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

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Accepted: 22 January 2024

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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 m² (92.08%)

of the existing coastal land use is in conformity with the spatial plan. Meanwhile, there is 14,750.09 m² (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

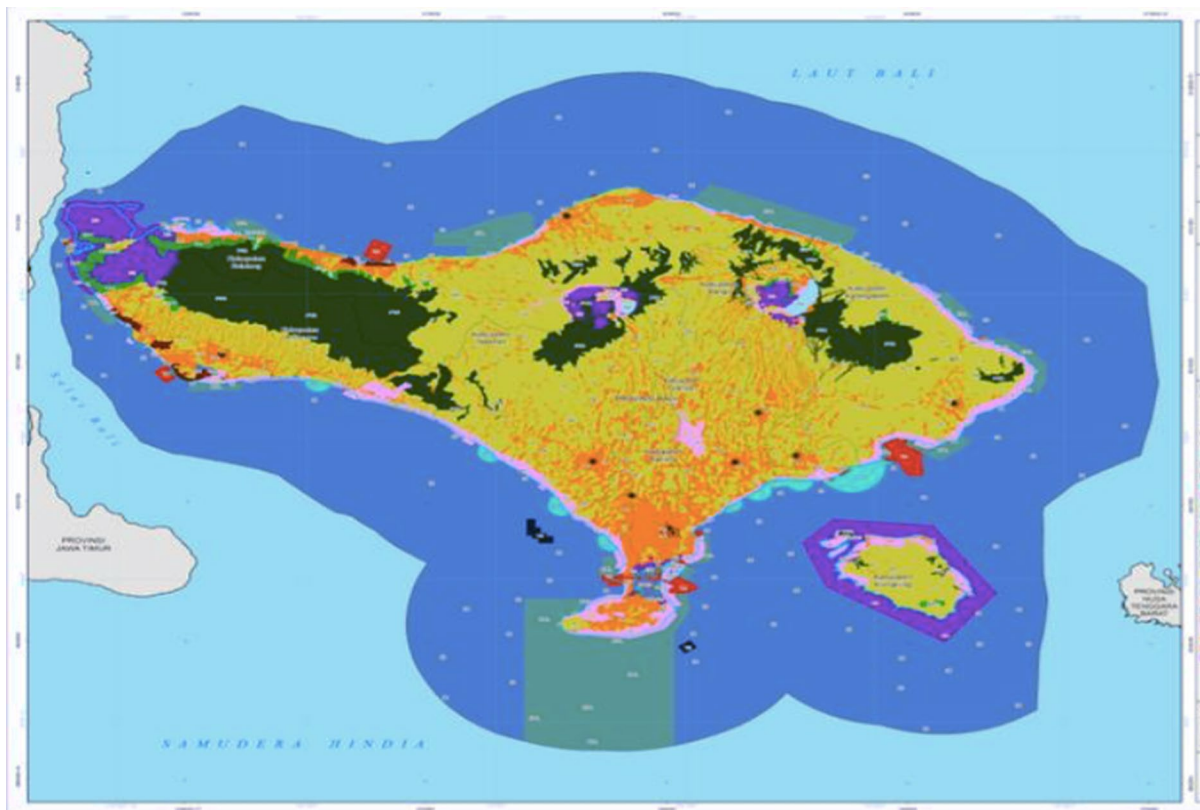


Fig. 1 Spatial Plan of Bali Province in 2023–2043

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 *sem-padan 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 m² with a total study area of 186,177.71 m² (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 m² 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

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

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.

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 m² 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

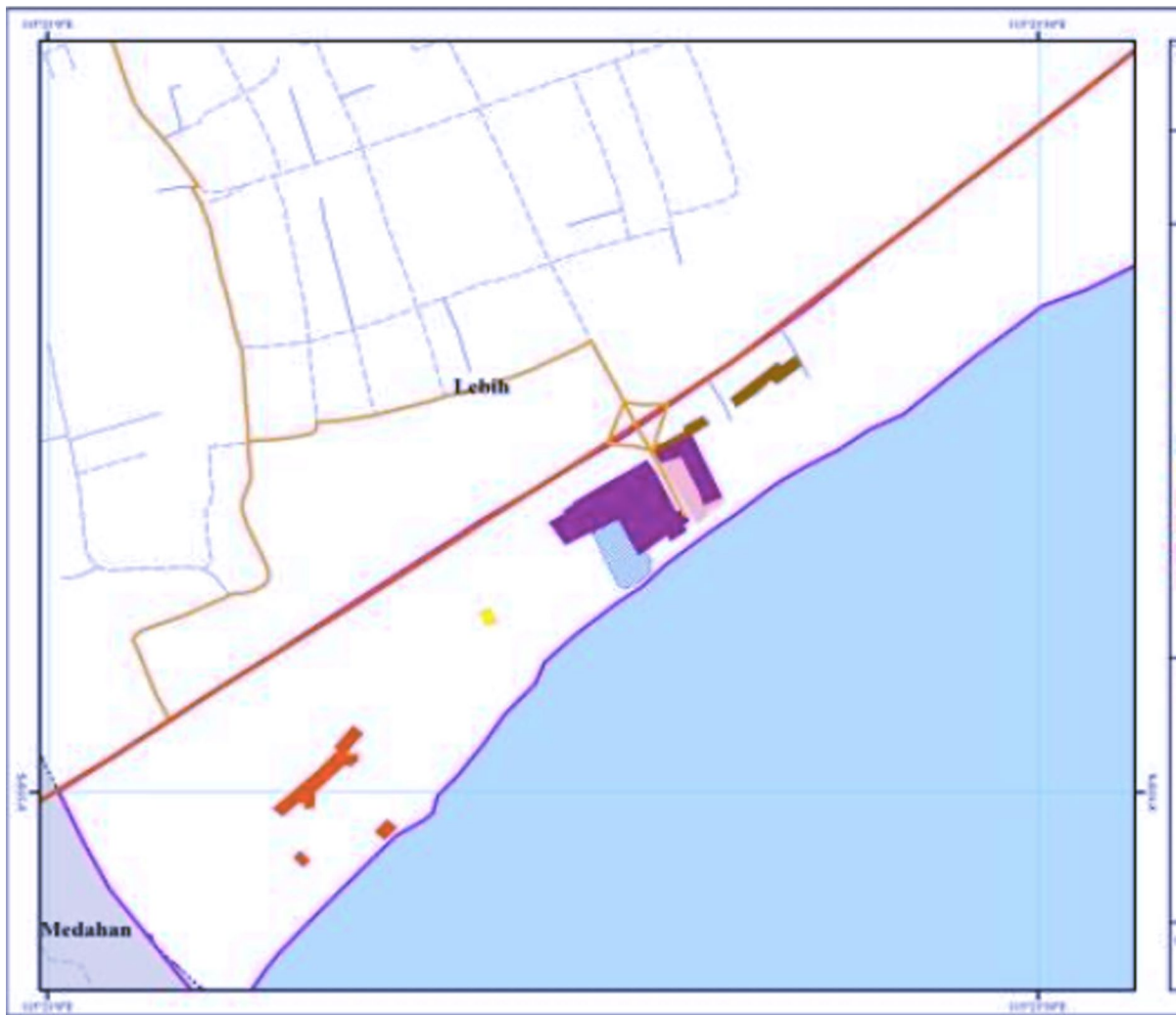


Fig. 3 The Discrepancy Map of Land-Use in the Coastline area

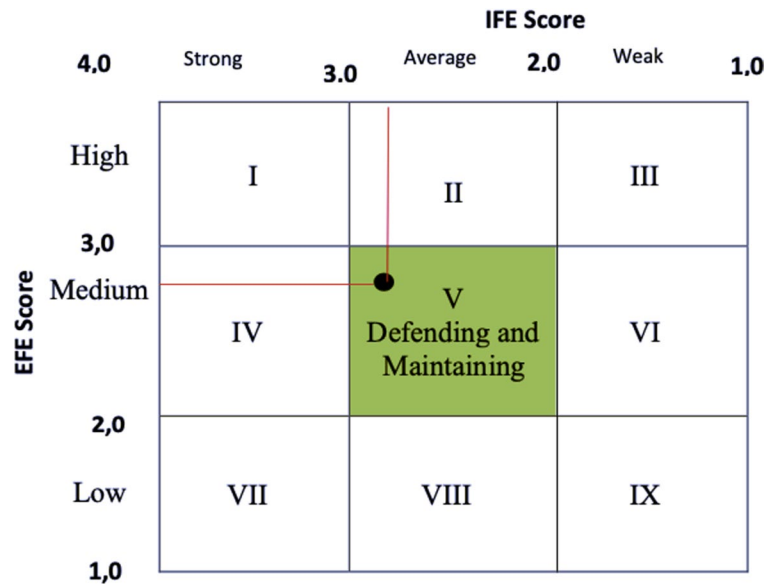
Table 3 Land-use area which is not following the spatial plan of the Gianyar Regency

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 (<i>Melasti</i>)	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 (<i>Nangluk</i>)	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 minimiszyee 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 m² or 92.08%, while 14,750.09 m² 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.

Acknowledgements The researcher would like to thank to the provincial government of Bali, the government of Gianyar and Badung Regency and also the village government for supporting the research.

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