From Coastal Resource Potential to Community Welfare: The Mediating Role of Marine Agro-Ecotourism Performance in Northern Coastal East Java, Indonesia

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Abstract: This study theoretically examines the determinants of Marine Agroecotourism Performance and its implications for the welfare of coastal communities using a Partial Least Squares-based Structural Equation Modelling (PLS-SEM) approach. The research model integrates Coastal Resource Potential, Socio-Cultural Aspects, and Community Empowerment as the main determinants of marine agroecotourism performance with data from 385 respondents. The results of the analysis show that these three constructs have a positive and significant effect on marine agroecotourism performance, with coastal resource potential as the most dominant factor. Furthermore, marine agroecotourism performance was found to have a significant effect on community welfare, reflecting improvements in the economic, social, and quality of life aspects of local communities. The novelty of this study lies in the development of an integrative model that links ecological, socio-cultural, and community empowerment dimensions in the context of marine agroecotourism, as well as in testing the role of tourism performance as a mediating mechanism for coastal community welfare. These findings enrich the literature on sustainable tourism and coastal area development, and provide policy implications that emphasise the importance of community-based approaches and resource sustainability in regional tourism development.

Keywords: Agro-ecotourism; Coastal resources; Community empowerment; Community welfare

Introduction

The coastal area of North East Java is a strategic region with abundant coastal natural resources, including catch fisheries (Amelia et al., 2025) and aquaculture (Anjeli et al., 2024), mangroves, and marine tourism potential (Maryantika & Lin, 2017; Vidayanti & Retnaningdyah, 2024). However, this high potential has not been fully matched by the welfare of coastal communities. Most coastal communities in this region still face structural problems, such as dependence on the primary sector, limited livelihood diversification, low economic added value, and vulnerability to climate change and environmental degradation (Tain, 2013; Ulfa, 2024).

The marine and fisheries sector has to deal with complex challenges because of its links to various sectors and its sensitivity to interactions, especially with environmental aspects. There are numerous fisheries management issues in Indonesia that have the potential to threaten the sustainability of fish stocks and the environment, the livelihoods of coastal and fishing communities, food security, and economic growth driven by the utilisation of marine and fisheries resources (Suherman et al., 2025). These challenges include, among others: (1) an increase in the number of fishing vessels with a focus on quantity rather than

quality (Trenggono, 2023); (2) declining fish availability and smaller fish sizes (Hidayah et al., 2022); (3) fishing areas becoming increasingly distant, longer journeys, and decreased efficiency in fishing operations (Lelono et al., 2024; TIP, 2012); (4) conflicts between fishermen due to the use of inappropriate fishing gear, such as fishing areas and fishing gear (Al Maghfiroh & Hermawan, 2020; Purnama et al., 2015; Yasyfi et al., 2022); (5) unbalanced economic growth, as the economic benefits of marine resource exploitation are concentrated in certain areas (western Indonesia); and (6) illegal fishing operations that violate regulations, do not have permits, violate fishing zones, and IUU (Illegal, Unreported, and Unregulated) fishing incidents, among others.

In the context of sustainable development, marine agro-ecotourism has emerged as a promising alternative approach because it integrates the agriculture, fisheries and tourism sectors based on local resources (de-Miguel-Molina et al., 2014; Guedri et al., 2025). This approach is not only oriented towards increasing income, but also towards coastal ecosystem conservation and socio-economic strengthening of communities (Shang et al., 2023). However, although the concepts of agrotourism and marine ecotourism have been widely studied, most previous studies tend to focus on tourism aspects separately, without examining integrated performance as the main mechanism that connects local potential with community welfare.

In addition, previous studies generally place natural resource potential, socio-cultural aspects, and community empowerment as factors that directly impact welfare. This approach implies the assumption that the existence of resources and social capital will automatically improve the standard of living of the community. However, in reality, in the coastal areas of North East Java, the availability of resources is often not accompanied by institutional and managerial capacity to manage them productively and sustainably (Indrawasih & Wahyono, 2009; Kusdiantoro et al., 2019; Nugroho & Atmaja, 2014; Suryagalih, 2012). This creates a gap between potential and development outcomes.

Based on these conditions, this study started from the argument that the welfare of coastal communities is not solely determined by the magnitude of resource potential, but rather by the extent to which this potential can be converted into economic, social, and ecological value through effective marine agro-ecotourism performance. Therefore, this study positions Marine Agro-ecotourism Performance as a key variable that mediates the influence of Potential of Coastal Resources, Socio-Cultural Aspects, and Community Empowerment on Community Welfare.

Method

Research Design

This study utilised quantitative methods. Data collection was conducted through surveys of visitors to marine agro-ecotourism sites and local residents living near marine tourism sites. Additional data was obtained not only by interviewing respondents, but also through observation and documentation of the management of marine agro-ecotourism on the north coast of East Java. Data collection was conducted using a Likert scale questionnaire with scores ranging from 1 to 5 (strongly disagree to strongly agree), with respondents being screened through several preliminary questions to meet the sample requirements, including domestic tourists aged 18 years and above who had visited marine agro-ecotourism sites in East Java at least once between 2023 and 2025. Respondents understood and agreed to complete the questionnaire for the purpose of data collection and publication. They did so after reading the introduction at the beginning of the interview. Thus, consent was obtained from all participants.

The research location was selected using purposive sampling (Mukhlis et al., 2019; Mukhlis et al., 2024; Asgaf et al., 2025), based on the representativeness of coastal resource potential, social and cultural aspects, the existence of agro-ecotourism destinations, and the presence of community empowerment activities, which are variables in this study. In addition, the research location was selected due to the dynamics of coastal and marine resource utilisation, such as the fluctuating volume and value of fish catches compared to other regions. The research was conducted in the coastal areas of Tuban, Lamongan and Gresik districts from January 2025 to May 2025.

Population Sampling

The research population consisted of visitors to marine agro-ecotourism sites on the north coast of East Java and residents living near marine agro-ecotourism areas, so the exact size of the research population was unknown. The sample size in this study was determined using Cochran's formula (Sugiyono, 2016), as the population size was unknown. The Cochran formula is used to determine the minimum sample size for large or unidentified populations. With a confidence level of 95% ($Z = 1.96$), a population proportion (p) assumed to be 0.5, and a margin of error (d) of 5%, the minimum sample size obtained was 384.12, rounded to 385 respondents.

The sampling technique used was purposive sampling (Mubarokah et al., 2024; Marliyah et al., 2025), which is a sampling technique based on specific criteria that are relevant to the research objectives. This technique was chosen due to the unavailability of a definite population framework and to ensure that the

respondents involved had knowledge and experience relevant to the research object. Respondents in this study were determined based on the following criteria: (1) having a direct connection to the research object, (2) being at least 18 years old, and (3) being willing to provide information by completing the research questionnaire.

Table 1. Demographic Profile of Respondents

Caracteristic	Category	Frequency	Percentage (%)
Gender	Male	185	48.05
	Female	200	51.95
Age	18 – 30 years	219	56.88
	31 – 40 years	90	23.38
	41 – 50 years	60	15.58
	>50 years	15	3.90
Education	Primary School	25	6.49
	Junior high	30	7.79
	Senior high school	225	58.44
	College / University	104	27.01

Data Collection

Data collection was conducted using three main techniques: (1) field observation to determine the management of marine agro-ecotourism; (2) structured interviews to obtain more in-depth information about the experiences and personal perceptions of tourists and communities surrounding marine agro-ecotourism; and (3) distribution of closed questionnaires that had been tested for validity and reliability. The model variables include Coastal Resource Potential (PCR), Socio-Cultural Aspects (SCA), Community Empowerment (CE), Marine Agro-ecotourism Performance (MAEP), and Community Welfare (CW). The MAEP variable acts as a mediating variable of PCR, SCA and CE in influencing CW.

All attitude measurements used a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). A preliminary test was conducted with 30 respondents outside the main sample to examine clarity, reliability, and validity. Construct validity was examined through factor analysis, while internal consistency reliability was measured using Cronbach's Alpha and Composite Reliability with a threshold higher than 0.70, as recommended in the structural equation modelling literature. All research procedures adhered to established ethical guidelines for human subject research. Before participating, respondents were informed about the purpose of the study, the voluntary nature of their involvement, and their right to withdraw at any time without consequences. Written consent was obtained from each participant, and anonymity was strictly maintained by assigning unique codes rather than personal identities. Data were collected and reported at the group level to ensure confidentiality.

Measurement indicators for coastal and marine resource potential (PCR) variables were developed through a combination of literature reviews. Coastal resource potential is a combination of environmental quality, biodiversity, landscape beauty, land availability, and accessibility, which together determine the suitability of an area for development as sustainable marine agroecotourism (Briciu, 2023; Carlson et al., 2021; Indrawati et al., 2025; F. Kurniawan et al., 2023; S. Kurniawan et al., 2025; Nurhayati et al., 2019; Saputra et al., 2024). Measurement items for the social and cultural aspect (SCA) through a combination of literature reviews on the socio-cultural aspects of marine agro-ecotourism management include local wisdom, the level of mutual cooperation, community support, openness to tourists, and low social conflict, which collectively determine the success and sustainability of community-based coastal tourism development (Bakker et al., 2019; Rasoolimanesh et al., 2017a, 2025; Rasoolimanesh & Seyfi, 2021; Stepanova & Bruckmeier, 2013). Measurement items for community empowerment (CE) were developed through the opinions of community empowerment actors and a literature review on community empowerment in marine agro-ecotourism management, reflected through involvement in planning, capacity building, access to capital, creation of local employment, and access to information and technology, which together strengthen the social, economic, and environmental sustainability of coastal areas (Battour et al., 2021; Croes & Rivera, 2017a; Demir et al., 2020; Giampiccoli, 2020; Giampiccoli & Saayman, 2018; Rasoolimanesh et al., 2017b). Measurement items for Marine Agro-ecotourism Performance (MAEP) through a combination of literature reviews on marine agro-ecotourism performance can be measured through the number of tourist visits, diversity of attractions, quality of services, sustainable environmental management, and the effectiveness of tourism promotion and information, which collectively reflect the success of sustainable marine tourism management (Hall et al., 2015; Kazmi et al., 2020; Mariani et al., 2021;

Wang et al., 2016; Weaver, 2018). Measurement items for Community Welfare (CW) through a combination of literature reviews indicate that community welfare in marine agro-ecotourism management is reflected in increased income, the opening up of local business opportunities, improvements in basic facilities, improved quality of life for families, and the growth of pride and local identity among coastal communities (Croes & Rivera, 2017b; Scheyvens & Biddulph, 2018; Telfer & Sharpley, 2015; Woo et al., 2018).

Data Analysis

Data analysis was conducted using Partial Least Squares Structural Equation Modelling (PLS-SEM) with Smart PLS 3.0 software. This technique was chosen because it is suitable for analysing complex models with many latent variables and can be applied when data are not normally distributed, which often occurs in rural surveys (J. F. Hair, 2014). The analysis consisted of two main stages. The first stage involved evaluating the measurement model (outer model) by assessing convergent validity through Average Variance Extracted (AVE) and factor loading, discriminant validity through the Fornell –Larcker criteria and the Heterotrait-Monotrait (HTMT) ratio, and construct reliability was evaluated through Cronbach's Alpha and Composite Reliability, with values greater than 0.70 indicating adequate internal consistency. All tests were conducted using SmartPLS version 3.0 software. The second stage involved evaluating the structural model (internal model) by examining path coefficients, effect sizes ($f2$), coefficients of determination ($R2$), predictive

relevance (Q2), and statistical significance using bootstrapping with 5,000 resampling.

All hypothesis testing was conducted at a significance level of 5 per cent ($\alpha = 0.05$). This systematic approach ensured that the findings would be statistically robust and contextually relevant for testing the effects of PCR, SCA, CE, and MAE on CW in the context of marine agro-ecotourism management on the north coast of East Java.

Result and Discussion

Result
Measurement Model Evaluation

Before testing causal relationships between latent constructs, it is important to ensure that the measurement model meets validity and reliability criteria. In the Partial Least Squares–Structural Equation Modelling (PLS-SEM) approach, measurement model evaluation aims to assess the extent to which the indicators used are able to represent latent constructs accurately and consistently. This test is a fundamental step because the accuracy of structural model estimation is highly dependent on the quality of construct measurement (J. Hair & Alamer, 2022; Hair Jr, 2021). Therefore, the measurement model evaluation in this study was conducted by assessing convergent validity, internal reliability, and discriminant validity, using outer loading indicators, Cronbach's Alpha, Composite Reliability, Average Variance Extracted (AVE), and Heterotrait–Monotrait Ratio (HTMT) as recommended in the latest PLS-SEM literature.

Table 2. Convergent Reliability and Validity

Construct	Indicator	Cronbach's Alpha	Rho_A	Composite Reliability (CR)	AVE
Community Empowerment	CE	0.914	0.927	0.936	0.746
Community Welfare	CW	0.917	0.920	0.938	0.753
Marine Agro-ecotourism Performance	MAEP	0.889	0.889	0.918	0.692
Potential Coastal Resources	PCR	0.891	0.891	0.920	0.696
Socio-Cultural Aspects	SCA	0.881	0.882	0.913	0.678

Criteria: AVE ≥ 0.50; CR ≥ 0.70; Cronbach's Alpha ≥ 0.70.

Table 3. Discriminant Validity – HTMT

Construct	CE	CW	MAEP	PCR	SCA
CE	—				
CW	0.644	—			
MAEP	0.567	0.877	—		
PCR	0.538	0.893	0.858	—	
SCA	0.460	0.826	0.770	0.868	—

Criteria: HTMT < 0.85 (konservatif) atau < 0.90 (liberal).

The evaluation of the measurement model shows that all indicators have outer loading values above 0.70, thus meeting the criteria for convergent validity. Cronbach's Alpha and Composite Reliability values for all constructs exceed 0.70, indicating good internal

consistency. In addition, the Average Variance Extracted (AVE) values for all constructs are above 0.50, confirming that the constructs are able to explain more than half of the variance in their indicators. Discriminant validity is also met, as indicated by HTMT values that

are all below the threshold of 0.90. Thus, the measurement model is declared valid and reliable for further structural model testing.
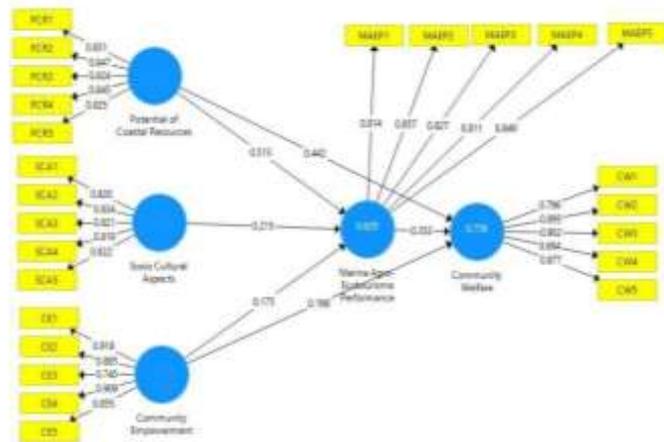

Figure 1. Output SEM PLS, outer model measurement results

Structural Model Evaluation

After the measurement model has been declared valid and reliable, the next step is to evaluate the structural model (inner model) to test the causal relationships between the latent constructs proposed in the conceptual framework. The evaluation of the structural model in PLS-SEM aims to assess the significance of the relationships between constructs, the strength of influence (path coefficient), and the predictive ability of the model, which is generally measured through t-statistics, p-values, and the coefficient of determination (R^2). (Hair & Alamer, 2022; Hair Jr, 2021).

The bootstrapping results indicate that all exogenous constructs have a positive and significant effect on Marine Agrotourism Performance, as shown by t-statistics values exceeding the critical threshold of 1.96 (α = 5%).

Potential Coastal Resources → Marine Agro-ecotourism Performance: This relationship shows t-statistics values of 9.009 and 8.194, indicating a highly significant and dominant influence. These findings indicate that the quality and carrying capacity of coastal

resources are key factors in improving the performance of marine agro-ecotourism.

Socio-Cultural Aspects → Marine Agro-ecotourism Performance: The influence of socio-cultural aspects on the performance of marine agrotourism is also significant, with a t-statistic value of 3.817. This indicates that cultural values, social norms, and community acceptance play an important role as social capital in supporting the successful management of agro-ecotourism.

Community Empowerment → Marine Agro-ecotourism Performance : Community empowerment has a significant influence with t-statistics values of 4.539 and 5.383, indicating that increasing the capacity, participation, and active role of local communities contributes significantly to improving the performance of marine agro-ecotourism.

The analysis results indicate that the performance of marine agro-ecotourism has a significant effect on community welfare, with a t-statistic value of 6.999, well above the significance threshold. These findings confirm that improvements in marine agro-ecotourism performance can promote improvements in the welfare of coastal communities, both through increased income, job creation, and improvements in social and economic quality of life.
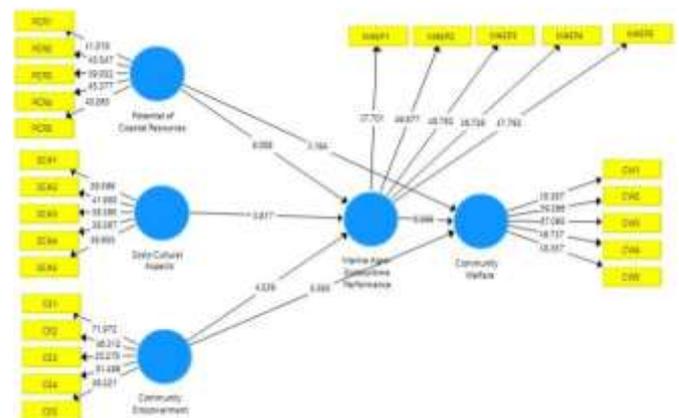

Figure 2. Bootstraping output SEM PLS inner model measurement results

Tabel 4. Structural Model Test Results (Path Coefficient, t-statistics, and p-values)

Relationships Between Constructs	Path Coefficient (β)	t-statistics	p-values	Description
CE → CW	0.198	5.383	< 0.001	Signifikan
CE → MAEP	0.175	4.539	< 0.001	Signifikan
MAEP → CW	0.353	6.999	< 0.001	Signifikan
PCR → CW	0.442	8.194	< 0.001	Signifikan
PCR → MAEP	0.513	9.009	< 0.001	Signifikan
SCA → MAEP	0.215	3.817	< 0.001	Signifikan

Note: t-statistic value > 1.96 indicates significance at α = 5%; p-values were obtained from the bootstrapping procedure (5,000 resamplings); a positive coefficient indicates a direct relationship.

Based on the previous model image, the coefficient of determination (R²) value shows that Marine Agrotourism Performance has a strong R² value, indicating that the variability of marine agrotourism performance can be substantially explained by coastal resource potential, socio-cultural aspects, and community empowerment. Community welfare also shows a high R² value, indicating that marine agrotourism performance is a strong predictor in explaining the welfare of coastal communities. Thus, the structural model has good explanatory power and predictive ability, making it suitable for testing hypotheses and drawing policy implications.

The results of structural model testing show that all hypothesized relationships between constructs are positive and significant. Coastal Resource Potential has the strongest influence on Marine Agrotourism Performance, followed by Community Empowerment and Socio-Cultural Aspects. Furthermore, Marine Agrotourism Performance was found to have a significant effect on Community Welfare. The t-statistics values for all paths exceeded the critical threshold of 1.96 with p-values < 0.001, indicating strong empirical support for the research hypothesis.

Discussion

The results of this study provide a strong empirical understanding of the mechanisms by which the local potential of the North Coast of East Java can be converted into community welfare through the performance of marine agro-ecotourism. The main findings indicate that Coastal Resource Potential, Socio-Cultural Aspects, and Community Empowerment have a positive and significant effect on Marine Agro-ecotourism Performance, which in turn has a significant impact on Community Welfare. These findings confirm that the welfare of coastal communities is not automatically created by the availability of resources, but rather depends heavily on the effectiveness of their management.

The Dominant Role of Coastal Resource Potential: The effect of Coastal Resource Potential on Marine Agro-ecotourism Performance is the strongest in the model. This is in line with the resource-based view perspective, which emphasises that natural resource advantages are strategic assets in tourism-based regional development (Hall et al., 2015; Weaver, 2018). Coastal environmental quality, biodiversity, landscape beauty, and accessibility have been proven to be the main foundations for enhancing the attractiveness and performance of marine agro-ecotourism destinations. These findings reinforce previous studies stating that sustainability and coastal ecosystem quality are important prerequisites for the long-term success of marine tourism (Carlson et al., 2021; Shang et al., 2023). However, these findings also indicate that resource potential will only provide added value if managed in an integrated and sustainable manner. Without effective governance, resource advantages risk degradation and may even exacerbate the socio-ecological vulnerability of coastal communities, as highlighted by Kusdiantoro et al. (2019) and Nugroho et al. (2014).

The Contribution of Socio-Cultural Aspects as Social Capital: The socio-cultural aspect shows a positive and significant influence on the performance of marine agro-ecotourism, although with a more moderate strength compared to natural resource potential. These findings confirm the role of social capital, such as local wisdom, mutual cooperation, the level of acceptance of tourists, and low social conflict, in supporting the success of community-based tourism management (Rasoolimanesh et al., 2017a; Stepanova & Bruckmeier, 2013). In the context of the North Coast of East Java, socio-cultural values function as informal institutional factors that strengthen the social legitimacy and acceptance of agro-ecotourism activities. However, the relatively moderate influence indicates that socio-cultural aspects have not been fully optimised as a main attraction, but still play a supporting role. This is consistent with the findings of Bakker et al. (2019) who stated that cultural potential is often not strategically integrated into the development of coastal tourism destinations.

Community Empowerment and Agro-ecotourism Performance: Community empowerment has been proven to have a significant impact on the performance of marine agro-ecotourism, emphasising the importance of active community involvement in planning, management, and the utilisation of economic benefits from tourism. These findings support the community-based tourism approach, which emphasises that capacity building, access to information and technology, and the creation of local employment opportunities are prerequisites for sustainable tourism (Croes & Rivera, 2017a; Giampiccoli & Saayman, 2018). However, the influence of community empowerment is still below the potential of natural resources, indicating that the empowerment process in the study area is still partial and not yet fully institutionalised, or due to the lack of human resources for community empowerment. This is in line with the findings of Demir et al. (2020) and Giampiccoli (2020) who state that without institutional support and consistent policies, community empowerment tends to have a limited impact on destination performance.

The Performance of Marine Agro-ecotourism as a Transformational Mechanism: The most important finding of this study is the significant role of Marine Agro-ecotourism Performance in Community Welfare. These results confirm that marine agro-ecotourism

performance functions as a transformational mechanism that connects resource potential, social capital, and community empowerment with improved economic and social welfare. In other words, the performance of marine tourism management is a determining factor in whether local potential can be converted into tangible benefits for the community. This finding expands on the literature, which has tended to place natural and social resources as factors that have a direct impact on welfare (Scheyvens & Biddulph, 2018; Telfer & Sharpley, 2015). This study shows that without effective management performance, as reflected in service quality, diversity of attractions, environmental management, and promotional effectiveness, these potentials do not automatically improve the welfare of coastal communities.

Theoretically, this study contributes by: (1) Offering an integrative framework that combines ecological, socio-cultural, and empowerment dimensions in a single PLS-SEM model; (2) Positioning Marine Agro-ecotourism Performance as a key mediating variable, rather than merely an intermediate outcome; (3) Providing empirical evidence from the context of coastal areas in developing countries, which are still relatively underrepresented in the global tourism and regional development literature. Thus, these findings reinforce the place-based development and sustainable tourism development approaches, and confirm that the success of coastal area development is highly dependent on the quality of governance and the performance of marine agro-ecotourism management.

Conclusion

This study shows that the welfare of coastal communities on the north coast of East Java is not directly determined by coastal resource potential, socio-cultural aspects, or community empowerment, but rather by the effectiveness of marine agro-ecotourism as the main connecting mechanism. The results of the PLS-SEM analysis confirm that coastal resource potential, socio-cultural capital, and community empowerment have a positive and significant effect on the performance of marine agro-ecotourism, which in turn contributes significantly to improving community welfare. These findings emphasise the importance of destination management and governance capacity in converting local resources into sustainable economic, social and ecological value. Theoretically, this study enriches the literature on sustainable tourism by placing the performance of marine agro-ecotourism as a key mediating variable in coastal area development. Practically, the results of the study emphasise the need for coastal development policies that are oriented

towards strengthening management performance, empowering local communities, and integrating environmental sustainability in order to promote inclusive and sustainable prosperity.

Conflicts of Interest
The authors declare no conflict of interest.

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