging on to Editorial Manager as an author. The URL is https://www.editorialmanager.com/gejo/.

Thank you for submitting your work to this journal.

Kind regards,
%EDITORS_NAME%

GeoJournal (GEJO) www.ariessys.com
From: em@editorialmanager.com
To: Utari Vipriyanti

Thu, Aug 3, 2023 at 1:24 AM

Dear Mrs Vipriyanti,

We acknowledge, with thanks, receipt of the revised version of your manuscript, "LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI", submitted to GeoJournal
The manuscript number is GEJO-D-23-00899R1.

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2. Bukti Konfirmasi Submit Revisi Pertama, Respon kepada reviewer, dan artikel yang disubmit

GeoJournal (GEJO)
www.ariessys.com
From:em@editorialmanager.com
To: Utari Vipriyanti
Tue, Jan 9 at 3:40 AM

Dear Mrs Vipriyanti,

We have received the reports from our advisors on your manuscript, "LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI", submitted to GeoJournal

Based on the advice received, I have decided that your manuscript can be accepted for publication after you have carried out the corrections as suggested by the reviewer(s).

I agree with the reviewer that the paper should stress the political economy of coastal development more. Your literature review is rather weak. Have the paper edited by a fluent English speaker.

Attached, please find the reviewers' comments for your perusal.

You are kindly requested to also check the website for possible reviewer attachments.

Please submit your revised manuscript online by using the journal's website.

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Please make sure to submit your editable source files (i. e. Word, TeX).

I am looking forward to receiving your revised manuscript before 22 Jan 2024.

With kind regards,

Barney Warf
Editor in Chief
GeoJournal

COMMENTS TO THE AUTHOR:

Reviewer #1: My general recommendation for this manuscript: the content is definitely important enough to warrant publication. The issue of spatial planning and implementation discrepancies is a significant one, illustrated by the unremediated violations revealed by overlay of GIS data on spatial planning maps for this case study. In general, the conclusions are supported by the evidence.

My two reservations which I believe should be addressed before publication concern the following:

1) The relative under-emphasis on the political economy and legal dimensions of the failures in implementation and law enforcement identified. Indeed, the spatial plans themselves have already been developed under the heavy political influence of a developmentalist set of government priorities and vested economic interests that have already compromised important cultural and environmental values in Bali. Reference to some of the literature on the political economy of overdevelopment would be appropriate. This is perhaps a matter of disciplinary emphasis and could be dealt with for the purposes of this publication by indicating the need for further research focused on these dimensions and/or some further consideration of the critical literature in these fields.

2) The need for careful editing by a native English speaker with knowledge of the field. Decision to publish should require further work on the expression and wording of the article. Some specific examples that need correction or revised wording include:

p1 Abstract - the term 'mismatch' is insufficient to cover the broad range of impacts of the violations of basic regulations for coastal development - 'significant discrepancy' or some other phrasing would strengthen the argument.
p2 line 21 - Similarly, 'useful' is not strong enough to convey the importance of incentive and disincentive mechanisms for land use control - 'critical' would be more appropriate to the argument of the paper.
p2 line 47 what is meant by 'the physical settlement (fake)'? The meaning of this sentence is not at all clear.
p3 line 46 'this beach'. It is not clear what beach is being referred to until 'Lebih Beach' is mentioned at the end of page 5
p6 line 6 the meaning of SWOT and AHP must be spelled out in full the first time used in the text; Also 'analyzes' should be 'analyses'
p.6 Indonesian technical terms relevant to implementation of spatial planning regulations should be included for clarity. For example, does Beach Border Space (p.6 Fig 2) refer to 'sempadan pantai'? This is important for government regulators who need to be aware of precise categories where discrepancies occur, which may be lost in translation.
More of this kind of research needs to be done to remedy the inevitable tendency to over-development of coastal areas globally. It will be important for the authors in future to collaborate with political economists, anthropologists and legal researchers to advance the goals of this important research.

GeoJournal (GEJO) www.ariessys.com
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Please make sure to submit your editable source files (i. e. Word, TeX).

I am looking forward to receiving your revised manuscript before 22 Jan 2024.

Authors' response to reviewers' comments

Dear Mr. Barney Warf, Editor in Chief GeoJournal

Thank you for your decision to accept our article and giving us the opportunity to submit a revised draft of our manuscript titled " **LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI**" to the Geo-Journal (Gejo). We really appreciate the time and effort that you and the reviewers have dedicated to provide your valuable feedback on our manuscript. We are grateful to the reviewer for their insightful comments on our paper. We fully considered and dealt with that. We have been able to incorporate changes to reflect most of the suggestions provided by the reviewer. In addition to dealing with all of the comments below, the current version of this manuscript has been checked and updated. We hope all issues have been fully dealt with. Once again, many thanks for your kind supports to improve the quality of our manuscript. Here is a point-by-point response to the reviewers' comments and concerns.

Response to Reviewer #1:

Reviewer #1: My general recommendation for this manuscript: the content is definitely important enough to warrant publication. The issue of spatial planning and implementation discrepancies is a significant one, illustrated by the unremediated violations revealed by overlay of GIS data on spatial planning maps for this case study. In general, the conclusions are supported by the evidence.

My two reservations which I believe should be addressed before publication concern the following:

Comment #1:

The relative under-emphasis on the political economy and legal dimensions of the failures in implementation and law enforcement identified. Indeed, the spatial plans themselves have already been developed under the heavy political influence of a developmentalist set of government priorities and vested economic interests that have already compromised important cultural and environmental values in Bali. Reference to some of the literature on the political economy of overdevelopment would be appropriate. This is perhaps a matter of disciplinary emphasis and could be dealt with for the purposes of this publication by indicating the need for further research focused on these dimensions and/or some further consideration of the critical literature in these fields.

Response #1:

We agree with this and have incorporated your suggestion throughout the manuscript. We added the theoretical literature regarding the political economy in the line 84-100 as follow:

"*Sustainability is the main goal of development programs in coastal areas. Conflicts over the use of land resources often occur, so the government needs to manage all parties and integrate sectoral and regional development programs. There are three efforts are needed to achieve sustainable coastal management such as: (1) well identified all parties and actively involve; (2) holistic and cross sectional approach; and (3) evaluation and intervention by community (Dimitrovski, Lemmetyinen, Nieminen, & Pohjola, 2021; Lee, Noh, & Khim, 2020; Powell, Tyrrell, Milliken, Tirpak, & Staudinger, 2019).*

Massive development in coastal areas needs to consider externalities. The benefits of development are indeed obtained by local communities, but the costs incurred often become an additional burden for them. This is the main problem known as spatial externalities (Magontier, Sole-Olle, & Marsal, 2021). People and tourists can enjoy beautiful beaches and coastal areas, but development in these areas can cause externalities in the form of a decrease in environmental quality. Faber & Gaubert (2019) stated that development along the Mexican coast has had a positive impact on society in providing employment opportunities. However, it has an impact on the comfort of people's lives".

Comment #2

The need for careful editing by a native English speaker with knowledge of the field. Decision to publish should require further work on the expression and wording of the article. Some specific examples that need correction or revised wording include:

More of this kind of research needs to be done to remedy the inevitable tendency to over-development of coastal areas globally. It will be important for the authors in future to collaborate with political economists, anthropologists and legal researchers.

Response #2:

Thank you for your comments. We have asked native English speakers to edit the article and hope to have made corrections to the reviewer's comments.

.

Comment # p1 Abstract –

the term 'mismatch' is insufficient to cover the broad range of impacts of the violations of basic regulations for coastal development - 'significant discrepancy' or some other phrasing would strengthen the argument.

Response #p1 Abstract

Thank you for your suggestion. We changed mismatch to "significant discrepancy" (line 8, line 48).

Comment #p2 line 21

Similarly, 'useful' is not strong enough to convey the importance of incentive and disincentive mechanisms for land use control - 'critical' would be more appropriate to the argument of the paper.

Response #p2 line 21

Thank you for your suggestion. We changed “useful” to be “critical” (line 43).

Comment #p2 line 47

what is meant by 'the physical settlement (fake)'? The meaning of this sentence is not at all clear.

Response #p2 line 47

Thank you for pointing this out. We already revised them in the manuscript.

Comment #p3 line 46

'this beach'. It is not clear what beach is being referred to until 'Lebih Beach' is mentioned at the end of page 5

Response #p3 line 46

Thank you for pointing this out. We already revised them in the manuscript

Comment #p6 line 6

the meaning of SWOT and AHP must be spelled out in full the first time used in the text; Also 'analyzes' should be 'analyses'

Response #p6 line 6

We have completed the spelling of SWOT analysis on first use (p6 line 9).

Comment #p6 Figure 2

p.6 Indonesian technical terms relevant to implementation of spatial planning regulations should be included for clarity. For example, does Beach Border Space (p.6 Fig 2) refer to 'sempadan pantai'? This is important for government regulators who need to be aware of precise categories where discrepancies occur, which may be lost in translation.

Response #p6 Figure 2

Thank you for pointing this out. As suggested by reviewer, we have added “sempadan pantai” for explaining beach boarder page 5 line 9.

GeoJournal

LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI

--Manuscript Draft--

Manuscript Number:	GEJO-D-23-00899R1
Full Title:	LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI
Article Type:	Manuscript
Keywords:	Coastline, Land use, Spatial plan, Strategic planning, Sustainability
Corresponding Author:	Utari Vipriyanti, Dr Universitas Mahasaraswati Denpasar Denpasar, Bali INDONESIA
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First Author Secondary Information:	
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	Ni Kadek Sri Arini, Magister
	Ernan Rustiadi, PhD
Order of Authors Secondary Information:	
Funding Information:	
Abstract:	The increase in land use in coastal areas due to tourism activities indicates that there is a mismatch in spatial planning as determined in the regional spatial layout plan and does not pay attention to disaster mitigation aspects. Therefore it is very important to protect the coastline area which is used as protection and public space. Even though there have been several previous studies, there are still many spatial violations. This study aims to analyze the level of suitability of land use in the coastal area of Southern Bali and formulate a strategy to control land use so that it is in accordance with the spatial plan. The method used is spatial analysis (GIS) by overlaying a land use map in the 2022 research area with the spatial pattern map in the regional spatial layout plan. In addition, data analysis for determining strategy uses the Internal Factor Evaluation (IFE) matrix, the External Factor Evaluation matrix (EFE) and the Internal External Matrix (IE). The results showed that 92% of land use on the coastline had followed the spatial plan, which was 171,427.62 m2, while the remaining 7.92% did not comply with the spatial plan, which was 14,750.09 m2 of the total area of the study area. The research results also show that strategies that can be implemented to control land use are (1) intensifying socialization and monitoring of land use control, (2) preparing detailed spatial plans, (3) implementing incentive and disincentive programs for relevant stakeholders, and (4) strengthen the law enforcement of regional regulations on district spatial plans.
Response to Reviewers:	Dear Barney Warf Editor in Chief GeoJournal Thank you for your correction taht has been given. We have made improvements as follows: 1. Adding pages to the article 2. Adding an explanation of the method and reference related to the method used

	We hope this article can be continued for the next process and meet the requirements for publication in the Geo Journal. Thank your for your kind attention. Best regard Nyoman Utari Vipriyanti Corresponding Author

Compliance with Ethical Standard

To: The honorable Editor of Geo Journal

Subject: Submission of Manuscript

Herewith we send our article to publish in Geo Journal. We have read the "*Author Instructions*" of journal and We hereby affirm that the content of this manuscript are original. Furthermore, it has been **neither** published elsewhere fully or partially or any language **nor** submitted for publication (fully or partially) elsewhere simultaneously.

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LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI

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Signature of Corresponding Author
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Name: Ni Kadek Sri Arini, ST, MSi
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Mailing address: Jalan Beliton No 2, Denpasar-Bali

Name: Prof. Ir. Ernan Rustiadi, M.Agr, Ph.D
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Mailing address: Meranti, Fac. of Agriculture Bldg., Level 5, Wing 18

CONFLICT OF INTEREST DECLARATION

TITLE OF PAPER:

LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI

Stated that We have no conflict of interest to declare, We warrant that the article is the Authors' original work. We warrant that the article has not received prior publication and is not under consideration for publication elsewhere. On behalf of all Co-Authors, the corresponding Author shall bear full responsibility for the submission.

This research has not been submitted for publication nor has it been published in whole or in part elsewhere. We attest to the fact that all Authors listed on the title page have contributed significantly to the work, have read the manuscript, attest to the validity and legitimacy of the data and its interpretation, and agree to its submission **to the Geo Journal**.

Signature of Corresponding Author
Name: Dr. Ir. Nyoman Utari Vipriyanti, MSi
Affiliation: Universitas Mahasaraswati Denpasar
Mailing address: Jalan Soka 47 A Denpasar-Bali

Signature of 2nd Author
Name: Ni Kadek Sri Arini, ST, MSi
Affiliation: Dinas PUPR-Perkim Provinsi Bali
Mailing address: Jalan Beliton No 2, Denpasar-Bali

Signature of 3rd Author
Name: Prof. Ir. Ernan Rustiadi, M.Agr, Ph.D
Affiliation: Dept. Soil and Land Resource, Fac. of Agric., IPB University
Mailing address: Meranti, Fac. of Agriculture Bldg., Level 5, Wing 18

LAND-USE PROBLEM AND CONTROLING FOR SUSTAINABLE COASTAL DEVELOPMENT IN SOUTH BALI

Abstract

The increase in land use in coastal areas due to tourism activities indicates that there is a mismatch in spatial planning as determined in the regional spatial layout plan and does not pay attention to disaster mitigation aspects. Therefore it is very important to protect the coastline area which is used as protection and public space. Even though there have been several previous studies, there are still many spatial violations. This study aims to analyze the level of suitability of land use in the coastal area of Southern Bali and formulate a strategy to control land use so that it is in accordance with the spatial plan. The method used is spatial analysis (GIS) by overlaying a land use map in the 2022 research area with the spatial pattern map in the regional spatial layout plan. In addition, data analysis for determining strategy uses the Internal Factor Evaluation (IFE) matrix, the External Factor Evaluation matrix (EFE) and the Internal External Matrix (IE). The results showed that 92% of land use on the coastline had followed the spatial plan, which was 171,427.62 m^2, while the remaining 7.92% did not comply with the spatial plan, which was 14,750.09 m^2 of the total area of the study area. The research results also show that strategies that can be implemented to control land use are (1) intensifying socialization and monitoring of land use control, (2) preparing detailed spatial plans, (3) implementing incentive and disincentive programs for relevant stakeholders, and (4) strengthen the law enforcement of regional regulations on district spatial plans.

Keywords: Coastline, Land use, Spatial plan, Strategic planning, Sustainability

1. Introduction

Spatial planning is the product of a system of spatial planning, land use and land use control. The implementation of land use is a normative condition of the community's need for land to support activities in their survival. Land is an important consideration in the development of a high population (Risma, Sitorus, Jalaluddin, & Retno, 2012; Rizal, 2021). In Indonesia at present, regional spatial conditions are far from the expectations of spatial planning goals to create safe, comfortable, productive and sustainable spaces. Spatial planning action directions

consist of planning, utilization and control (Sugiarto, 2017). These three components influence each other from one component to another. If the implementation of one of the components is insufficient, then the results obtained will be worse. The impact is increasing the intensity of disasters, and damage to nature (Cendrero, 1989; Hadley, 2009; Zou, Liu, Wang, Yang, & Wang, 2019).

Land use control is an integral part of the spatial planning process. This control effort is carried out by establishing zoning regulations, incentives and disincentives, as well as imposing sanctions. According to Rizal (2021), controlling land use through incentive and disincentive instruments is useful in developing coastline areas.

The implementation of spatial use in various regions in Indonesia is not always in accordance with the established spatial plans. There are still many violations of spatial plans due to the use of soft agreements so that the influence of open consideration of spatial plans is low (Junef, 2016). Land use mismatch is influenced by weak legal requirements, low community participation, and limited infrastructure. To be able to maintain consistency and land use in regional spatial planning plans, each provincial and district/city government requires monitoring of ongoing land use and evaluating the suitability of existing land use with spatial planning (Utomo, 2012). In addition to the physical quality of the environment (characteristics), the physical settlement (fake), and the social economy of the community cannot be differentiated to maintain consistency of land use (Lautetu, Kumurur, & Warouw, 2019; Silaban, Owen, & Milala, 2021). The evaluation carried out by the government to monitor land use according to the spatial plan through monitoring one of them is in the coastline area based on (Bupati Giayar,

2021) which is located along 610.4 km of the coastline of Bali Province (Figure 1).

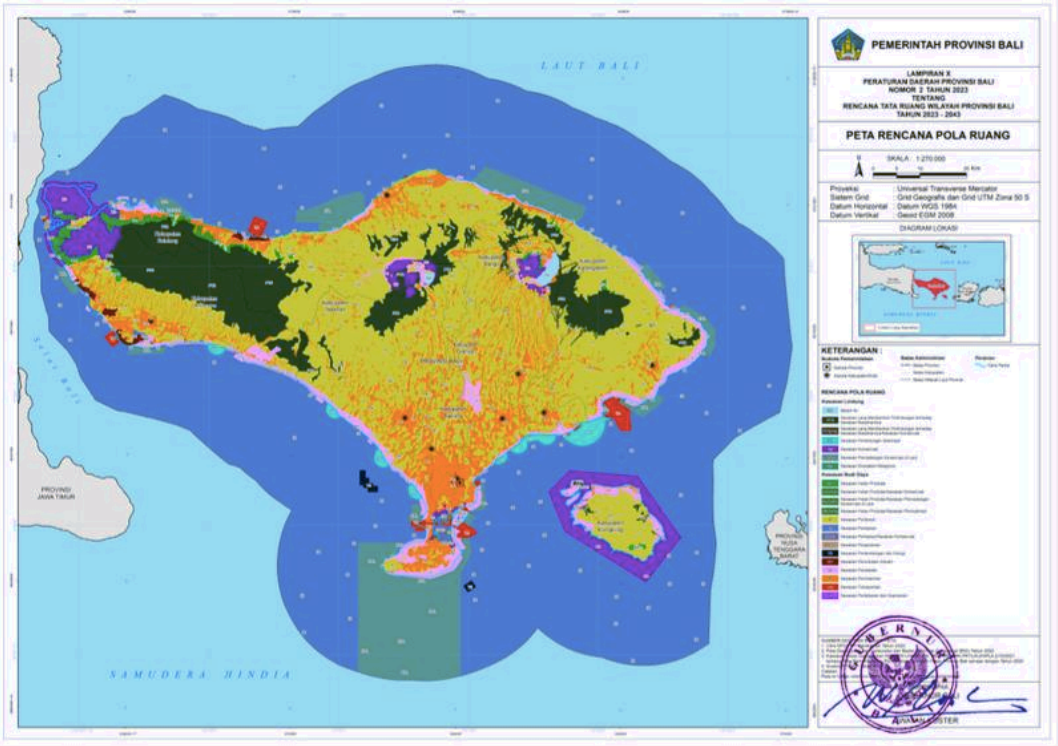

Figure 1. Spatial Plan of Bali Province in 2023 - 2043

In accordance with **Bali Provincial Government Regulations** (Pemerintah Provinsi Bali, 2009), one of the strategic areas based on the point of view of economic growth is a strategic tourism area located in southern Bali. Parts of strategic tourism areas that have coastline areas are Kuta, Nusa Dua, Legian, Pandawa, Tanjung Benua and More Beaches. Unlike the other beaches in Badung Regency, this beach is located in Gianyar Regency. This more coastal area is a developing area. As a tourist destination, this area is in great demand by investors, especially the coastline area which is considered attractive and potential because it presents beautiful beaches and blue sea with views towards Nusa Penida Island. This beach is also famous for its culinary tourism. Currently, there are indications that land use in the southern coastal areas of Bali, such as Sanur, Kuta, Legian, is

not in accordance with the spatial planning and coastal boundaries. Especially tourism support facilities such as restaurants and local resorts which are indicated as not complying with the provisions of the coastal area zoning regulations, as well as ignoring attention to aspects of disaster mitigation. Spatial information dissemination in the form of spatial planning information boards also does not yet exist in the area. The massive development of tourism accommodation buildings has not been followed by an understanding of the community and entrepreneurs regarding spatial planning, the importance of the existence of the coastline area as a public space as well as protection (Qiang & Lam, 2015; Rizal, 2021; Samanta & Paul, 2016).

In South Bali, part of the beach is also used as a place for traditional and religious ceremonies carried out by the Balinese Hindu community, both from villages around the coast and other villages (Vipriyanti & Kardi, 2015). In addition, the coastal area is also used to harbor fishing boats by the local community. This study aims to analyze the level of suitability of spatial use in developing coastal areas in South Bali and to formulate a strategy to control spatial use so that it is in accordance with the spatial plan.

2. Methods

Data collection in this study was carried out by observation, interviews, and questionnaires. Observations were made directly around the coastal border area to find out the use of existing space, observe beach conditions, and get an overview of the research location (Fauzy, 2019).

While in-depth interviews were conducted with regional officials who handle spatial planning, both provincial and district governments, as well as village officials and communities around the coast to find out the informants' perceptions of the current beach conditions and continued with distributing questionnaires to 15 people as respondents using the informant determination technique used through purposive sampling method (Dimitrovski, Lemmetyinen, Nieminen, & Pohjola, 2021; Dubbeling, de Zeeuw, & van Veenhuizen, 2010).

This research also uses a geospatial approach that utilizes Geographic Information Systems (GIS) (Fraser, Bernatchez, & Dugas, 2017). The Spatial analysis technique is done by overlaying the map. Analysis of the level of suitability for the use of the coastal area uses the criteria for the coastline area, namely an area along the coastline that is at least 100 (one hundred) meters wide from the highest tide point inland in proportion to the shape and physical condition of the beach (Samanta & Paul, 2016).

The overlay analysis uses a land use map for 2022 (existing conditions) with a spatial planning map (Bali Provincial Government, 2009) which aims to analyze the suitability of using more coastline boundaries on the south coast of Bali. The results of the overlay show the extent to which the existing space utilization is appropriate or not in accordance with the spatial plan, then the percentage is calculated.

This research focuses on the coastal area in the southern region of Gianyar Regency, to be precise in the *Lebih* beach area, because this area has the potential

to be developed into a culinary tourism object, but its development tends to be inconsistent with existing regulations.

SWOT and AHP analyzes are used to control land use so that it is in accordance with the Gianyar Regency spatial plan. In addition, this analysis is used to systematically identify various factors based on logic by maximizing strengths and opportunities while simultaneously minimizing weaknesses and threats. The analytical tools used are the IFE (Internal Factor Evaluation) and EFE (External Factor Evaluation) matrices and are equipped with an IE (Internal-External) matrix approach. The strategic decision-making process is always related to the development of government missions, objectives, strategies and policies (Henrique Dos Santos, Miranda, Sant'Anna, Oliveira, & Carvalho, 2019; Lasibey & Milyardo, 2021; Rahmatillah, Insyan, Nurafifah, & Hirsan, 2019; Vipriyanti, Semadi, & Fauzi, 2022). Design of AHP Analysis to determine strategy priority showed in Figure 2.

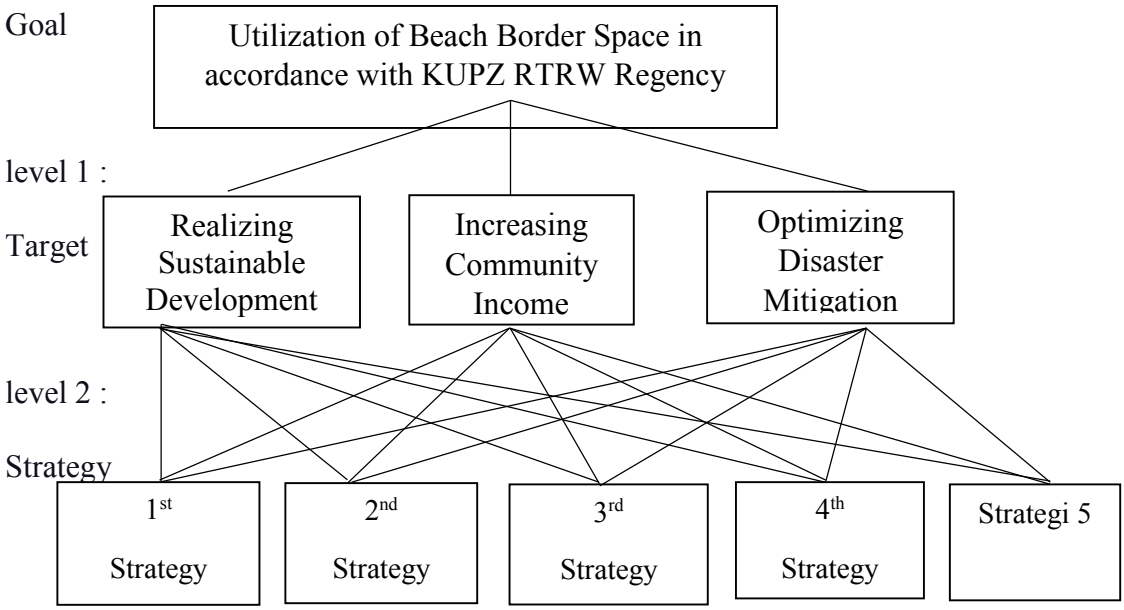

Figure 2. Design of AHP Model

3. Results

Based on the map of land use in the area along the coastline obtained through satellite imagery data for 2022, it shows that the area of land use in the area along the southern coastline of Bali is divided into eleven types of activities such as temples, rice fields, parks, swimming pools, houses, resorts (villa) , shops and homes, local restaurants, fishing facilities, recreational beaches, fishing and parking lots etc. The most extensive land use in the research location is plantation area of 88,115.86 m2 with a total beach area of 186,177.71 m2 of the total area of the village. Land use according to the data on the 2022 coastal area map is presented in Table 1.

Table 1. Land-use on the coastal area of South Bali in 2022

No.	Type of Activity	Area (m^2)	(%)
1	Temple	850.92	0.46
2	Rice field	61,983.77	33.29
3	Gardens	88,115.86	47.33
4	Swimming Pool	1,957.59	1.05
5	Houses	2,401.73	1.29
6	Resorts / Villa	7,097.65	3.81
7	Ruko (shop and house)	5,451.52	2.93
8	Local Restaurants	9,119.63	4.90
9	Fishermen facilities	2,059.87	1.11
10	Recreational Beach / Fishing	5,845.09	3.14
11	Parking Lots	1,294.08	0.70
Total		186,177.71	100.00

At this stage an overlay is carried out between the 2022 coastal land use map and the spatial plan pattern map (Bupati Giayar, 2021; Pemerintah Kabupaten Gianyar, 2012) especially in the coastline area to determine the area and percentage of land use that is suitable and not in accordance with the plan spatial. The coastline area is measured 100 m from the highest tide point inland, using

GIS to obtain an area of 23.85 hectare as shown in Figure 3.

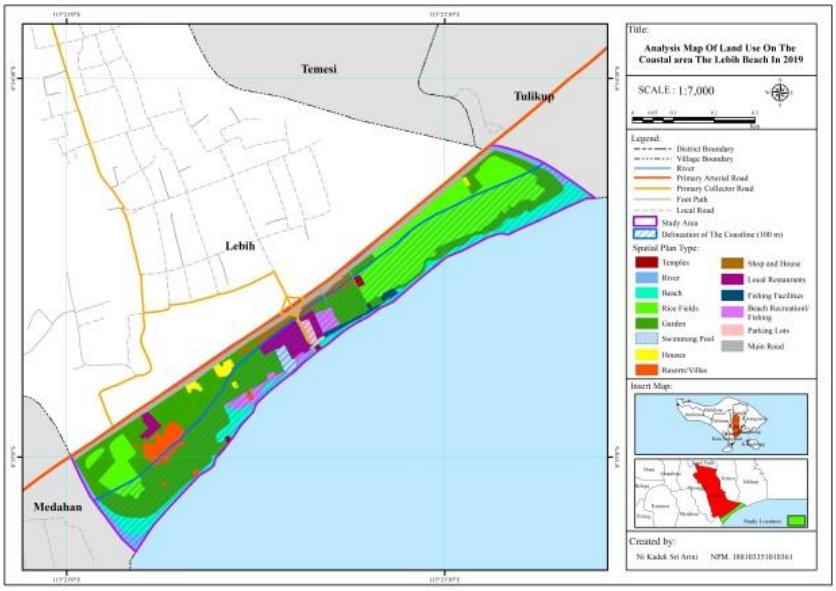

Figure 3. Analysis map of land use on the beach in 2022

Based on the results of the overlay, it can be described nine types of activities that utilize space in the coastline area according to their designation. Space utilization according to the Gianyar Regency spatial plan covering an area of 171,427.62 m2 or 92.08% of the total area of the study includes temples, fields, gardens, residential houses, resorts/villa, shophouses, local restaurants, fishing facilities, and beach/fisherman recreation, where the spatial utilization located in the coastline area and outside the area, but still in the study area. The utilization of the coastline area in accordance with the Gianyar Regency spatial plan can be seen in Table 2 and Figure 4.

Table 2. Land-use on the coastline area following the spatial plan of Gianyar Regency

No	Type of Utilization	Area	
		m^2	%
1	Temple	850.92	0.46
2	Rice fields	61,983.77	33.29
3	Gardens	88,115.86	47.33
4	Houses	2,203.41	1.18
5	Resorts / Villas	4,659,59	2.50
6	Ruko (shop and house)	3,989.33	2.14
7	Local Restaurants	1,719.78	0.92
8	Fisherman Facilities	2,059.87	1.11
9	Recreational Beach / Fishing	5,845.09	3.14
Total		171,427.62	92.08

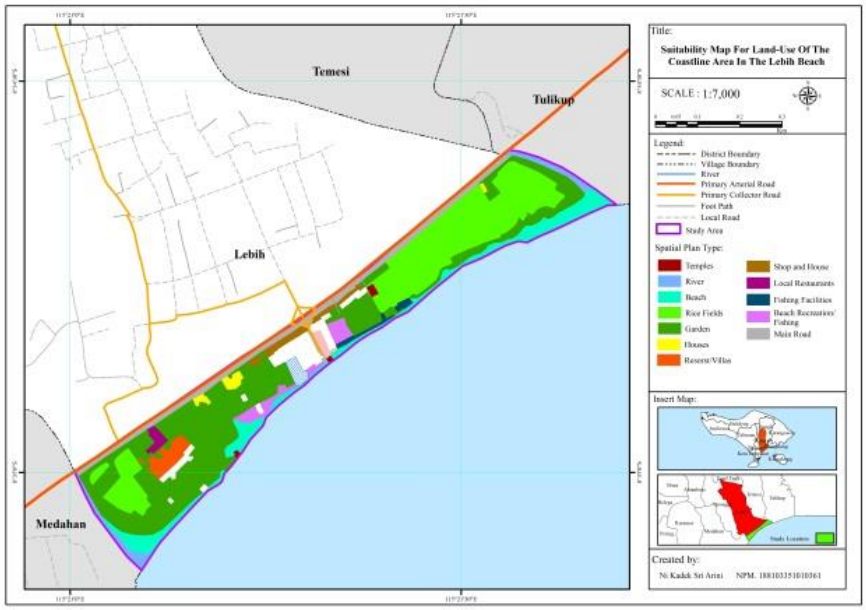

Figure 4. Suitability map for land-use of the coastline area

While the use of space on the coastline area that is not following the spatial plan of Gianyar Regency, the results of the overlaying obtained six types of activities including swimming pools, houses, resorts/villas, shop and house, local

restaurants, and parking lots that are on the radius of the coastline area with the entire area inappropriate utilization of 14,750.09 m^2 or 7.92% of the total area of the study area. The spatial utilization which is not following the spatial plan of Gianyar Regency can be seen in the Table 3 and Figure 5.

Table 3. Land-use area which is not following the spatial plan of the Gianyar Regency

No	Type of Utilization	Area	
		m^2	%
1	Swimming Pool	1,957.59	1.05
2	Houses	198,32	0.11
3	Resort / Villa	2,438.06	1.31
4	Ruko (Shop and house)	1,462.19	0.79
5	Local Restaurants	7,399.85	3. 97
6	Parking Lots	1,294.08	0.70
	Total	14,750.09	7.92

The cause of the mismatch of land use in the coastal area at the research location is due to (1) the low level of public understanding of the function of the coastal area in accordance with the conditions of the forest area, (2) the lack of intensive outreach regarding land use, (3) the weak control by the government. This is consistent with research which states that outreach to the public about public green open spaces is one of the determining factors for inappropriate land use, and (4) there is no detailed spatial plan that regulates coastal areas.

Figure 5. The Mismatch Lap of land-Use in the Coastline area

Identification on the internal part of the coastline area describes the internal factors that are the strengths and weaknesses of the area. Based on the weighting given by the respondents to the existing factors, it shows that the main strength in preserving the coastal area is the sacred value of the beach because it is used as a religious ceremony for Hindus in Bali. The main weakness of the coastline area in the South Bali Coastal area is that there are no signs prohibiting certain activities. This is consistent with previous research conducted by Vipriyanti et al., 2022. The formulation of the IFE matrix for this coastline area can be seen in Table 4.

Table 4. The IFE matrix of the coastline area in the South Bali Coastal

No	Internal Factors	Weight	Rating	Score
	Strengths			
1	There is support for local government (Strategic Area District)	0.14	3.73	0.52
2	Availability of infrastructure road access	0.13	3:53	0.47
3	Sacred place for traditional ceremony (*Melasti)*	0.14	3.73	0.53
4	View of the Beach	0.14	3.73	0.53
5	The existence of culinary tours	0.12	3.27	0.40
6	The existence of Infrastructure coastal security	0.02	0.53	0.01
7	The existence of Jogging Track	0.01	0.27	0.00

8	The activities of fishermen	0.02	0.47	0.01
9	The existence of traditional ceremony (*Nangluk)*	0.01	0.27	0.00
	Weakness			
1	There is no socialization about the spatial planning (map information board)	0.06	1.53	0.09
2	Lack of the spatial plans detail	0.04	1.13	0.05
3	There is no coastline designation yet	0.04	1.13	0.05
4	Reduced public space planning	0.05	1.40	0.07
5	Lack of community understanding of the spatial plan	0.05	1.27	0.06
6	Spatial violations	0.00	0.07	0.00
7	Investment in economic activities	0.01	0.13	0.00
8	Beach cleanliness not yet maintained	0.00	0.07	0.00
9	Coastal abrasion occurred	0.01	0.20	0.00
	Total	1.00		2.80

The IFE matrix in Table 4 showed the results of respondent assessment of the coastline area in utilizing strengths and minimizing weaknesses has a total value of 2.80. There are two of the greatest strengths that belong to the coastline area that is sacred place for traditional ceremony (called *Melasti)* and view of the Beach with a value of 0.53. Then for the second strength is the existence of district government support (Regency Strategic Area) with a value of 0.52.

While the main weakness is seen from the lowest score. There are four main weaknesses that are owned by the coastline area in of the Beach, that are the violation of the spatial planning, investment in economic activities, cleanliness of the beach has not been maintained, and there is a beach abrasion with a value of 0.00. Then for the second weakness are, there is no detailed spatial plan yet and there is no determination of the coastline line by the government with a value of 0.05.

The identification of the external portion of the coastline area in the Beach generates an external picture or factor in the form of opportunities and threats.

After that, each factor is given a weighting and rating by each respondent. The results from weighting and rating external factors will be formulated in the form of an EFE (External Factor Evaluation) matrix. The EFE matrix formulation for the coastline area in the South Bali Coastal can be seen in Table 5.

Table 5. The EFE matrix of the coastline area in the South Bali Coastal

No	External Factor	Weight	Rating	Score
	Opportunities			
	The commitment from the government about the importance of the spatial planning	0.15	3.80	0.58
	Progress of compiling detailed of the spatial planning	0.14	3.60	0.52
	The high demand for space utilization (investor)	0.12	3.00	0.36
	Increasing community income through tourism activities	0.14	3.40	0.46
	Can be used as promotion and tourism package	0.14	3.40	0.46
	Protection of provincial strategic areas / coastal abrasion	0.01	0.20	0.00
	Threats			
	Difficulty for implementing the regional spatial plans, due to sectoral growth and market demand	0.07	1.73	0.12
	Conflicts between activities in the coastline area	0.06	1.53	0.09
	Pressure on natural resources and the environment	0.05	1.27	0.06
	Community economic competition	0.06	1.47	0.09
	Weak law enforcement of local regulations on the spatial plans in the Gianyar Regency	0.06	1.47	0.09
	Limited human resources as a spatial planning investigator	0.00	0.07	0.00
	Lack of government attention in supervising the land-use	0.00	0.07	0.00
	Total	**1.00**		**2.83**

The EFE matrix in Table 5 showed the assessment results of respondents of the coastline area in the Beach has a total value of 2.83. The coastline area has a high enough ability to take advantage of existing opportunities and overcome the threats that occur. The biggest opportunity owned by the coastline area is the commitment from the government about the importance of the spatial planning with a value of 0.58. For the second largest opportunity, which is the progress of compiling detailed of the spatial planning with a value of 0.52.

While the two biggest threats that occur in the coastline area are the limited human resources as spatial investigators and the lack of government attention in supervising the land-use with a value of 0.00. Then for the second biggest threat, is the pressure on natural resources and the environment with a value of 0.06.

The IE (Internal-External) matrix serves to determine the position of the coastline area in the Beach. Following the IFE matrix formulation which is owned by the coastline area in the Beach. The total value is 2.80 which indicates that the coastline area has an average ability to utilize strengths and minimize weaknesses. Whereas in the EFE matrix, the coastline area in the Beach has a total value of 2.83, it can be concluded that the opportunity for the coastline area can be utilized to cover existing threats. If the two values are found, they will be in cell V of the IE matrix, which is defending and maintaining column (strategy has not changed). Figure 4 shows the position of the coastline area in the Beach on the IE matrix.

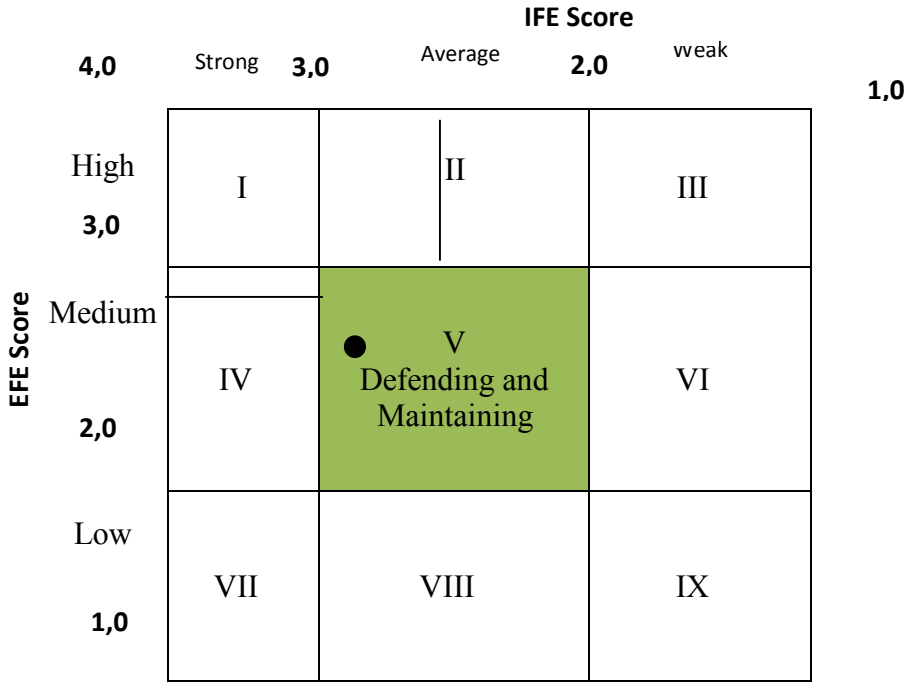

Fig. 6. The IE matrix of the coastline area

The growth strategies are designed to achieve growth, both in sales, assets, profits, or a combination of the three. This can be achieved through market penetration and special product development. Efforts that can be carried out to control spatial use in the coastline area in the beach are to intensify socialization and supervision of land-use control, compile the detailed spatial plans, implementing incentive programs and disincentives to relevant stakeholders and strengthened in enforcing regional regulations regarding the spatial plan of the government. The Priority of Strategy for achieving suitability of land use in south Bali coastal area presented in Table 6.

Table 6. Analysis of AHP for Determining Strategy Priority

Level	Description	Score
1.	**Criteria/Target**	
	1. Optimizing Disaster Mitigation	0.382
	2. Increasing Community Income	0.319
	3. Realizing Sustainable Development	0.300
2	**Strategy Alternavie**	
	1. Building an information board about Map of Regional Spatial Plan to increase public knowledge of the importance of coastal border areas that function as protected areas and disaster mitigation efforts.	0.294
	2. Preparing a detail spatial plan as a guideline for government to ensure suitable land use in coastal area.	0.317
	3. Implementing incentive and disincentive programs.	0.148
	4. Strengthening the law enforcement	0.241

4. Conclusion

The suitability level of the use of space in the coastline area that is the use of space following the spatial plan of Gianyar Regency with an area of 171,427.62 m^2 or 92.08%, while the use of space in the coastline area is not following the land-use plan because the space is at a radius area of coastline area of 14,750.09 m^2 or only 7.92% of the total area of research. Strategies that can be carried out in efforts to control land-use of the coastline area in South Bali are intensifying the socialization and supervision of land-use control, preparing detailed the spatial plans, implementing incentive programs and disincentives to relevant stakeholders, and strengthened in enforcing regional regulations regarding the spatial plan of the Regency.

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Land-use problem and controling for sustainable coastal development in South Bali

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Abstract Land-use development in the coastline areas due to tourism activities leads to indications of the spatial significant discrepancy because it is not in line with the spatial planning and does not pay attention to aspects of disaster mitigation. Therefore, it is essential to maintain the coastline area that used as protection and public space. Although several previous studies have been conducted, there are still many spatial violations. This study analyses the level of land-use suitability in the coastline area and formulates strategies for land-use control following the spatial plan. The study employs Geographic Information System (GIS) by overlaying the land use map in 2022 with the regional spatial plan of Gianyar Regency. Here, the data analysis used a matrix of the Internal Factor Evaluation (IFE), the External Factor Evaluation matrix (EFE) and the Internal External Matrix (IE). The results show that 171,427.62 m^2 (92.08%) of the existing coastal land use is in conformity with the spatial plan. Meanwhile, there is 14,750.09 m^2 (7.92%) of the total study area that is not conforming with the spatial plan. Strategies that can be carried out in efforts to control land-use are intensifying the socialization and supervision of land-use control, preparing detailed the spatial plans, implementing incentive and disincentive programs to relevant stakeholders, and strengthened in enforcing regional regulations regarding the spatial plan of the Gianyar Regency.

Keywords Coastline · Land use · Spatial plan · Strategic planning · Sustainability

Introduction

The spatial plan is a product of the spatial planning system, land-use, and land-use control. The implementation of land-use is a normative condition from the land requirements by the community to support activities in their survival. Land needs become a significant prerequisite thinking about the high populace development (Sugiarto, 2017). The condition of regional space in Indonesia now days is long way from the spatial planning objectives to create a safe, comfortable, productive, and sustainable space. In Indonesia, the direction of the spatial planning action consists of planning, use, and control. These three components greatly affect one component to another. If the implementation of one component is

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insufficient, the results obtained will be worse. The impact is increasing the intensity of disasters, and natural damage (Cendrero, 1989; Hadley, 2009).

Land-use control is an inseparable part of the spatial planning process. This control exertion is done by setting zoning regulations, incentives and disincentives, and forcing sanctions. According to Rizal (2021), land-use control through incentive and disincentive instruments is critical in building up the coastline area.

The utilization of space in many regions in Indonesia, in its implementation, is not always following the established spatial plan. There are as yet numerous infringement of the spatial planning because of the utilisation of gentle endorses with the goal that the effect on open consideration on the spatial planning is low (Junef, 2016). The significant discrepancy of land-use is affected by weak law enforcement, low community role, and limited infrastructure. Each provincial and district or city government needs to control existing land-use and evaluating the suitability of its use with the spatial plans as an effort to maintain the consistency of regional spatial planning implementation (Utomo, 2012). Apart from the qualities of the environment (characteristic), residential, and socio-economic, community participation is also important to keep up the consistency of land-use (Lautetu et al., 2019; Silaban et al., 2021). An evaluation conducted by the government to monitor land-use following the spatial plan through monitoring one of them on the coastline area based on (Bupati, 2021) located along the 610.4 km coastline of the Bali Province (Fig. 1).

Following the regulation of Bali Government (Pemerintah Provinsi Bali, 2009), one of the strategic areas based on the point of interest in economic growth is the strategic tourism area which is located in the southern part of Bali. Part of the strategic tourism area with a coastline area is Kuta, Nusa Dua, Penida, Legian, Lebih and Pandawa Beach. As one

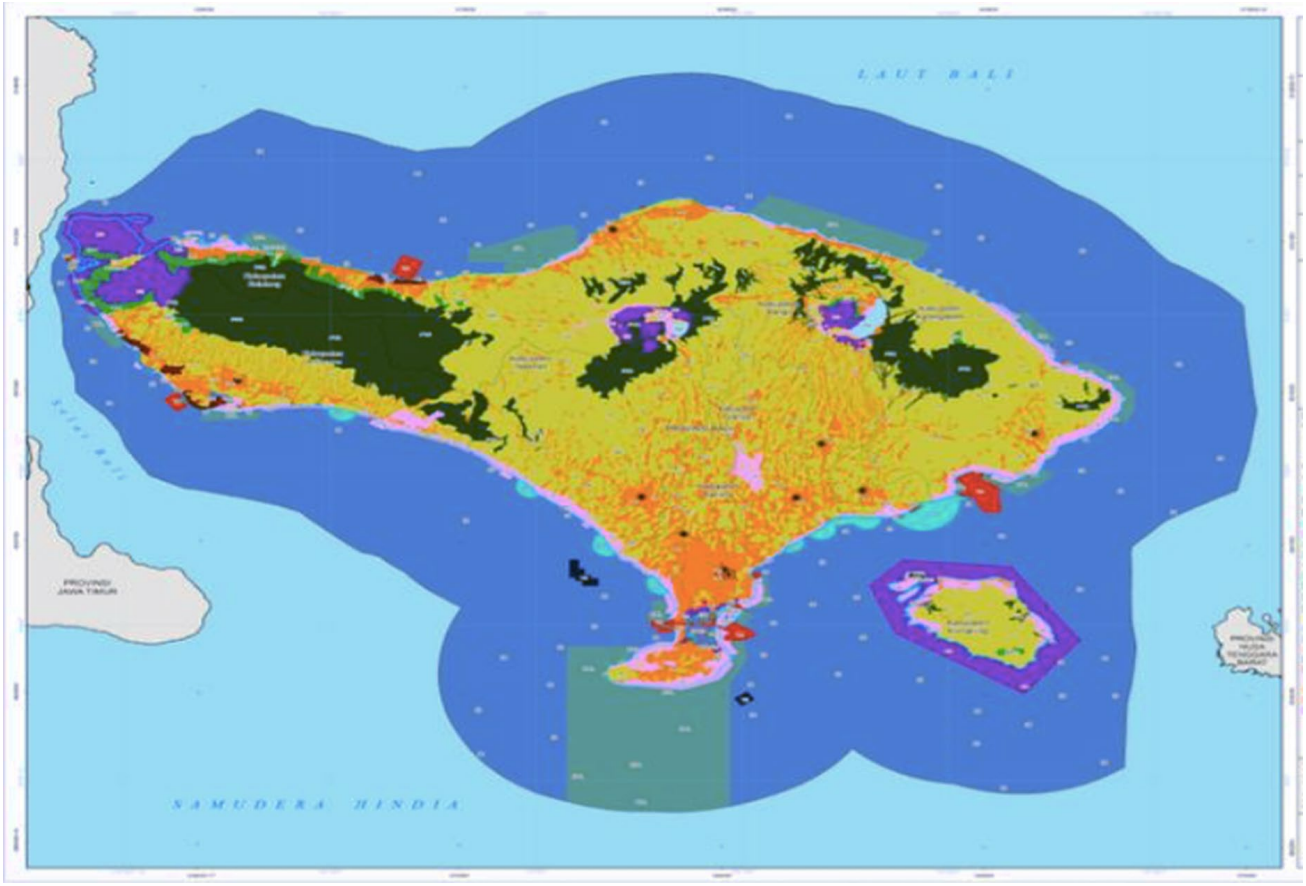

Fig. 1 Spatial Plan of Bali Province in 2023–2043

of the tourism destinations, the beach area is more in demand by investors, especially the coastline area which is considered interesting and potential because it presents the beauty of the beach and blue sea. All beaches are also famous for its culinary tourism. At present there are various land-use categories in the coastline area of south Bali. More in the form of tourism support facilities such as local restaurants and resorts that are indicated to be incompatible with the provisions of zoning regulations for coastline area and ignore the attention to aspects of disaster mitigation. The spatial information dissemination in the form of the spatial planning information boards also does not yet exist in the area. So that the massive development of tourism accommodation building is not followed by understanding both local people and entrepreneurs of the spatial planning. Neither the importance of the existence of the coastline area as public spaces as well as protection. In South Bali, some of the beach is also used for traditional and religion ceremonies named *Melasti* and *Nangluk* which is conducted by religious Hindu communities both come from village surround the beach (Agung & Vipriyanti, 2019; Vipriyanti & Kardi, 2015). Also, the coastline area is used to anchorage fishing boat by local people.

Sustainability is the main goal of development programs in coastal areas. Conflicts over the use of land resources often occur, so the government needs to manage all parties and integrate sectoral and regional development programs. There are three efforts are needed to achieve sustainable coastal management such as: (1) well identified all parties and actively involve; (2) holistic and cross sectional approach; and (3) evaluation and intervention by community (Dimitrovski et al., 2021; Lee et al., 2020; Powell et al., 2019).

Massive development in coastal areas needs to consider externalities. The benefits of development are indeed obtained by local communities, but the costs incurred often become an additional burden for them. This is the main problem known as spatial externalities (Magontier, Sole-Olle, & Marsal, 2021). People and tourists can enjoy beautiful beaches and coastal areas, but development in these areas can cause externalities in the form of a decrease in environmental quality. Faber & Gaubert (2019) stated that development along the Mexican coast has had a positive impact on society in providing employment opportunities . However, it has an impact on the comfort of people's lives. This study aims to analyses the suitability level of using space in the coastline area in South Bali Province and formulate a strategy for controlling land-use following the spatial plan**.**

Methods

The data collection in this study was carried out by observation, interviews, and questionnaires. The observation was carried out by direct observation around the border area of the Beach (called *sempadan pantai*) to determine the use of existing space, to observe the beach existing condition, and to know the study area characteristics. While in-depth interviews were conducted with regional apparatuses handling the spatial planning both provincial and district governments, also the village apparatus and the local community near the beach to find out the existing condition of the beach and followed by distributing questionnaires to respondents with informants determining techniques used through the purposive sampling method.

This research was conducted using a geospatial approach that utilises Geographic Information Systems (GIS) (Fraser et al., 2017). The Spatial analysis technique is done by overlaying the map. Analysis of the suitability level of the existing land-use in the coastline area is more emphasised with the criteria following Presiden Indonesia (2016) that the land along the coastline whose width is proportional to the shape and physical condition of the beach, at least 100 (one hundred) meters from the highest tide point towards the land (Samanta & Paul, 2016).

This analysis was carried out overlaying the existing land-use map in 2022 with the map of the spatial plan (Pemerintah Provinsi Bali, 2009) which aims to analyse the existing land-use suitability with the spatial plan, especially in south beach of Bali. The result is the extent of existing land-use utilisation that is suitable and unsuitable according to the spatial plan, both spatially and statistically.

This research focuses on coastal areas in the southern region of Gianyar regency-Bali, namely *Lebih* beaches because this area has the potential to develop into culinary tourism objects, but its development tends to be disobedient to existing regulations. The Strength-Weakness-Opportunity-Threat (SWOT) analysis is used to control land-use development

following the spatial plan of the Gianyar Regency. The SWOT analysis can identify various factors systematically based on the logic that can maximize strengths and opportunities, but simultaneously can minimise weaknesses and threat. The analytical tool used is the Internal Factor Evaluation (IFE) and the External Factor Evaluation (EFE) matrix and is equipped with an Internal–External (IE) matrix approach. The strategic decision-making process is always related to the development of mission, goals, strategies, and policies (Henrique Dos Santos et al., 2019; Lasibey & Milyardo, 2021; Rahmatillah et al., 2019; Vipriyanti et al., 2022).

Results

Land-use of Coastline Area in South Bali

Land-use map along the coastline is obtained by digitizing on-screen on 2022 satellite imagery, the results obtained are the extent of land-use along the Bali south coastline that is divided into eleven types of activities such as temples, rice fields, garden, swimming pool, houses, resorts/villas, shop and house, local restaurants, fisherman facilities, recreational beach/fishing, and parking lots. With the most extensive activities namely plantation area of 88,115.86 m^2 with a total study area of 186,177.71 m^2 (Table 1 and Fig. 2).

At this stage, it was carried out an overlaying between the coastal land-use map over 2022 coupled with a map of the spatial plan patterns (Bupati, 2021; Pemerintah Kabupaten Gianyar, 2012) especially in coastline area for determining the extent and percentage of suitable and unsuitable land-use according to the spatial plan. The coastline area is measured as far as 100 m from the highest tide point towards the land, using GIS obtained an area of 23.85 ha as shown in the Fig. 2.

The overlay analysis provided nine types of activities that take advantage of space in the coastline area are following its designation. Utilization of space corresponding the spatial plan of Gianyar Regency covering 171,427.62 m^2 or 92.08% of the total area of research includes temples, fields, gardens, houses, resorts/villas, shop and house, local restaurants, fishermen facilities, and recreational beach/fishing, where the utilization of the space located in coastline area and outside the area, but still within the study area. The utilization area of the coastline of the beach that is following the spatial plan of the Gianyar Regency can be seen in the Table 2 and Fig. 3.

Table 1 Land-use on the coastal area of South Bali in 2022

No	Type of Activity	Area	
		m^2	%
1	Temple	850.92	0.46
2	Rice field	61,983.77	33.29
3	Gardens	88,115.86	47.33
4	Swimming Pool	1,957.59	1.05
5	Houses	2,401.73	1.29
6	Resorts/Villa	7,097.65	3.81
7	Shophouse	5,451.52	2.93
8	Local Restaurants	9,119.63	4.90
9	Fishermen facilities	2,059.87	1.11
10	Recreational Beach / Fishing	5,845.09	3.14
11	Parking Lots	1,294.08	0.70
Total		186,177.71	100.00

While the use of space on the coastline area that is not following the spatial plan of Gianyar Regency, the results of the overlaying obtained six types of activities including swimming pools, houses, resorts/villas, shop and house, local restaurants, and parking lots that are on the radius of the coastline area with the entire area inappropriate utilization of 14,750.09 m^2 or 7.92% of the total area of the study area. The spatial utilization which is not following the spatial plan of Gianyar Regency can be seen in the Table 3 and Fig. 4.

Unsuitable land-use in the coastal area of Gianyar Regency is caused by the lack of community understanding about the function of the coastline area which is in line with conditions in the forest area, un-intensive socialization regarding land-use control by the government, this is following research that the importance of socialization to the public about public green open space, as well as the lack of detailed the spatial plans governing the coastline area. Incompatibility of land use in the coastline area can be also caused by an increase in people's income, resulting in a need for leisure and housing (Hadley, 2006).

Fig. 2 Map Analysis of Land Use in Lebih Beach, 2022

Table 2 Land-use on the coastline area following the spatial plan of Gianyar Regency

No	Type of Utilisation	Area	
		m^2	%
1	Temple	850.92	0.46
2	Rice fields	61,983.77	33.29
3	Gardens	88,115.86	47.33
4	Houses	2,203.41	1.18
5	Resorts / Villas	4,659,59	2.50
6	Shophouse	3,989.33	2.14
7	Local Restaurants	1,719.78	0.92
8	Fisherman Facilities	2,059.87	1.11
9	Recreational Beach / Fishing	5,845.09	3.14
Total		171,427.62	92.08

Land-use controlling Strategy in South Bali Coastline Area

Identification in the internal portion of the coastline area in the beach generates an overview or internal factors that are the strengths and weaknesses of the area. From the existing factors, respondents will be given a weighting and rating. Results from weighting and rating internal factors will be formulated in the form of an IFE matrix. The IFE matrix can summarize and evaluate the main strengths and weaknesses of the coastline area in South Bali Coastal area. The formulation of the IFE matrix for this coastline area can be seen in Table 4.

Table 4 showed the results of respondent assessment of the coastline area in utilizing strengths and minimizing weaknesses has a total value of 2.80. There are two of the greatest strengths that belong

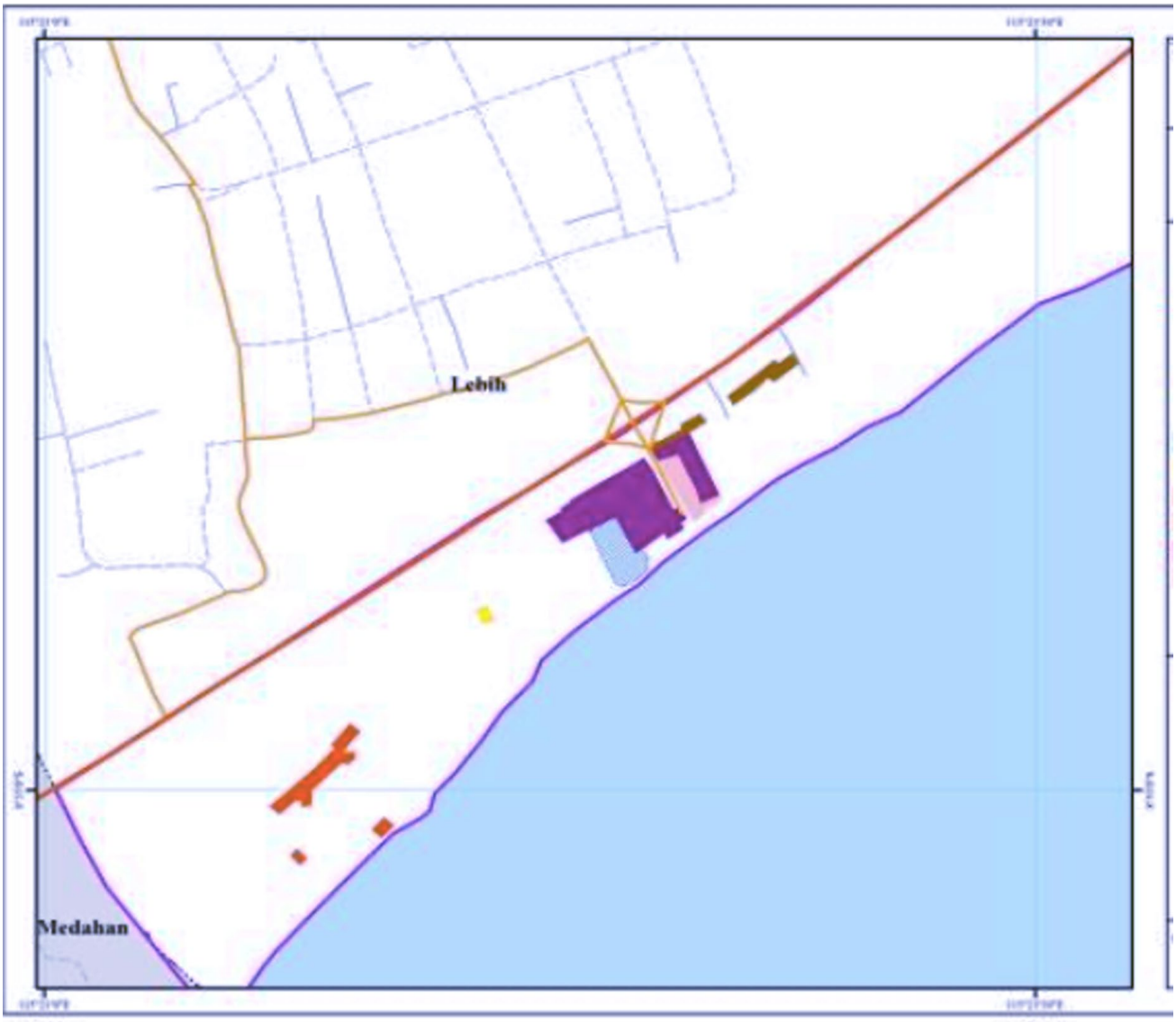

Fig. 3 The Discrepancy Map of Land-Use in the Coastline area

Table 3 Land-use area which is not following the spatial plan of the Gianyar Regency

No	Type of Utilisation	Area	
		m^2	%
1	Swimming Pool	1,957.59	1.05
2	Houses	198,32	0.11
3	Resort/Villa	2,438.06	1.31
4	Shophouse	1,462.19	0.79
5	Local Restaurants	7,399.85	3. 97
6	Parking Lots	1,294.08	0.70
	Total	14,750.09	7.92

to the coastline area that is sacred place for traditional ceremony (*Melasti)* and view of the beach with a value of 0.53. Then for the second strength is the existence of district government support (Regency Strategic Area) with a value of 0.52.

While the main weakness is observed from the lowest score. There are four main weaknesses that are owned by the coastline area in of the beach, that are the violation of the spatial planning, investment in economic activities, cleanliness of the beach has not been maintained, and there is a beach abrasion with a value of 0.00. Then, for the second weakness are, there is no detailed spatial plan yet and there is no determination of the coastline line by the government with a value of 0.05.

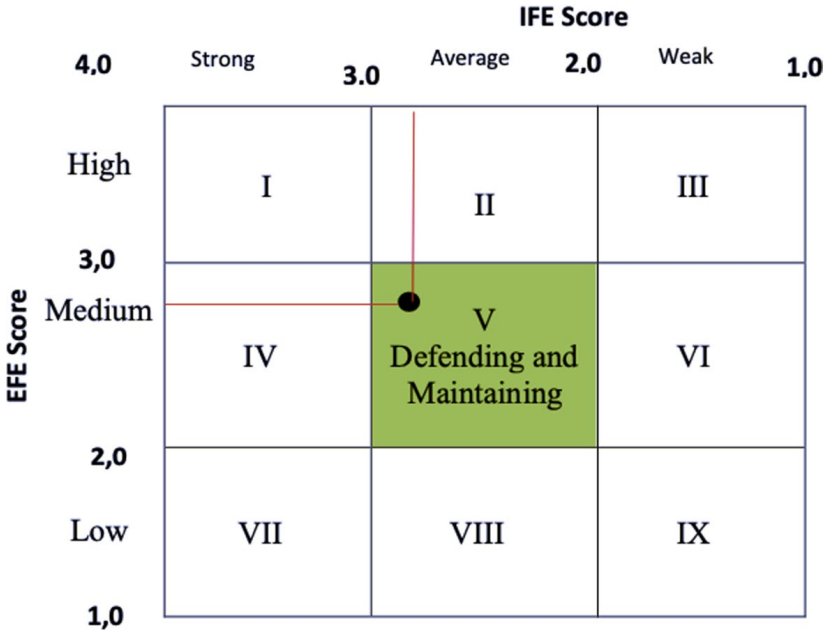

Fig. 4 The IE matrix of the coastline area

The identification of the external portion of the coastline area in the beach generates an external picture or factor in the form of opportunities and threats. After that, each factor is given a weighting and rating by each respondent. The results from weighting and rating external factors will be formulated in the form of an EFE matrix. The EFE matrix formulation for the coastline area in the South Bali Coastal can be seen in Table 5.

Table 5 shows the assessment results of respondents of the coastline area in the Beach has a total

Table 4 The IFE matrix of the coastline area in the South Bali Coastal

No	Internal Factors	Weight	Rating	Score
Strengths				
1	There is support for local government (Strategic Area District)	0.14	3.73	0.52
2	Availability of infrastructure road access	0.13	3:53	0.47
3	Sacred place for traditional ceremony (*Melasti)*	0.14	3.73	0.53
4	View of the Beach	0.14	3.73	0.53
5	The existence of culinary tours	0.12	3.27	0.40
6	The existence of Infrastructure coastal security	0.02	0.53	0.01
7	The existence of Jogging Track	0.01	0.27	0.00
8	The activities of fishermen	0.02	0.47	0.01
9	The existence of traditional ceremony (*Nangluk)*	0.01	0.27	0.00
Weakness				
1	There is no socialisation about the spatial planning (map information board)	0.06	1.53	0.09
2	Lack of the spatial plans detail	0.04	1.13	0.05
3	There is no coastline designation yet	0.04	1.13	0.05
4	Reduced public space planning	0.05	1.40	0.07
5	Lack of community understanding of the spatial plan	0.05	1.27	0.06
6	Spatial violations	0.00	0.07	0.00
7	Investment in economic activities	0.01	0.13	0.00
8	Beach cleanliness not yet maintained	0.00	0.07	0.00
9	Coastal abrasion occurred	0.01	0.20	0.00
	Total	1.00		2.80

Table 5 The EFE matrix of the coastline area in the South Bali Coastal

No	External Factor	Weight	Rating	Score
Opportunities				
The commitment from the government about the importance of the spatial planning	0.15	3.80	0.58	
Progress of compiling detailed of the spatial planning	0.14	3.60	0.52	
The high demand for space utilisation (investor)	0.12	3.00	0.36	
Increasing community income through tourism activities	0.14	3.40	0.46	
Can be used as promotion and tourism package	0.14	3.40	0.46	
Protection of provincial strategic areas / coastal abrasion	0.01	0.20	0.00	
Threats				
Difficulty for implementing the regional spatial plans, due to sectoral growth and market demand	0.07	1.73	0.12	
Conflicts between activities in the coastline area	0.06	1.53	0.09	
Pressure on natural resources and the environment	0.05	1.27	0.06	
Community economic competition	0.06	1.47	0.09	
Weak law enforcement of local regulations on the spatial plans in the Gianyar Regency	0.06	1.47	0.09	
Limited human resources as a spatial planning investigator	0.00	0.07	0.00	
Lack of government attention in supervising the land-use	0.00	0.07	0.00	
Total	1.00		2.83	

value of 2.83. The coastline area has a high enough ability to take advantage of existing opportunities and overcome the threats that occur. The biggest opportunity owned by the coastline area is the commitment from the government about the importance of the spatial planning with a value of 0.58. For the second largest opportunity, which is the progress of compiling detailed of the spatial planning with a value of 0.52.

While the two biggest threats that occur in the coastline area are the limited human resources as spatial investigators and the lack of government attention in supervising the land-use with a value of 0.00. Then for the second biggest threat, is the pressure on natural resources and the environment with a value of 0.06.

The IE matrix serves to determine the position of the coastline area in the Beach. Following the IFE matrix formulation which is owned by the coastline area in the Beach. The total value is 2.80 which indicates that the coastline area has an average ability to utilise strengths and minimisyzee weaknesses. Whereas in the EFE matrix, the coastline area in the Beach has a total value of 2.83, it can be concluded that the opportunity for the coastline area can be utilised to cover existing threats. If the two values are found, they will be in cell V of the IE matrix, which is defending and maintaining column (strategy has not changed). Figure 4 shows the position of the coastline area in the Beach on the IE matrix.

The growth strategies are designed to achieve growth, both in sales, assets, profits, or a combination of the three. This can be achieved through market penetration and special product development. Efforts that can be carried out to control spatial use in the coastline area in the beach are to intensify socialisation and supervision of land-use control, compile the detailed spatial plans, implementing incentive programs and disincentives to relevant stakeholders and strengthened in enforcing regional regulations regarding the spatial plan of the government.

Conclusion

The level of land use suitability in the south Bali coastline area that following the spatial plan of Gianyar Regency has an area of 171,427.62 m^2 or 92.08%, while 14,750.09 m^2 or 7.92% of the study area is unsuitable with the spatial plan. Strategies that can be carried out in efforts to control land-use of the coastline area in South Bali are intensifying the socialisation and supervision of land-use control, preparing detailed the spatial plans, implementing incentive

programs and disincentives to relevant stakeholders, and strengthened in enforcing regional regulations regarding the spatial plan of the Gianyar Regency.

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Land-use problem and controling for sustainable coastal development in South Bali

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Abstract Land-use development in the coastline areas due to tourism activities leads to indications of the spatial significant discrepancy because it is not in line with the spatial planning and does not pay attention to aspects of disaster mitigation. Therefore, it is essential to maintain the coastline area that used as protection and public space. Although several previous studies have been conducted, there are still many spatial violations. This study analyses the level of land-use suitability in the coastline area and formulates strategies for land-use control following the spatial plan. The study employs Geographic Information System (GIS) by overlaying the land use map in 2022 with the regional spatial plan of Gianyar Regency. Here, the data analysis used a matrix of the Internal Factor Evaluation (IFE), the External Factor Evaluation matrix (EFE) and the Internal External Matrix (IE). The results show that 171,427.62 m^2 (92.08%) of the existing coastal land use is in conformity with the spatial plan. Meanwhile, there is 14,750.09 m^2 (7.92%) of the total study area that is not conforming with the spatial plan. Strategies that can be carried out in efforts to control land-use are intensifying the socialization and supervision of land-use control, preparing detailed the spatial plans, implementing incentive and disincentive programs to relevant stakeholders, and strengthened in enforcing regional regulations regarding the spatial plan of the Gianyar Regency.

Keywords Coastline · Land use · Spatial plan · Strategic planning · Sustainability

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Introduction

The spatial plan is a product of the spatial planning system, land-use, and land-use control. The implementation of land-use is a normative condition from the land requirements by the community to support activities in their survival. Land needs become a significant prerequisite thinking about the high populace development (Sugiarto, 2017). The condition of regional space in Indonesia now days is long way from the spatial planning objectives to create a safe, comfortable, productive, and sustainable space. In Indonesia, the direction of the spatial planning action consists of planning, use, and control. These three components greatly affect one component to another. If the implementation of one component is

insufficient, the results obtained will be worse. The impact is increasing the intensity of disasters, and natural damage (Cendrero, 1989; Hadley, 2009).

Land-use control is an inseparable part of the spatial planning process. This control exertion is done by setting zoning regulations, incentives and disincentives, and forcing sanctions. According to Rizal (2021), land-use control through incentive and disincentive instruments is critical in building up the coastline area.

The utilization of space in many regions in Indonesia, in its implementation, is not always following the established spatial plan. There are as yet numerous infringement of the spatial planning because of the utilisation of gentle endorses with the goal that the effect on open consideration on the spatial planning is low (Junef, 2016). The significant discrepancy of land-use is affected by weak law enforcement, low community role, and limited infrastructure. Each provincial and district or city government needs to control existing land-use and evaluating the suitability of its use with the spatial plans as an effort to maintain the consistency of regional spatial planning implementation (Utomo, 2012). Apart from the qualities of the environment (characteristic), residential, and socio-economic, community participation is also important to keep up the consistency of land-use (Lautetu et al., 2019; Silaban et al., 2021). An evaluation conducted by the government to monitor land-use following the spatial plan through monitoring one of them on the coastline area based on (Bupati, 2021) located along the 610.4 km coastline of the Bali Province (Fig. 1).

Following the regulation of Bali Government (Pemerintah Provinsi Bali, 2009), one of the strategic areas based on the point of interest in economic growth is the strategic tourism area which is located in the southern part of Bali. Part of the strategic tourism area with a coastline area is Kuta, Nusa Dua, Penida, Legian, Lebih and Pandawa Beach. As one

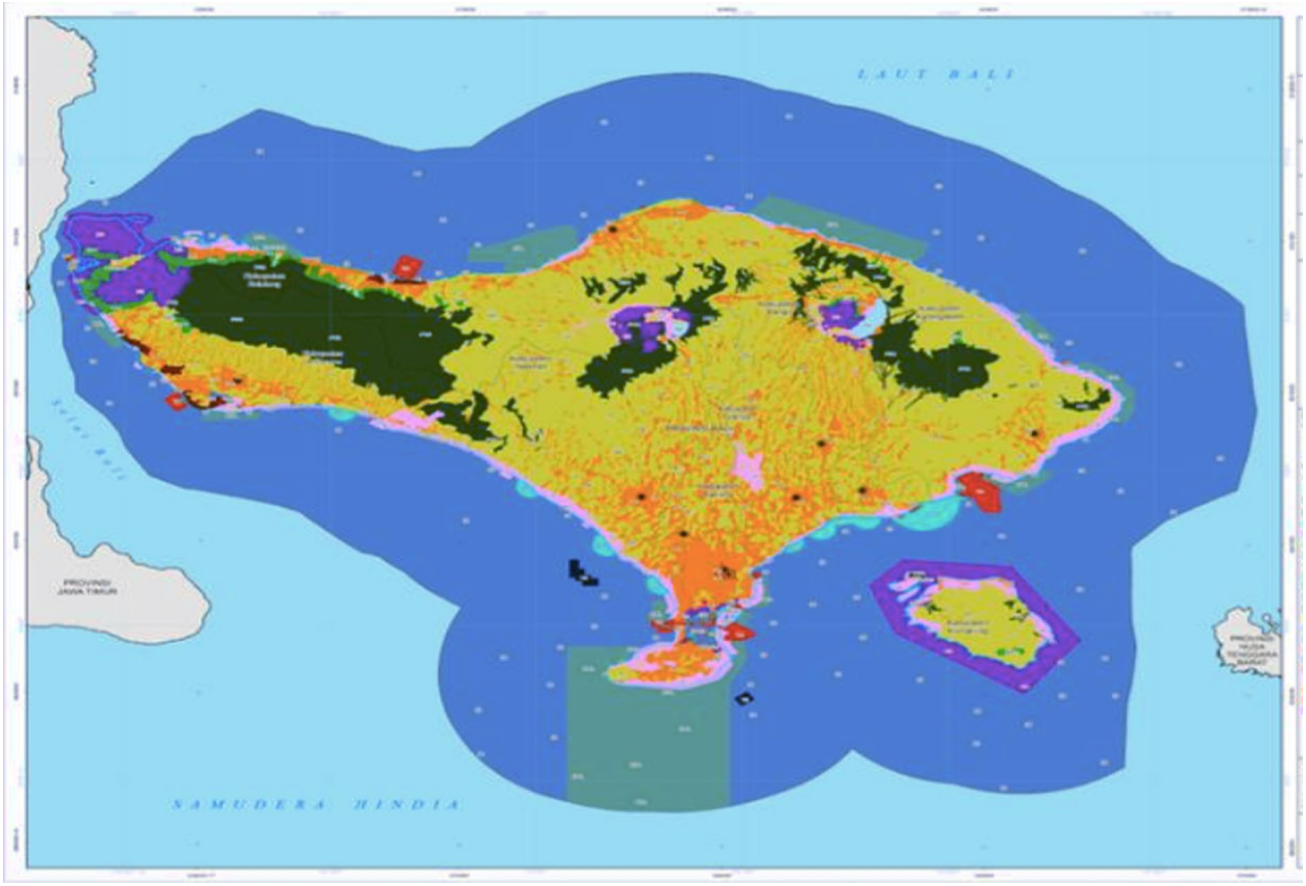

Fig. 1 Spatial Plan of Bali Province in 2023–2043

of the tourism destinations, the beach area is more in demand by investors, especially the coastline area which is considered interesting and potential because it presents the beauty of the beach and blue sea. All beaches are also famous for its culinary tourism. At present there are various land-use categories in the coastline area of south Bali. More in the form of tourism support facilities such as local restaurants and resorts that are indicated to be incompatible with the provisions of zoning regulations for coastline area and ignore the attention to aspects of disaster mitigation. The spatial information dissemination in the form of the spatial planning information boards also does not yet exist in the area. So that the massive development of tourism accommodation building is not followed by understanding both local people and entrepreneurs of the spatial planning. Neither the importance of the existence of the coastline area as public spaces as well as protection. In South Bali, some of the beach is also used for traditional and religion ceremonies named *Melasti* and *Nangluk* which is conducted by religious Hindu communities both come from village surround the beach (Agung & Vipriyanti, 2019; Vipriyanti & Kardi, 2015). Also, the coastline area is used to anchorage fishing boat by local people.

Sustainability is the main goal of development programs in coastal areas. Conflicts over the use of land resources often occur, so the government needs to manage all parties and integrate sectoral and regional development programs. There are three efforts are needed to achieve sustainable coastal management such as: (1) well identified all parties and actively involve; (2) holistic and cross sectional approach; and (3) evaluation and intervention by community (Dimitrovski et al., 2021; Lee et al., 2020; Powell et al., 2019).

Massive development in coastal areas needs to consider externalities. The benefits of development are indeed obtained by local communities, but the costs incurred often become an additional burden for them. This is the main problem known as spatial externalities (Magontier, Sole-Olle, & Marsal, 2021). People and tourists can enjoy beautiful beaches and coastal areas, but development in these areas can cause externalities in the form of a decrease in environmental quality. Faber & Gaubert (2019) stated that development along the Mexican coast has had a positive impact on society in providing employment opportunities . However, it has an impact on the comfort of people's lives. This study aims to analyses the suitability level of using space in the coastline area in South Bali Province and formulate a strategy for controlling land-use following the spatial plan**.**

Methods

The data collection in this study was carried out by observation, interviews, and questionnaires. The observation was carried out by direct observation around the border area of the Beach (called *sempadan pantai*) to determine the use of existing space, to observe the beach existing condition, and to know the study area characteristics. While in-depth interviews were conducted with regional apparatuses handling the spatial planning both provincial and district governments, also the village apparatus and the local community near the beach to find out the existing condition of the beach and followed by distributing questionnaires to respondents with informants determining techniques used through the purposive sampling method.

This research was conducted using a geospatial approach that utilises Geographic Information Systems (GIS) (Fraser et al., 2017). The Spatial analysis technique is done by overlaying the map. Analysis of the suitability level of the existing land-use in the coastline area is more emphasised with the criteria following Presiden Indonesia (2016) that the land along the coastline whose width is proportional to the shape and physical condition of the beach, at least 100 (one hundred) meters from the highest tide point towards the land (Samanta & Paul, 2016).

This analysis was carried out overlaying the existing land-use map in 2022 with the map of the spatial plan (Pemerintah Provinsi Bali, 2009) which aims to analyse the existing land-use suitability with the spatial plan, especially in south beach of Bali. The result is the extent of existing land-use utilisation that is suitable and unsuitable according to the spatial plan, both spatially and statistically.

This research focuses on coastal areas in the southern region of Gianyar regency-Bali, namely *Lebih* beaches because this area has the potential to develop into culinary tourism objects, but its development tends to be disobedient to existing regulations. The Strength-Weakness-Opportunity-Threat (SWOT) analysis is used to control land-use development

following the spatial plan of the Gianyar Regency. The SWOT analysis can identify various factors systematically based on the logic that can maximize strengths and opportunities, but simultaneously can minimise weaknesses and threat. The analytical tool used is the Internal Factor Evaluation (IFE) and the External Factor Evaluation (EFE) matrix and is equipped with an Internal–External (IE) matrix approach. The strategic decision-making process is always related to the development of mission, goals, strategies, and policies (Henrique Dos Santos et al., 2019; Lasibey & Milyardo, 2021; Rahmatillah et al., 2019; Vipriyanti et al., 2022).

Results

Land-use of Coastline Area in South Bali

Land-use map along the coastline is obtained by digitizing on-screen on 2022 satellite imagery, the results obtained are the extent of land-use along the Bali south coastline that is divided into eleven types of activities such as temples, rice fields, garden, swimming pool, houses, resorts/villas, shop and house, local restaurants, fisherman facilities, recreational beach/fishing, and parking lots. With the most extensive activities namely plantation area of 88,115.86 m^2 with a total study area of 186,177.71 m^2 (Table 1 and Fig. 2).

At this stage, it was carried out an overlaying between the coastal land-use map over 2022 coupled with a map of the spatial plan patterns (Bupati, 2021; Pemerintah Kabupaten Gianyar, 2012) especially in coastline area for determining the extent and percentage of suitable and unsuitable land-use according to the spatial plan. The coastline area is measured as far as 100 m from the highest tide point towards the land, using GIS obtained an area of 23.85 ha as shown in the Fig. 2.

The overlay analysis provided nine types of activities that take advantage of space in the coastline area are following its designation. Utilization of space corresponding the spatial plan of Gianyar Regency covering 171,427.62 m^2 or 92.08% of the total area of research includes temples, fields, gardens, houses, resorts/villas, shop and house, local restaurants, fishermen facilities, and recreational beach/fishing, where the utilization of the space located in coastline area and outside the area, but still within the study area. The utilization area of the coastline of the beach that is following the spatial plan of the Gianyar Regency can be seen in the Table 2 and Fig. 3.

Table 1 Land-use on the coastal area of South Bali in 2022

No	Type of Activity	Area	
		m^2	%
1	Temple	850.92	0.46
2	Rice field	61,983.77	33.29
3	Gardens	88,115.86	47.33
4	Swimming Pool	1,957.59	1.05
5	Houses	2,401.73	1.29
6	Resorts/Villa	7,097.65	3.81
7	Shophouse	5,451.52	2.93
8	Local Restaurants	9,119.63	4.90
9	Fishermen facilities	2,059.87	1.11
10	Recreational Beach / Fishing	5,845.09	3.14
11	Parking Lots	1,294.08	0.70
Total		186,177.71	100.00

While the use of space on the coastline area that is not following the spatial plan of Gianyar Regency, the results of the overlaying obtained six types of activities including swimming pools, houses, resorts/villas, shop and house, local restaurants, and parking lots that are on the radius of the coastline area with the entire area inappropriate utilization of 14,750.09 m^2 or 7.92% of the total area of the study area. The spatial utilization which is not following the spatial plan of Gianyar Regency can be seen in the Table 3 and Fig. 4.

Unsuitable land-use in the coastal area of Gianyar Regency is caused by the lack of community understanding about the function of the coastline area which is in line with conditions in the forest area, un-intensive socialization regarding land-use control by the government, this is following research that the importance of socialization to the public about public green open space, as well as the lack of detailed the spatial plans governing the coastline area. Incompatibility of land use in the coastline area can be also caused by an increase in people's income, resulting in a need for leisure and housing (Hadley, 2006).

Fig. 2 Map Analysis of Land Use in Lebih Beach, 2022

Table 2 Land-use on the coastline area following the spatial plan of Gianyar Regency

No	Type of Utilisation	Area	
		m^2	%
1	Temple	850.92	0.46
2	Rice fields	61,983.77	33.29
3	Gardens	88,115.86	47.33
4	Houses	2,203.41	1.18
5	Resorts / Villas	4,659,59	2.50
6	Shophouse	3,989.33	2.14
7	Local Restaurants	1,719.78	0.92
8	Fisherman Facilities	2,059.87	1.11
9	Recreational Beach / Fishing	5,845.09	3.14
Total		171,427.62	92.08

Land-use controlling Strategy in South Bali Coastline Area

Identification in the internal portion of the coastline area in the beach generates an overview or internal factors that are the strengths and weaknesses of the area. From the existing factors, respondents will be given a weighting and rating. Results from weighting and rating internal factors will be formulated in the form of an IFE matrix. The IFE matrix can summarize and evaluate the main strengths and weaknesses of the coastline area in South Bali Coastal area. The formulation of the IFE matrix for this coastline area can be seen in Table 4.

Table 4 showed the results of respondent assessment of the coastline area in utilizing strengths and minimizing weaknesses has a total value of 2.80. There are two of the greatest strengths that belong

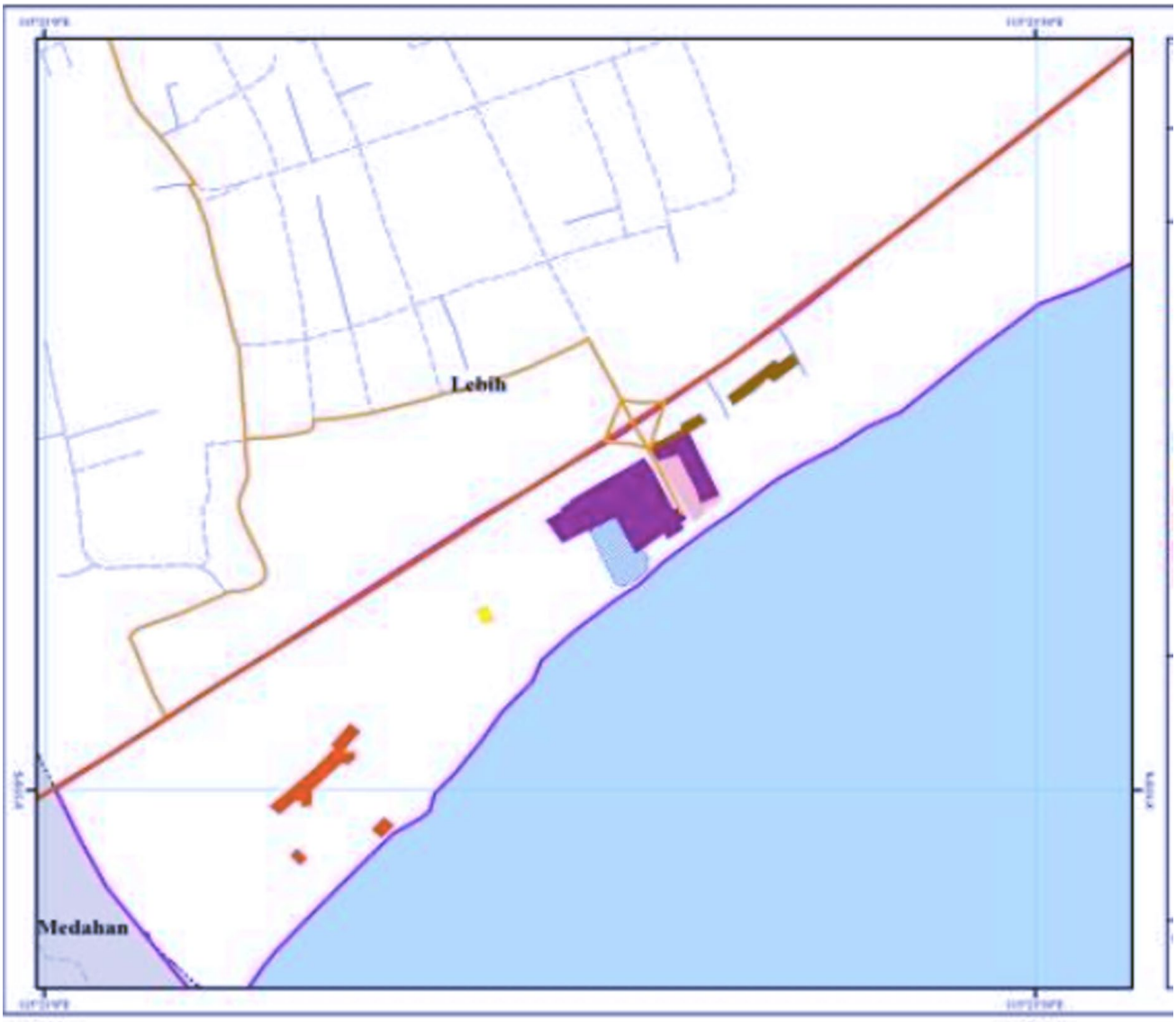

Fig. 3 The Discrepancy Map of Land-Use in the Coastline area

Table 3 Land-use area which is not following the spatial plan of the Gianyar Regency

No	Type of Utilisation	Area	
		m^2	%
1	Swimming Pool	1,957.59	1.05
2	Houses	198,32	0.11
3	Resort/Villa	2,438.06	1.31
4	Shophouse	1,462.19	0.79
5	Local Restaurants	7,399.85	3. 97
6	Parking Lots	1,294.08	0.70
	Total	14,750.09	7.92

to the coastline area that is sacred place for traditional ceremony (*Melasti)* and view of the beach with a value of 0.53. Then for the second strength is the existence of district government support (Regency Strategic Area) with a value of 0.52.

While the main weakness is observed from the lowest score. There are four main weaknesses that are owned by the coastline area in of the beach, that are the violation of the spatial planning, investment in economic activities, cleanliness of the beach has not been maintained, and there is a beach abrasion with a value of 0.00. Then, for the second weakness are, there is no detailed spatial plan yet and there is no determination of the coastline line by the government with a value of 0.05.

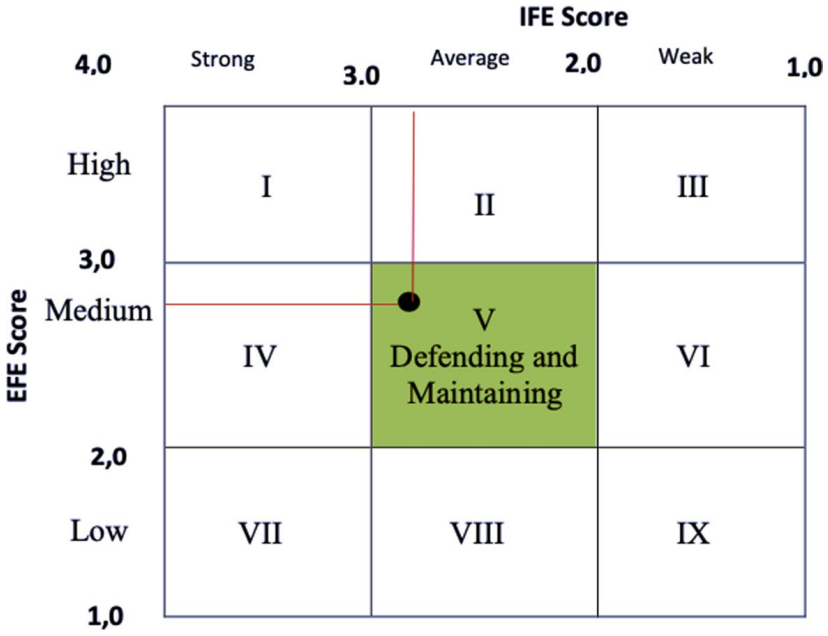

Fig. 4 The IE matrix of the coastline area

The identification of the external portion of the coastline area in the beach generates an external picture or factor in the form of opportunities and threats. After that, each factor is given a weighting and rating by each respondent. The results from weighting and rating external factors will be formulated in the form of an EFE matrix. The EFE matrix formulation for the coastline area in the South Bali Coastal can be seen in Table 5.

Table 5 shows the assessment results of respondents of the coastline area in the Beach has a total

Table 4 The IFE matrix of the coastline area in the South Bali Coastal

No	Internal Factors	Weight	Rating	Score
Strengths				
1	There is support for local government (Strategic Area District)	0.14	3.73	0.52
2	Availability of infrastructure road access	0.13	3:53	0.47
3	Sacred place for traditional ceremony (*Melasti)*	0.14	3.73	0.53
4	View of the Beach	0.14	3.73	0.53
5	The existence of culinary tours	0.12	3.27	0.40
6	The existence of Infrastructure coastal security	0.02	0.53	0.01
7	The existence of Jogging Track	0.01	0.27	0.00
8	The activities of fishermen	0.02	0.47	0.01
9	The existence of traditional ceremony (*Nangluk)*	0.01	0.27	0.00
Weakness				
1	There is no socialisation about the spatial planning (map information board)	0.06	1.53	0.09
2	Lack of the spatial plans detail	0.04	1.13	0.05
3	There is no coastline designation yet	0.04	1.13	0.05
4	Reduced public space planning	0.05	1.40	0.07
5	Lack of community understanding of the spatial plan	0.05	1.27	0.06
6	Spatial violations	0.00	0.07	0.00
7	Investment in economic activities	0.01	0.13	0.00
8	Beach cleanliness not yet maintained	0.00	0.07	0.00
9	Coastal abrasion occurred	0.01	0.20	0.00
	Total	1.00		2.80

Table 5 The EFE matrix of the coastline area in the South Bali Coastal

No	External Factor	Weight	Rating	Score
Opportunities				
The commitment from the government about the importance of the spatial planning	0.15	3.80	0.58	
Progress of compiling detailed of the spatial planning	0.14	3.60	0.52	
The high demand for space utilisation (investor)	0.12	3.00	0.36	
Increasing community income through tourism activities	0.14	3.40	0.46	
Can be used as promotion and tourism package	0.14	3.40	0.46	
Protection of provincial strategic areas / coastal abrasion	0.01	0.20	0.00	
Threats				
Difficulty for implementing the regional spatial plans, due to sectoral growth and market demand	0.07	1.73	0.12	
Conflicts between activities in the coastline area	0.06	1.53	0.09	
Pressure on natural resources and the environment	0.05	1.27	0.06	
Community economic competition	0.06	1.47	0.09	
Weak law enforcement of local regulations on the spatial plans in the Gianyar Regency	0.06	1.47	0.09	
Limited human resources as a spatial planning investigator	0.00	0.07	0.00	
Lack of government attention in supervising the land-use	0.00	0.07	0.00	
Total	1.00		2.83	

value of 2.83. The coastline area has a high enough ability to take advantage of existing opportunities and overcome the threats that occur. The biggest opportunity owned by the coastline area is the commitment from the government about the importance of the spatial planning with a value of 0.58. For the second largest opportunity, which is the progress of compiling detailed of the spatial planning with a value of 0.52.

While the two biggest threats that occur in the coastline area are the limited human resources as spatial investigators and the lack of government attention in supervising the land-use with a value of 0.00. Then for the second biggest threat, is the pressure on natural resources and the environment with a value of 0.06.

The IE matrix serves to determine the position of the coastline area in the Beach. Following the IFE matrix formulation which is owned by the coastline area in the Beach. The total value is 2.80 which indicates that the coastline area has an average ability to utilise strengths and minimisyzee weaknesses. Whereas in the EFE matrix, the coastline area in the Beach has a total value of 2.83, it can be concluded that the opportunity for the coastline area can be utilised to cover existing threats. If the two values are found, they will be in cell V of the IE matrix, which is defending and maintaining column (strategy has not changed). Figure 4 shows the position of the coastline area in the Beach on the IE matrix.

The growth strategies are designed to achieve growth, both in sales, assets, profits, or a combination of the three. This can be achieved through market penetration and special product development. Efforts that can be carried out to control spatial use in the coastline area in the beach are to intensify socialisation and supervision of land-use control, compile the detailed spatial plans, implementing incentive programs and disincentives to relevant stakeholders and strengthened in enforcing regional regulations regarding the spatial plan of the government.

Conclusion

The level of land use suitability in the south Bali coastline area that following the spatial plan of Gianyar Regency has an area of 171,427.62 m^2 or 92.08%, while 14,750.09 m^2 or 7.92% of the study area is unsuitable with the spatial plan. Strategies that can be carried out in efforts to control land-use of the coastline area in South Bali are intensifying the socialisation and supervision of land-use control, preparing detailed the spatial plans, implementing incentive

programs and disincentives to relevant stakeholders, and strengthened in enforcing regional regulations regarding the spatial plan of the Gianyar Regency.

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