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Environmental governance of a mass tourism destination: An analytic hierarchy process assessment of sustainable tourism policy implementation in Badung Regency, Bali, Indonesia

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Abstract

Badung Regency carries the heaviest tourism load in Indonesia, and with it some of the most serious environmental pressures at the destination scale. These include coastal solid waste, the conversion of agricultural land, and an exceedance of environmental carrying capacity that has not yet been measured. The problems have continued even after Regulation No. 9 of 2021 on Sustainable Tourism Destinations came into force, which suggests that the difficulty lies in how the policy is delivered rather than in the rules themselves. In this study we assessed how the regulation is implemented across its four sustainability pillars and measured the relative importance of the factors that govern delivery. A descriptive qualitative design was combined with the Analytic Hierarchy Process. The qualitative work used in-depth interviews with nine key informants, non-participant observation at Kuta and Seminyak beaches, and documentary analysis, while the Analytic Hierarchy Process broke the four Edwards III determinants into thirteen sub-criteria that were compared on the Saaty nine-point scale and tested for consistency. Implementation was strongest in the socio-cultural and economic pillars and weakest in the environmental and governance pillars. The Analytic Hierarchy Process ranked communication first (0.399), followed by resources (0.266), bureaucratic structure (0.204), and disposition (0.131), with all consistency ratios below 0.10. Clarity and consistency of the policy message were the highest-ranked sub-criteria, while budget availability was among the lowest. These results show that the participating stakeholders perceived message quality, technical competence, and role clarity, rather than a shortage of funds, as the most important implementation factors among those assessed. They express expert judgement about relative priority, not measured effects on environmental outcomes.

Keywords

Sustainable tourism; Environmental policy implementation; Analytic hierarchy process; Coastal waste; Carrying capacity

1. INTRODUCTION

Tourism is one of the most effective tools for local economic development, but it is also one of the least regulated sources of environmental pressure in developing economies. When the number of visitors grows faster than the capacity of institutions to manage them, a destination tends to face solid waste accumulation, declining coastal water quality, land-use conversion, and infrastructure saturation. This condition is now widely described as overtourism (Risfandini 2024). The environmental cost is rarely paid by the tourism sector itself. Instead, it is passed on to coastal ecosystems, municipal waste systems, and the residents who depend on both. Evidence from Indonesian island destinations shows that the ecological damage caused by unregulated visitor growth, especially coral reef degradation and marine litter, can outweigh the economic benefit that drove the growth in the first place (Lukman et al. 2022).

Indonesia's post-pandemic recovery has made this problem sharper. Foreign arrivals fell to roughly four million in 2020 and dropped further in 2021 because of mobility restrictions, then recovered to more than fourteen million by 2024 (BPS 2025). This recovery has been concentrated geographically rather than spread evenly (Fig. 1). Between 2020 and 2024, Ngurah Rai International Airport in Bali received a cumulative 14.77 million foreign arrivals, compared with 5.97 million through Soekarno-Hatta and fewer than 0.65 million through each of the other main gateways. A single island therefore absorbed more than twice the arrivals of the national capital region and roughly nine times those of all other monitored gateways combined (BPS 2025).

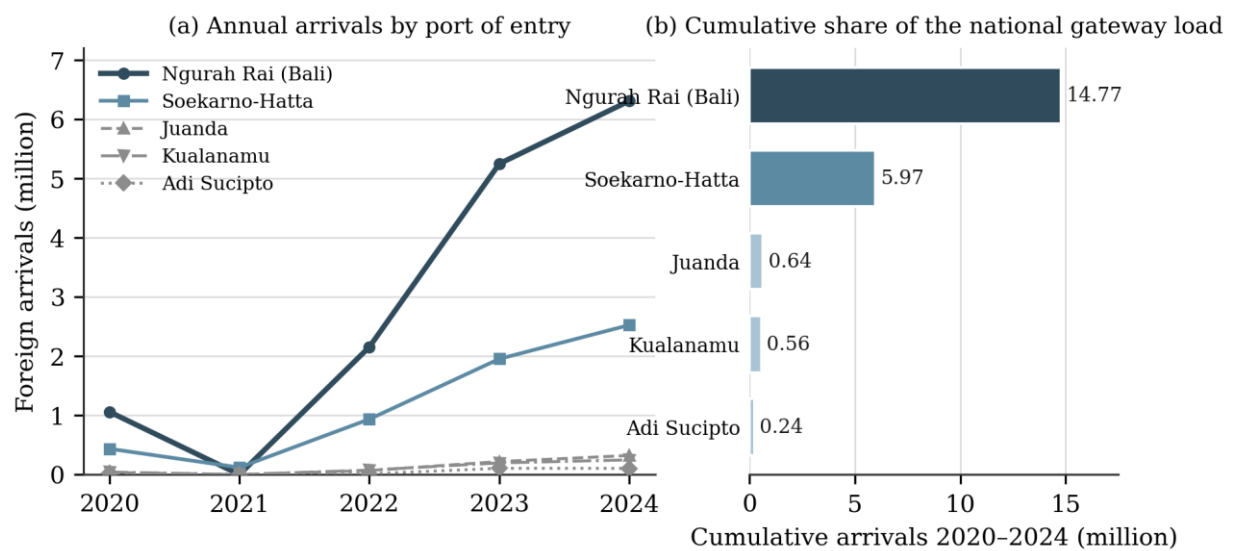


Fig. 1: Foreign tourist arrivals to Indonesia by principal port of entry, 2020 to 2024: (a) annual trajectory of post-pandemic recovery; (b) cumulative arrivals over the period. Source: compiled from BPS (2025).

The same concentration appears at the sub-provincial scale. Within Bali, Badung Regency recorded 6,745,502 domestic visitor trips in 2024, about 1.5 times the volume of the next-ranked jurisdiction and more than three times the median for the province's nine regencies and cities (Fig. 2). Badung has held this position continuously since 2020. As a result, it absorbs a national-scale environmental load within an area of only about 418 km².

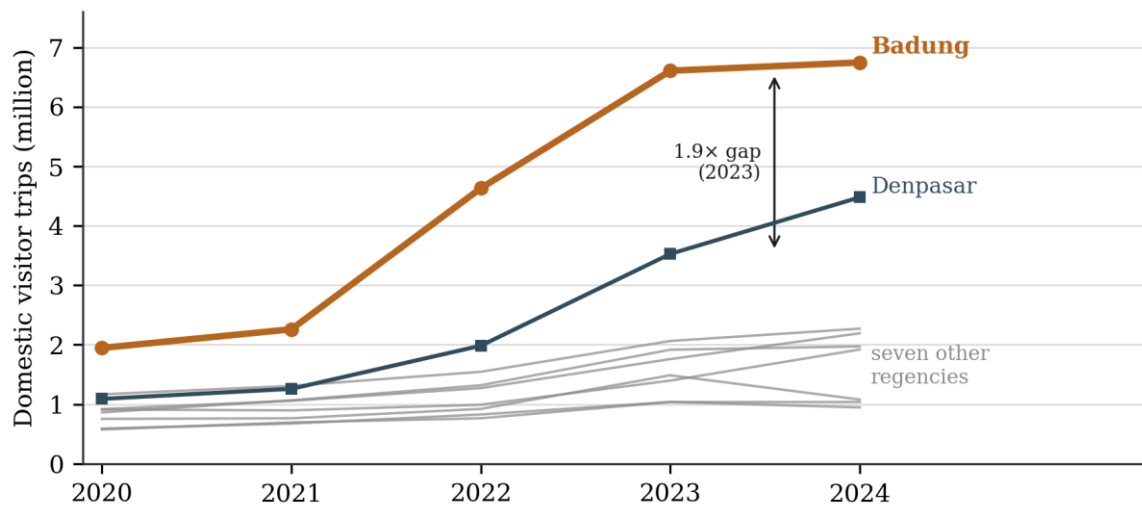


Fig. 2: Domestic visitor trips by regency and city of destination in Bali Province, 2020 to 2024. Source: compiled from BPS (2025).

The environmental consequences are well documented. Land-cover analysis of Badung shows a steady conversion of paddy fields and open land into commercial and accommodation use, with a loss of infiltration capacity and agrarian livelihood security (Indrawan et al. 2022). Waste-flow assessment indicates that plastics make up about 68% of the solid waste generated in the regency, much of it from tourism establishments and markets and carried to the sea through the river network (Ratnawati et al. 2022). Beach-sediment surveys on the Indonesian coast show that this pressure is directly attributable rather than diffuse. At Kondang Merak, a popular beach destination in Malang Regency, the backshore zone shaped by visitor activity carries a litter composition that can be distinguished from the foreshore zone supplied by waves and currents, so the tourism-derived fraction can be separated from the marine-transported fraction (Yona et al. 2024). Traffic saturation in the Kuta-Seminyak corridor has become both an emissions problem and a liveability complaint (Ariana et al. 2025), and the regency's dependence on a single sector was exposed by the collapse in employment during the pandemic (Heny et al. 2024). Stakeholder studies also report that ecotourism development in Badung remains economically weighted, so that ecological and cultural safeguards are placed below visitor-volume targets, and that cooperation between government, business, and community actors is limited by weak mutual trust (Hamka et al. 2022).

Indonesia's policy response is Regulation of the Minister of Tourism and Creative Economy No. 9 of 2021 on Guidelines for Sustainable Tourism Destinations. It replaced the earlier 2016 instrument and, for the first time, set a single integrated standard covering four pillars at once: sustainable destination governance, economic sustainability, socio-cultural sustainability, and environmental sustainability (Fadli et al. 2022). The environmental pillar is explicit. It requires efficient management of water, energy, and waste, protection of biodiversity, control of pollution, and spatial planning that takes the environment into account. The regulation also aligns destination management in Indonesia with Sustainable Development Goals 8, 11, 12, 13, 14, and 15.

The fact that environmental degradation in Badung has continued five years after the regulation came into force therefore points to an implementation problem rather than a regulatory one. Other Indonesian evidence supports this reading. Studies of sustainable tourism policy at the national level identify communication between actors, resource allocation, and community involvement as the main determinants of success, rather than the content of the rules themselves (Damiasih 2023). Systematic review evidence points to cross-sectoral coordination and human resource capacity as the recurring bottlenecks, with budget limits and stakeholder conflict as secondary constraints (Cahyono et al. 2025). The same pattern appears in Indonesian environmental management outside tourism. In a study of polyethylene terephthalate bottle waste, Amirudin et al. (2023) found that the main barrier to performance was the absence of a clear allocation of roles, obligations, targets, and activities among stakeholders. They proposed a public-private partnership framework that fixes each actor's role before performance is expected. This approach can be transferred directly to destination-scale environmental governance, where the set of actors is similarly fragmented across tourism, environment, spatial planning, and customary institutions.

What has not been established is the relative weight of these determinants. Implementation research in the Indonesian tourism sector is dominated by descriptive case studies that identify constraints without ranking them. This leaves local governments, which operate under real fiscal and administrative limits, without any basis for deciding which reforms to tackle first. Multi-criteria decision analysis addresses exactly this gap. The Analytic Hierarchy Process breaks a complex judgement into a hierarchy of criteria and sub-criteria, converts expert judgement into ratio-scale weights through pairwise comparison, and then tests those weights for consistency (Saaty & Vargas 2012). It is well suited to environmental policy problems of this kind, where the criteria are qualitative and the evidence is necessarily expert judgement, but the resulting priorities still need to be reproducible and open to inspection.

This study therefore combines a qualitative implementation assessment with the Analytic Hierarchy Process, using the four determinants proposed by Edwards III (1980), namely communication, resources, disposition, and bureaucratic structure, as the criteria layer. The objectives are threefold: to assess how Regulation No. 9 of 2021 is implemented across its four pillars in Badung Regency; to determine the relative priority of the implementation determinants and their sub-criteria; and to draw implications for environmental governance in comparable mass tourism destinations.

2. MATERIALS AND METHODS

2.1. Study Area

Badung Regency lies in southern Bali, Indonesia, and covers about 418.52 km² across six districts. It contains Ngurah Rai International Airport and the main coastal tourism zones of Kuta, Legian, Seminyak, Canggu, Jimbaran, Nusa Dua, and Uluwatu, together with an upland interior that still holds agricultural and customary land uses. The regency's coastline receives both direct tourism-derived waste and riverborne waste from upstream catchments (Ratnawati et al. 2022). We concentrated field observation at Kuta Beach and Seminyak Beach because they combine the highest visitor

densities in the regency with visible pressure on solid waste handling, public space, and traffic capacity, and therefore provide the most demanding test of the environmental pillar of the regulation.

2.2. Research Design

We adopted a descriptive qualitative design as the main strategy, because implementation is an interpretive process whose meaning is carried by the accounts of the actors who perform it. Purely narrative implementation research has a known limitation: it identifies constraints but does not weight them. To overcome this, we integrated the qualitative component with the Analytic Hierarchy Process. The two strands are interdependent rather than parallel. The qualitative data establish what is happening and why, and they serve three specific functions in relation to the Analytic Hierarchy Process. They supply the operational sub-criteria that fill the hierarchy (Section 2.4); they provide the expert judgement from which the pairwise comparisons are drawn; and they give the interpretive context in which the resulting weights are read, so that a numerical priority is explained by the field evidence rather than presented on its own. The Analytic Hierarchy Process, in turn, converts the constraints identified in the qualitative work from an unranked list into an ordered, consistency-tested priority structure. The full sequence from problem definition to the derivation of governance implications is set out in Fig. 3 in the Appendix. Data collection and analysis were carried out between 2025 and January 2026.

2.3. Data Collection

We used three techniques. In-depth interviews were conducted with nine key informants, selected purposively and then extended by snowball sampling from an initial set of officials in the Badung Tourism Office. We judged informants suitable against three explicit criteria: direct involvement in the formulation, delivery, or oversight of sustainable tourism policy in Badung; at least five years of relevant professional or scholarly engagement with the destination; and the ability to compare implementation determinants against one another, which is the specific skill the Analytic Hierarchy Process requires. The informants were two officials of the Badung Tourism Office, two destination managers responsible for Kuta and Seminyak beaches, two representatives of local communities involved in tourism, and three tourism academics from Udayana University. All nine informants took part in the in-depth interviews and completed the full set of Analytic Hierarchy Process pairwise comparisons, so the qualitative evidence and the priority weights come from the same expert panel. The panel was deliberately weighted toward actors with a cross-cutting view of destination governance. It did not include dedicated representatives of the environmental agency, the spatial-planning authority, waste-management operators, or the tourism business associations, and we discuss the implications of this boundary for the environmental findings in Section 4.6. Interviews were held face to face or by telephone, lasted 45 to 90 minutes, and were recorded and transcribed in full. Passive participant observation was carried out at the two coastal sites, focusing on waste handling, public-space and beach conditions, traffic loading at peak hours, and the visible application of sustainability requirements by tourism enterprises. Documentary analysis covered Regulation No. 9 of 2021, the Badung Regional Tourism Development Master Plan 2017 to 2025, annual performance reports of the Badung Tourism Office, and internal operating documents of destination managers.

2.4. Analytical Framework and Hierarchy Construction

We specified the criteria layer of the hierarchy from the implementation framework of Edwards III (1980), which holds that policy delivery is governed by communication, resources, disposition, and bureaucratic structure. We chose this framework for two reasons. First, Regulation No. 9 of 2021 is a hierarchical instrument passed down from central to local government, so a top-down analytical lens is appropriate. Second, its four variables match the constraints reported independently for Badung, namely weak collaboration between actors, limited technical capacity, an economically weighted policy orientation, and fragmented institutional arrangements (Hamka et al. 2022, Cahyono et al. 2025). Each criterion was then broken into operational sub-criteria drawn from the theoretical framework, the content of the regulation, and the preliminary field findings, giving thirteen sub-criteria in total (Table 1). The resulting three-level hierarchy places the goal at level one, the four determinants at level two, and the thirteen sub-criteria at level three (Fig. 4).

Table 1: Criteria and sub-criteria used in the Analytic Hierarchy Process.

Criterion	Sub-criterion	Operational definition
Communication	Clarity of policy content	Extent to which policy objectives, indicators and actor roles are unambiguously specified
Communication	Consistency of policy messaging	Stability and mutual coherence of policy messages across agencies and over time
Communication	Reach of policy information	Extent to which information penetrates all tourism actors, including micro-enterprises and villages
Resources	Competence of human resources	Technical capability of officials and managers in environmental management and sustainability practice
Resources	Technical support	Availability of technical guidance, mentoring, standards and specialist expertise
Resources	Facilities and infrastructure	Availability and serviceability of physical assets supporting sustainable destination management
Resources	Budget availability	Adequacy of fiscal allocation for sustainability programmes
Disposition	Commitment of implementers	Depth of implementer attachment to sustainability objectives under commercial pressure
Disposition	Motivation of implementers	Internal drive to deliver consistently, shaped by incentives and recognition
Disposition	Positive attitude toward policy	Acceptance of the policy's goals as legitimate and worth pursuing
Bureaucratic structure	Clarity of standard operating procedures	Precision of workflows, delegated authority and boundaries of responsibility
Bureaucratic structure	Inter-agency coordination	Effectiveness of coordination across agencies, customary villages and private actors
Bureaucratic structure	Procedural efficiency	Administrative speed and absence of redundant procedural steps

Source: authors, derived from Edwards III (1980), Regulation No. 9 of 2021 and field findings.

2.5. Analytic Hierarchy Process Procedure

Pairwise comparisons were obtained from the key informants using Saaty's nine-point scale, on which 1 means equal importance and 9 means that one element is extremely more important than another, with reciprocal values entered in the transposed cells (Saaty & Vargas 2012). Comparisons were made first among the four criteria with respect to the goal, and then among the sub-criteria with respect to each parent criterion. The individual judgements were combined into a single group matrix using the geometric mean, which is the aggregation rule consistent with the ratio-scale properties of the method.

Each aggregated matrix was normalised by dividing every entry by its column total, and the priority vector was obtained as the row-wise arithmetic mean of the normalised matrix. For a matrix that is exactly consistent, this arithmetic-mean vector equals the principal right eigenvector. For the near-consistent matrices obtained here, it is a close and commonly used approximation, and we confirmed that the two agree to three decimal places for every matrix in this study. Consistency was tested through the maximum eigenvalue $\lambda_{\max}$, the consistency index in Eq. (1), and the consistency ratio in Eq. (2), where n is the matrix order and RI is the random index (0.58 for $n = 3$ and 0.90 for $n = 4$). Consistency was checked at two levels. Each respondent's own comparison matrices were checked before aggregation and had to satisfy $CR \leq 0.10$. Where an individual matrix exceeded this threshold at first, the respondent was asked to reconsider the specific judgements involved, and only matrices that met the threshold were carried into the geometric-mean aggregation. In this way the group weights are not an average over internally inconsistent judgements. The aggregated matrices were then tested again at the group level and again satisfied $CR \leq 0.10$. Global weights were obtained by multiplying each sub-criterion's local weight by the weight of its parent criterion. All computations were carried out in Microsoft Excel. The aggregated pairwise-comparison matrices and a worked example of the priority-vector and consistency calculation are given in Appendix B, and the full set of individual matrices is available from the corresponding author on request.

$$CI = (\lambda_{\max} - n) / (n - 1) \quad \dots(1)$$

$$CR = CI / RI \quad \dots(2)$$

2.6. Qualitative Analysis and Validity

Interview transcripts, field notes, and documents were analysed using the interactive model of Miles et al. (2014), moving through data collection, data condensation, data display, and conclusion drawing with verification. We established credibility in two ways. Source triangulation compared accounts across government, managerial, community, and academic informants, and technique triangulation tested interview claims against direct observation and official documents. We treated convergence across the three sources on the main implementation findings as the criterion of adequacy.

We assess the four pillars below as an interpretive judgement based on the convergence of interview, observation, and documentary evidence. We did not apply any formal scoring procedure or quantitative implementation index. The words “strongest” and “weakest” therefore refer to the relative weight of enabling over constraining conditions in the qualitative evidence (Table 2). These are findings about how the policy is implemented, drawn from informants and field observation. They are different from measured environmental outcomes such as water quality, waste generation, or land-cover change, which we did not quantify in this study and which, where cited, come from previously published work.

3. RESULTS

3.1. Implementation of the Four Sustainability Pillars

Destination governance. Badung has adopted a collaborative governance model in which customary villages, tourism enterprises, and community groups take part alongside the regency administration, and formal instruments such as the Regional Tourism Development Master Plan and regental regulations on tourism villages are in place. Monitoring mechanisms exist, but they are not well integrated. Coordination between the Tourism Office, the Environment and Sanitation Office, and the spatial planning authority remains sectoral, so programmes run in parallel rather than in sequence. Beach cleaning is carried out routinely with community participation, but upstream waste handling does not always keep pace, and the predictable result is that riverborne material returns to the coastal zone that has just been cleaned. Tourism Office informants and destination managers described this repeated re-accumulation independently of one another, and direct observation at both study beaches confirmed it. The transparency of monitoring results to non-governmental actors also remains limited, a point on which community and academic informants agreed.

Economic sustainability. Tourism contributes a large share of Badung's own-source revenue, and the regency has used this fiscal room to fund micro-enterprise development, tourism village programmes, and workforce training in places such as Pangsang, Sangeh, and Belok. Household incomes and local employment have risen, but the benefits are not evenly distributed. Returns are concentrated in large accommodation and food-service operators that have better access to markets and to regulatory processes, while micro-enterprises depend on government help for similar opportunities, and village-level economic institutions remain weak. Training has tended to be short and without sustained mentoring, producing the situation Edwards III (1980) calls resource inadequacy, where implementers are willing but under-equipped. Community informants described the support they received as one-off events rather than continuing accompaniment, which is consistent with the Tourism Office's own programme documents.

Socio-cultural sustainability. This is the strongest pillar. The Tri Hita Karana principle, which orders the relationships among people, nature, and the divine, works as a normative foundation for destination management, and customary villages hold real authority over the scheduling of tourism activity, the use of sacred space, and the way cultural performance is presented to visitors. Cultural identity has been kept as the regency's main attraction, and at the same time it works as a form of social

control over tourism conduct. This arrangement is best described as cultural governance (Sastrawan 2020). We identified two risks. Ritual practices are increasingly packaged for visitor consumption in ways that erode their sacred meaning (Greenwood 1989), and the transmission of cultural value to younger generations is not yet systematically organised. Academic and community informants both stressed the authority of the customary villages over tourism conduct, while noting that participation is stronger in carrying out decisions than in making them (Tosun 2000).

Environmental sustainability. This is the weakest pillar, and the most important one for pollution control. Several substantive initiatives exist: plastic reduction campaigns, cooperation with waste operators, community mangrove planting and beach cleaning, waste banks, environmental education, and community-based water management in upland tourism villages that adapts the traditional subak irrigation system. The stated policy direction is toward green tourism. Even so, three problems remain. First, compliance among tourism enterprises is uneven, especially among small operators, where liquid waste handling and energy efficiency are not well understood. Destination managers reported that large operators generally meet the standards while smaller establishments often do not, and our observation at Kuta and Seminyak was consistent with this. Second, enforcement of environmental regulation is weak, so non-compliance carries little cost while compliance carries a real one. Third, and most seriously, no comprehensive carrying-capacity assessment has been completed for the regency, so development approvals and visitor numbers in the coastal zone are not held to any measured ecological limit. Kuta and Canggu continue to record solid and liquid waste problems linked to rapid growth in accommodation and restaurants (Amirudin et al. 2023).

Table 2: Enabling and constraining conditions identified across the four sustainability pillars.

Pillar	Enabling conditions	Constraining conditions
Destination governance	Strong role of customary villages; community and enterprise participation; monitoring in place	Cross-sectoral coordination not integrated; slow policy response; limited transparency of results
Economic	Rising household income; local employment; substantive micro-enterprise support	Unequal access to opportunity; dominance of large-capital operators; weak village institutions
Socio-cultural	Effective tourism-culture integration; strong social legitimacy; culture as value added	Erosion of sacred meaning under market pressure; unsystematic intergenerational transmission
Environmental	Active campaigns and participation; strong customary enforcement; green-tourism direction	Inconsistent enterprise compliance; weak enforcement; carrying-capacity assessment not comprehensive

Source: field data, 2025 to 2026.

3.2. Priority Structure of Implementation Determinants

All aggregated comparison matrices met the consistency requirement, with consistency ratios below the 0.10 threshold at both the criteria and the sub-criteria level, so the derived weights are acceptable. A group-level consistency ratio can hide disagreement among respondents, so we also examined how stable the criteria ranking was across the informant groups. The ordering of communication first and disposition last was common to the government, management, community, and academic sub-panels, while the middle positions of resources and bureaucratic structure were less clearly separated. The headline ordering is therefore robust, but the exact interior weights should be read as indicative rather than exact. We report the weights below to five decimal places to reproduce the computation, not to claim that level of precision in the underlying judgements. The criteria weights are given in Table 3 and shown in Fig. 5. The distribution is far from the uniform 0.250 that would result if the four determinants were equally important: communication is 59% above that reference, while disposition is 48% below it.

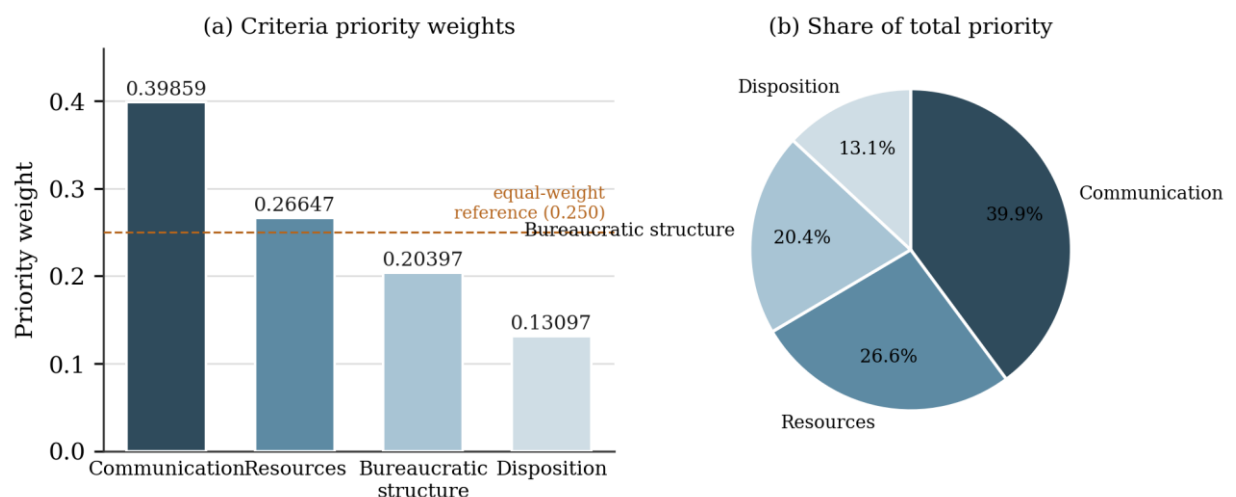


Fig. 5: Priority weights of the four implementation criteria: (a) weights against the equal-weight reference; (b) proportional share of total priority.

Table 3: Priority weights of the implementation criteria.

Criterion	Priority weight	Rank	Consistency
Communication	0.39859	1	CR < 0.10
Resources	0.26647	2	CR < 0.10
Bureaucratic structure	0.20397	3	CR < 0.10
Disposition	0.13097	4	CR < 0.10
Total	1.00000	—	—

¹ Source: Analytic Hierarchy Process computation, aggregated by geometric mean.

Combining local and parent weights makes all thirteen sub-criteria comparable on a single scale (Table 4, Fig. 6). The distribution is very uneven. The two highest-ranked sub-criteria each carry about twice the weight a uniform distribution would give, while the two lowest carry about one third of it, a ratio of 6.4 between the highest and lowest elements.

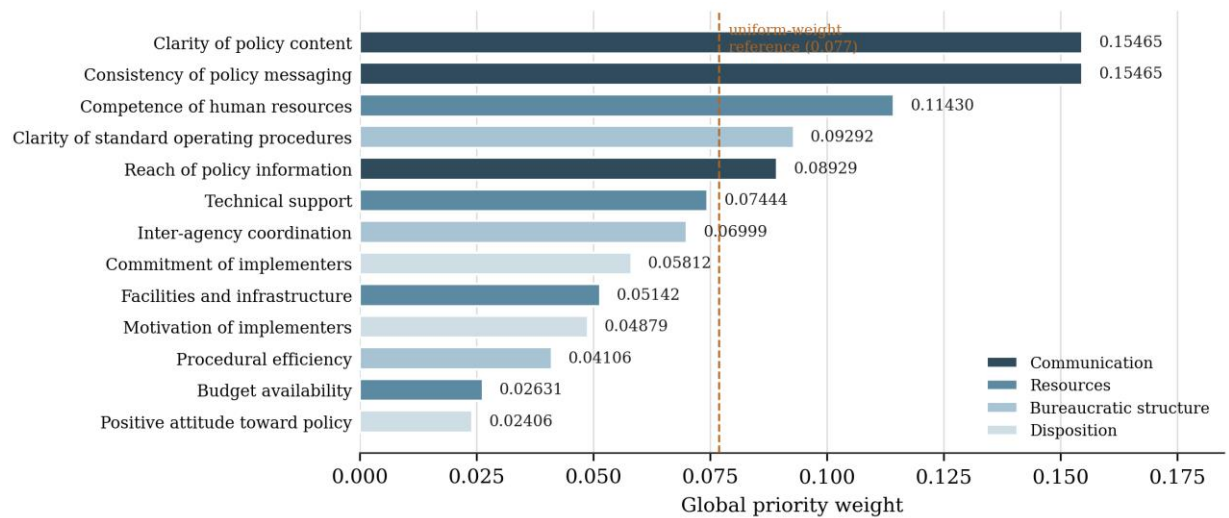


Fig. 6: Global priority weights of the thirteen sub-criteria, ranked, coloured by parent criterion. The dashed line marks the weight each sub-criterion would carry under a uniform distribution.

Table 4: Local and global priority weights of the thirteen sub-criteria.

Criterion (weight)	Sub-criterion	Local	Global	Rank
Communication (0.39859)	Clarity of policy content	0.38800	0.15465	1
Communication (0.39859)	Consistency of policy messaging	0.38800	0.15465	1
Communication (0.39859)	Reach of policy information	0.22401	0.08929	5
Resources (0.26647)	Competence of human resources	0.42893	0.11430	3
Resources (0.26647)	Technical support	0.27934	0.07444	6
Resources (0.26647)	Facilities and infrastructure	0.19298	0.05142	9
Resources (0.26647)	Budget availability	0.09875	0.02631	12
Bureaucratic structure (0.20397)	Clarity of standard operating procedures	0.45545	0.09292	4
Bureaucratic structure (0.20397)	Inter-agency coordination	0.34327	0.06999	7
Bureaucratic structure (0.20397)	Procedural efficiency	0.20128	0.04106	11
Disposition (0.13097)	Commitment of implementers	0.44377	0.05812	8
Disposition (0.13097)	Motivation of implementers	0.37252	0.04879	10
Disposition (0.13097)	Positive attitude toward policy	0.18372	0.02406	13

¹ Global weight = local weight × parent criterion weight. Ranks 1 and 2 are tied.

4. DISCUSSION

4.1. Communication as the Dominant Determinant

Communication carries the highest weight of the four criteria at 0.39859, half again as much as resources and about three times as much as disposition (Fig. 5). This is expected in theory, because

Edwards III (1980) treats communication as the first factor, whose failure spreads into every later stage. Its size here, however, reflects the particular structure of the Badung policy field, where a mixed set of actors, including regional agencies, hotel and restaurant operators, destination managers, customary villages, and residents, must share a single meaning of sustainability.

The internal structure of the criterion is more informative than the aggregate. Clarity of policy content and consistency of policy messaging carry identical global weights of 0.15465 and rank jointly first among all thirteen sub-criteria, while reach ranks only fifth at 0.08929. Informants gave more weight to the quality of the message than to how widely it is spread. The qualitative material explains why. Field-level implementers often read sustainability as cleanliness and conservation alone, rather than the balanced management the regulation requires, and operators read it through the lens of visitor numbers. When the message is understood differently along the chain, the policy drifts from its stated intent, which is exactly the distortion Edwards III (1980) predicts, and clear objectives are a precondition for consistent action in cross-sectoral policy of this kind (Hjern & Porter 1981). Widening dissemination before the message is stable raises rather than lowers the risk of miscommunication (Pressman & Wildavsky 1973), and signals that keep shifting erode compliance (Mazmanian & Sabatier 1983). The main reform is therefore not another round of socialisation events, but a single, technically clear, and stable statement of what sustainability requires of each type of actor. This is the qualitative counterpart of the numerical result. Because clarity and consistency of the message are the two highest-weighted sub-criteria, and because the interviews trace implementation drift to different understandings of sustainability along the delivery chain, the single technical guideline proposed in Section 4.5 follows as the specific instrument the ranking points to.

4.2. Resources: Competence Rather Than Finance

Resources rank second at 0.26647, but the make-up of the criterion goes against the usual expectation. Competence of human resources dominates at a global weight of 0.11430, third overall, while budget availability is last within the criterion and twelfth of thirteen at 0.02631 (Fig. 6). The low weight on budget reflects Badung's particular fiscal position, since its tourism-derived own-source revenue is among the highest of any Indonesian regency. This result needs to be read carefully. The informants perceived budget as relatively less important than competence, which is not the same as showing that budget is not a constraint at all. What the evidence supports is that, in a regency with Badung's fiscal standing, the constraint that is felt more sharply moves from the amount of money to the capacity to turn money into environmental outcomes (Pressman & Wildavsky 1973, Wu et al. 2015). Implementing the environmental pillar needs officials and managers who can carry out carrying-capacity analysis, zoning, waste-stream management, and destination sustainability standards, and these skills are unevenly spread across the regency's institutions. Without them, the policy stays normative rather than operational (Hall 2019). What the informants' priorities suggest, for well-resourced destinations, is that sustained investment in technical capacity and mentoring is likely to matter at least as much as extra environmental budget lines. This is a statement about perceived relative priority among the factors assessed, not a claim that funding does not matter.

4.3. Bureaucratic Structure and Role Allocation

Bureaucratic structure ranks third at 0.20397, but its leading sub-criterion, clarity of standard operating procedures, is fourth of the thirteen sub-criteria overall at 0.09292, ahead of every element of the two lower-weighted criteria. Implementers gave roughly twice as much weight to procedural certainty as to administrative speed. Where tourism regulation meets environmental protection, spatial planning, and customary law, unclear procedure creates conflict over jurisdiction, and clear procedure is a precondition for consistent and coordinated delivery (Hill & Hupe 2002). Coordination also carries substantial weight, because sustainable tourism in Badung needs alignment among regional agencies, customary villages, operators, and residents, and collaborative arrangements fail without strong coordinating mechanisms (Ansell & Gash 2008, Emerson et al. 2012). This agrees with Amirudin et al. (2023), who found that the decisive constraint in Indonesian waste governance was the absence of a framework setting out the role, obligation, target, and activity of each stakeholder. The strongest institutional asset in Badung, the enforcement capacity of the customary villages, currently sits outside any formal allocation of environmental responsibility. Setting it out in a written procedural framework would turn an informal source of compliance into a durable governance tool.

4.4. Disposition as an Intervening Condition

Disposition ranks fourth at 0.13097, with commitment (0.05812) more than twice the weight of positive attitude (0.02406). Where institutional arrangements and fiscal capacity are relatively mature, disposition works as a latent variable that strengthens or weakens the structural determinants rather than as a visible constraint on its own (Van Meter & Van Horn 1975). The internal ordering shows that implementers draw a sharp line between endorsing sustainability and being bound by it. Under constant commercial pressure, individual approval has to be turned into consistent collective action before it affects outcomes (Matland 1995). Local leadership is decisive here, because customary leaders interpret policy against conditions on the ground and effectively set its local content (Lipsky 1980). Motivation is shaped by what is measured, yet sustainability indicators are not built into the performance evaluation of officials (Ryan 2012).

4.5. Implications for Environmental Governance

Taken together, the qualitative and multi-criteria results point to a consistent reading. The evidence suggests that Badung's environmental deficit is linked less to an absence of regulation, a shortage of funds, or unwilling implementers, than to the delivery mechanism itself: a policy message that is unclear and inconsistently passed on, uneven technical competence, and an incomplete allocation of procedural responsibility across a fragmented set of actors. Because the priority weights express stakeholder perception rather than measured causal effect, we offer this as the most coherent account of the convergent qualitative and multi-criteria evidence, not as a demonstrated causal chain. The ranked weights translate into a suggested reform sequence, set out in Fig. 7 in the Appendix and ordered by the priority the participating stakeholders gave to the determinants. The sequence is a decision aid based on perceived priorities, not a prediction of environmental outcomes.

Four practical implications follow. First, the regency should issue a single technical guideline that states, in terms that micro-enterprises and tourism village managers can use, what each type of actor must do, by when, and against what measurable indicator. Second, a comprehensive environmental carrying-capacity assessment should be completed and made the binding basis for development permits and for managing visitor numbers in the coastal zone. We mean carrying capacity in four linked senses: ecological capacity, the assimilative limit of the coastal and reef environment; physical-infrastructure capacity, the limits of water supply, roads, and drainage; waste-management capacity, the throughput of collection, treatment, and disposal systems; and visitor or social capacity, the density beyond which the experience of residents and visitors declines. Sediment-based litter surveys that separate visitor-derived from marine-transported material give a practical monitoring tool for the waste-management dimension, since they isolate the share of coastal pollution that destination management can actually control (Yona et al. 2024). Third, sustainability indicators should be built into the annual performance reports of every relevant regional agency. Fourth, the environmental responsibilities of customary villages, private operators, waste banks, and regional agencies should be set out in an explicit partnership framework that specifies the role, obligation, target, and activity of each actor (Amirudin et al. 2023). These measures can be transferred to other high-pressure coastal destinations where the same pattern of strong regulation and weak delivery appears (Fadli et al. 2022, Zakaria 2024).

4.6. Limitations

Several limitations qualify these findings. First, the Analytic Hierarchy Process weights come from the judgements of nine key informants, so they express expert perception of relative importance rather than measured environmental performance or causal effect. They show where the participating stakeholders would direct implementation attention, not how much environmental improvement would follow. Second, although the panel spanned government, management, community, and academic perspectives, it did not directly include the environmental agency, the spatial-planning authority, waste-management operators, or the tourism business associations, all of which are closely tied to the environmental findings. Their absence may under-represent constraints that are specific to those functions, and claims about the implementation system as a whole should be read with this boundary in mind. Third, non-participant observation was concentrated at Kuta and Seminyak beaches, the most heavily used sites in the regency. We chose them as the most demanding test of the environmental pillar, but they are not statistically representative of every tourism area in Badung, so we generalise observations from them to the regency only where interview or documentary evidence supports it. Fourth, the study covers a single regency whose fiscal capacity is unusual for Indonesia, so the low weight on budget should not be generalised to jurisdictions with tighter finances. Fifth, the design is cross-sectional and cannot capture change in the priority structure over time. Future work should combine this framework with quantitative environmental indicators, including coastal water quality, waste diversion rate, and land-cover change, so that the stakeholder-perceived priorities reported here can be validated against measured environmental outcomes.

5. CONCLUSIONS

The implementation of Regulation No. 9 of 2021 in Badung Regency has gone furthest in the socio-cultural and economic pillars, where customary village institutions and the Tri Hita Karana principle provide both legitimacy and effective social enforcement. It has gone least far in the environmental and governance pillars, where cross-sectoral coordination is still fragmented, enforcement is weak, the economic benefit is unevenly shared, and no comprehensive carrying-capacity assessment yet limits development in the coastal zone.

The Analytic Hierarchy Process ranked the determinants as communication (0.399), resources (0.266), bureaucratic structure (0.204), and disposition (0.131), with all consistency ratios below 0.10. At the sub-criterion level, clarity of policy content and consistency of policy messaging ranked jointly first (0.155 each), followed by competence of human resources (0.114) and clarity of standard operating procedures (0.093). Budget availability ranked twelfth and positive attitude toward policy thirteenth, so the two lowest-ranked sub-criteria were budget and a disposition item, not budget alone. Among the determinants assessed, the participating stakeholders identified the quality and stability of the policy message, the technical competence of the people who put it into practice, and the precision with which procedural responsibility is shared among governmental, commercial, and customary actors as the most important for implementing the environmental pillar in a destination with strong regulation and strong fiscal capacity. These are priorities perceived by an expert panel, not causal effects established against measured environmental indicators, and they need to be validated through the quantitative environmental monitoring described above. Read with that qualification, the evidence suggests that, for destinations of this kind, strengthening the delivery mechanism deserves at least as much attention as adding further rules or funds.

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AUTHOR CONTRIBUTIONS

Conceptualization, A.A. and A.H.W.; methodology, A.A. and T.A.S.A.; software, T.A.S.A.; validation, B.S.H., E.N.P. and A.A.; formal analysis, T.A.S.A. and A.A.; investigation, T.A.S.A.; resources, A.H.W.; data curation, T.A.S.A.; writing-original draft preparation, T.A.S.A. and A.A.; writing-review

and editing, A.H.W., B.S.H. and E.N.P.; visualization, T.A.S.A.; supervision, B.S.H. and A.A.; project administration, A.H.W. All authors have read and agreed to the published version of the manuscript.

INSTITUTIONAL REVIEW BOARD STATEMENT

Ethical review and approval were waived for this study because it involved interviews with public officials and professional stakeholders in their institutional capacity, collected no sensitive personal data, and posed no more than minimal risk to participants.

INFORMED CONSENT STATEMENT

Informed consent was obtained from all key informants involved in the study.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

APPENDIX A

Fig. 3 sets out the full research design, showing how the qualitative implementation assessment and the Analytic Hierarchy Process fit together.

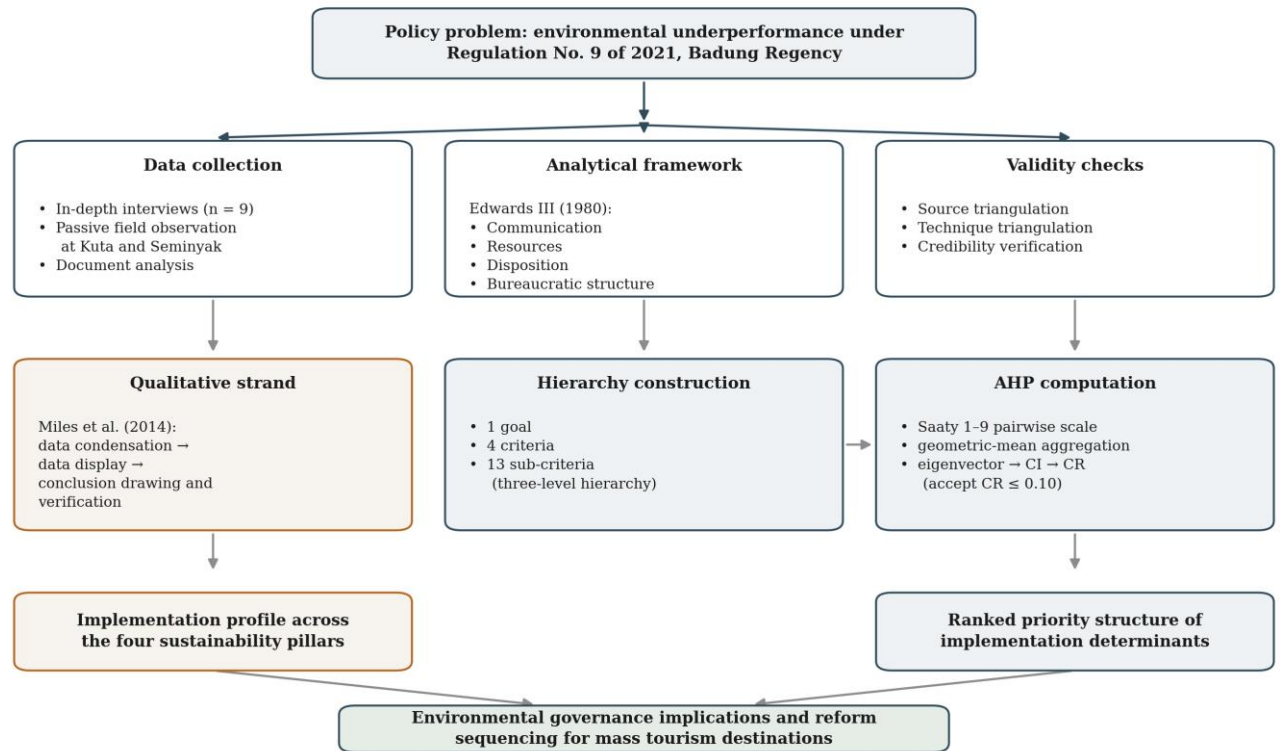


Fig. 3: Research design integrating the qualitative implementation assessment with the Analytic Hierarchy Process. Solid arrows denote the sequence of the design; the two strands converge on the governance implications.

Fig. 4 shows the three-level hierarchy on which the Analytic Hierarchy Process was built, with the derived criteria weights in parentheses.

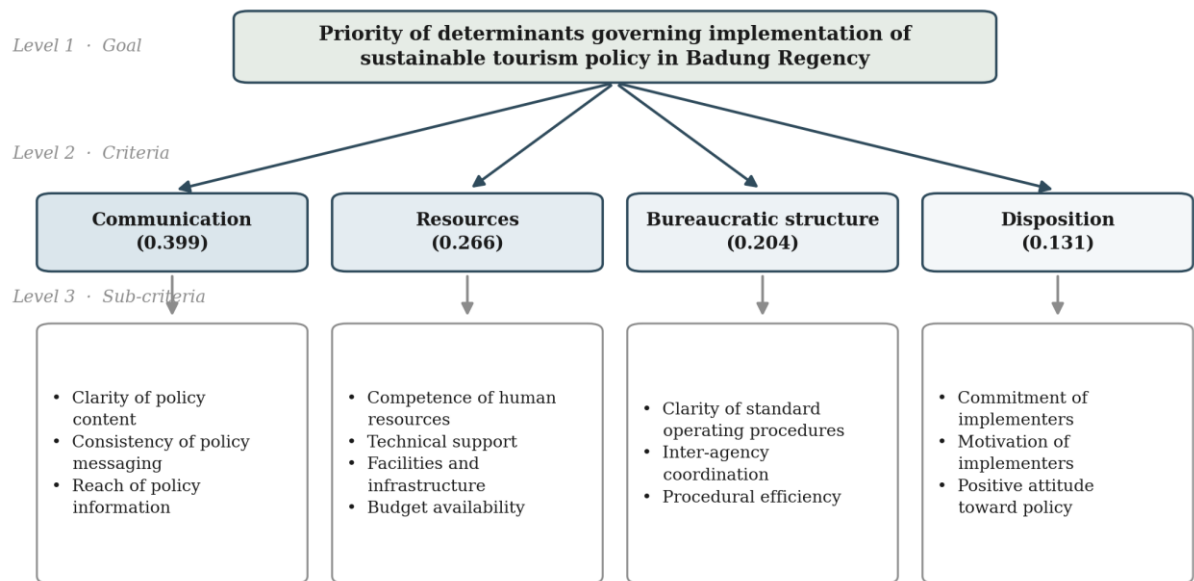
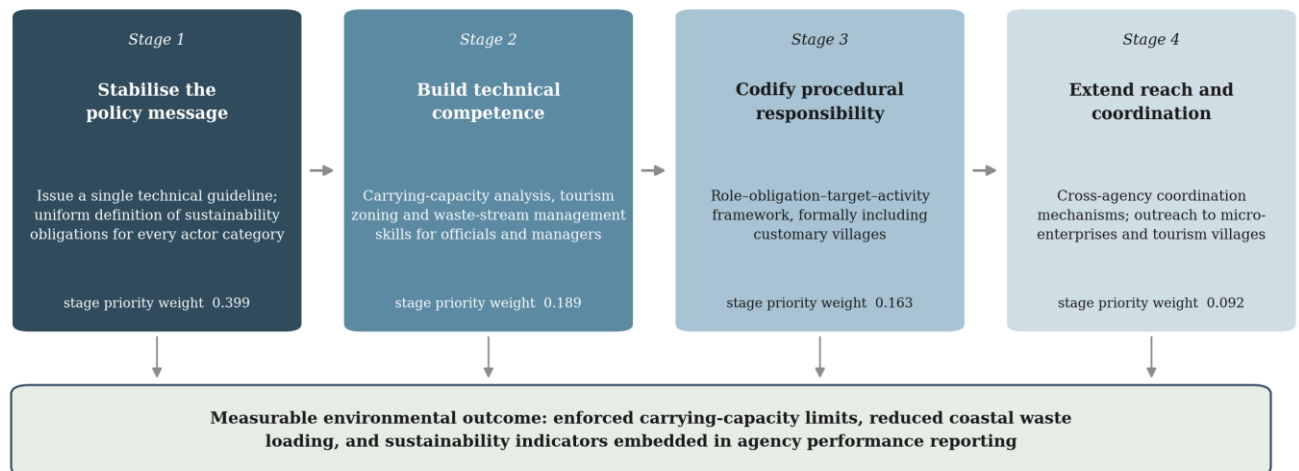


Fig. 4: Hierarchical structure of the Analytic Hierarchy Process model. Values in parentheses are the criteria priority weights derived in this study.

Fig. 7 presents the reform sequence implied by the global priority weights reported in Table 4.



Stages are ordered by the stakeholder-perceived priority of the determinants (Table 4), not by cumulative weight

Fig. 7: Priority sequencing for strengthening environmental policy delivery in Badung Regency, derived from the global weights in Table 4. The value shown for each stage is the combined global priority weight of the sub-criteria addressed at that stage (Table 4); the four values are not cumulative running totals and do not sum to one.

APPENDIX B

This appendix illustrates the Analytic Hierarchy Process calculation with a worked example and reports the aggregated criteria matrix. The example uses one representative respondent's comparison of the

four criteria. The criteria weights in Table 3 are the geometric-mean aggregation of all nine respondents' matrices, and we show this single matrix only to make the procedure clear.

A respondent compared the four criteria pairwise on Saaty's nine-point scale, entering reciprocals in the transposed cells. The resulting comparison matrix is shown in Table B1, with each column normalised by its total. The priority weight of each criterion is the mean of its normalised row.

Table B1: Illustrative pairwise-comparison matrix for the four criteria (one respondent).

Criterion	C	R	B	D	Weight
Communication (C)	1	2	2	3	0.417
Resources (R)	1/2	1	2	2	0.269
Bureaucratic structure (B)	1/2	1/2	1	2	0.193
Disposition (D)	1/3	1/2	1/2	1	0.121
Column total	2.333	4.000	5.500	8.000	1.000

Weight = mean of the row of the column-normalised matrix. Values rounded to three decimals.

Consistency is checked as follows. Multiplying the comparison matrix by the weight vector gives the weighted-sum vector, and dividing each element by the corresponding weight gives the four estimates 4.089, 4.102, 4.035 and 4.060, whose mean is the maximum eigenvalue $\lambda_{\max} = 4.071$. The consistency index is $CI = (\lambda_{\max} - n) / (n - 1) = (4.071 - 4) / 3 = 0.024$, and with the random index $RI = 0.90$ for $n = 4$ the consistency ratio is $CR = CI / RI = 0.024 / 0.90 = 0.026$, which is below the 0.10 threshold, so the matrix is acceptably consistent.

For this matrix, the arithmetic-mean weight vector (0.417, 0.269, 0.193, 0.121) and the principal right eigenvector (0.418, 0.271, 0.191, 0.121) agree to within 0.002. This shows why the row-mean method is used as a close approximation to the principal eigenvector for near-consistent matrices. Table B2 sets out the aggregated criteria comparison as the ratios implied by the reported group weights, from which the criteria weights in Table 3 are recovered exactly. The full set of nine individual respondent matrices, from which the geometric-mean aggregation was computed, is available from the corresponding author on request.

Table B2: Aggregated criteria comparison expressed as implied weight ratios, and the derived weights reported in Table 3.

Criterion	C	R	B	D	Weight
Communication (C)	1.000	1.496	1.954	3.043	0.39859
Resources (R)	0.669	1.000	1.306	2.035	0.26647
Bureaucratic structure (B)	0.512	0.765	1.000	1.557	0.20397
Disposition (D)	0.329	0.491	0.642	1.000	0.13097

Cells are the ratios of the group weights; the priority vector recovers the Table 3 weights, with $CR \approx 0$ by construction. Residual inconsistency in the underlying nine individual matrices is reflected in their group consistency ratio, which was below 0.10.