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GeoRegions as Flexible Identity Frameworks: Stakeholder-Informed Pathways for Geotourism and Geoconservation

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Abstract

Australian regional communities are actively seeking development pathways that generate local economic value while maintaining environmental and cultural integrity. In this context, GeoRegions have emerged in Australia as a community-led approach for recognising and interpreting geoheritage and associated abiotic–biotic–cultural (ABC) values through geotourism and geoeducation. The GeoRegion concept remains intentionally operationally flexible, but for regional communities encountering a myriad of barriers to sustainable geotourism implementation, any uncertainty for proponents about what constitutes an implementable GeoRegion and what resources and governance arrangements are required for credible and sustained delivery requires resolution. This study developed a stakeholder-informed conceptual model to clarify the practical 'building blocks' of GeoRegion establishment and the conditions under which GeoRegions can contribute to sustainability-oriented regional development. Using a design thinking framing and semi-structured interviews with thirteen expert participants, we used semantic discourse analysis to identify the factors perceived as essential to GeoRegion viability and legitimacy. We found that participants expected GeoRegions to be geologically centred, but their perceived value and long-term durability depend on (i) genuine community support and locally legitimate narratives (including Indigenous knowledge where appropriate), (ii) capable champions or coordinating groups, (iii) sustained resourcing for interpretation and visitor readiness, and (iv) a facilitative and not prescriptive role for government. Participants emphasised that GeoRegions should never be constrained by land tenure but cautioned that competing land uses, access logistics and uneven capacity across regions were highly influential in the delineation of feasible boundaries and management intensity. Our GeoRegion model differentiates core inputs (community mandate, knowledge co-production, geoheritage significance, human capacity and funding) from expected outputs (interpretive materials, geoeducation, geotourism, economic development, conservation outcomes and strengthened place identity), and we identify feedback that can either reinforce or erode sustainability outcomes over time. We argue that GeoRegions can provide a low-risk, scalable mechanism for geoconservation-informed regional development, particularly where formal protected-area tools or geopark ambitions are politically or economically constrained, provided that supporting governance and resourcing are treated as essential design requirements.

Keywords: geoconservation; geoheritage; geoeducation; geointerpretation; sustainable development goals; design thinking

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1. Introduction

Formal frameworks such as UNESCO Global Geoparks were developed to provide formalised, integrated models that link geoconservation, community engagement, education, and sustainable tourism within territorially coherent landscapes. However, in many national contexts, the institutional, financial, and administrative requirements of formal geopark designation are difficult to meet. Barriers may include centralised governance systems, limited technical capacity for nomination and management, fragmented land ownership, political sensitivities around new conservation labels, or competing development priorities. As a result, many significant geologically or geoculturally distinctive regions remain without coordinated recognition or stewardship frameworks. It is within this policy and governance gap that locally grounded, non-statutory approaches may offer an intermediate pathway for advancing geoconservation and geotourism development.

Geotourism is a practice and a rapidly evolving field within tourism research, emerging from late twentieth-century efforts to integrate geological heritage with tourism and conservation objectives [1]. Geotourism is a place-based activity and practice that sustains local character, culture and environment when centred around a geological or geographic theme, such as mountains or restored mining heritage. To operationalise these principles, geoparks were first developed in Europe and China and later expanded globally through the UNESCO Global Geoparks (UGGp) framework, promoting geotourism alongside conservation and education objectives [2]. The contribution of geotourism towards sustainable development has been a primary driver of interest in the field alongside the role of geoparks in promoting geotourism [3].

When supported by organisational structures guiding infrastructure, education and tourism growth, geoparks have proven to lead to significant economic development, value creation and involvement of local communities [4,5], all key ingredients for sustainable long-term growth. At the same time, research has shown that the mere presence of geodiversity and its valorisation for tourists is not sufficient for ensuring such outputs, even within designated geoparks [6–8]. The unique characteristics of geotourism involve combining the multidomain knowledge of tourism products and geoproducts to create viable and sustainable geotourism products. In isolation, a geoproduct may lead to valorisation, presentation and conservation of geodiversity, but if not viewed as a tourism product as well, there are fewer additional social and economic benefits. Additionally, the overarching banner of UGGp or territorial geopark identity may not be congruent with local branding or cultural identity, leaving some local communities without an appropriate mechanism to express and organise their geotouristic story.

A recent bibliographic review of geotourism by [9] shows that not only the volume of research on geotourism has increased significantly, but the focus of the research has also shifted from geoparks and geoheritage to sustainable development and good tourism practices. At the same time, it has highlighted the need for community involvement and integration of theoretical research with on-ground applications. Emerging research links geotourism and sustainable development [10]. For communities and regions that lack capacity, agency, interest or required specificity to sustainably develop geotourism through formal UGGp or similar mechanisms, local approaches grounded in sustainability principles may be more efficient in achieving geotouristic ventures.

This research examines one such locally grounded initiative. We have undertaken qualitative research in the examination of the concept of 'GeoRegions', introduced as a uniquely Australian, community-led framework where "sites and landscapes of geological significance are linked together around a central natural or cultural value" [11]. GeoRegions are intended to operate through bottom-up governance, flexible tenure arrangements and diffuse boundaries, allowing local communities and government agencies to define place-

based values and development priorities without imposing new statutory conservation controls. The approach is intentionally flexible so that local proponents can truly express and sustain the character of their place and the wellbeing of their residents without needing to undertake the substantial next (and in Australia, currently unformalised) step towards UGGp development. This article captures knowledge from diverse expert practitioners from geosciences, tourism, natural environment management and region development. It seeks to reveal perspectives on the perceived value and identity of GeoRegions and synthesise these perspectives into a bottom-up approach for sustainable development in Australia's *regional* communities, which, like many other parts of the world, suffer from skill-, resource- and legal-structural deficits.

2. Background

2.1. Geotourism in Australia—Opportunities and Challenges

The tourism industry is pivotal to the Australian economy, accounting for 4.4% of employment and $198 billion visitor spending in 2023–2024 [12]. It is, therefore, not surprising that it is seen as an important tool for regional development and reducing socioeconomic disadvantages in regional Australia. The THRIVE 2030 strategy aims for regional Australia to capture more than 40% of this expenditure by 2030, contributing $100 billion to the regional economy [13]. However, presently, the visitation in Australia remains heavily concentrated in capital or major cities and attractions close to these cities, with almost all international and a significant portion of domestic expenditure in capital cities [14]. Despite this, regional Australian economy is more dependent on tourism than metropolitan centres: the former accounting for 3.1% of the nominal Gross Value Added versus 2% for capital city destinations [15].

Regional areas often have relatively 'intact' natural and cultural elements enhancing attractiveness as nature-based tourism destinations, including geotourism. Regional Australia has many such geotourism experiences (Figure 1). In addition, tourism contributes to social development and capacity building in regional Australia, providing employment and training opportunities, especially in areas transitioning from manufacturing economies [16]. Conversely, these intact natural and cultural attractions may suffer degradation from increased visitation to hastily planned or lower cost new regional tourism developments, ultimately further diminishing value and visitation. Consequently, there is a need for a systematic approach to guide geotourism strategies in regional Australia.

Regional Australia could have a myriad of well-managed and socially responsible geotourism ventures with the resources available to support its growth, but several barriers exist, including socioeconomic differences compared to urban counterparts. Human capital exists in regional Australia with strong place and landscape connections; however, gaps remain in technical and complex decision-making workforce numbers [17], which means specialised skills are currently reliant on 'imported' staff from other cities or countries, and these people have limited local connections with place. To add to this, a delay in the supply of high-speed internet hampered innovation and new business development in regional Australia [18] until recently, reducing skilled workforce migration. As an 'export product' reliant on visitation, regional tourism bears disproportionate costs in 'accessibility infrastructure' [19], including roads, tracks, public toilets and other amenities. Regional tourism challenges are potentially exacerbated by multiple competing regional developmental agencies with limited funding and objectives often bent towards parochial interests or satisfying large capital stakeholders [20].

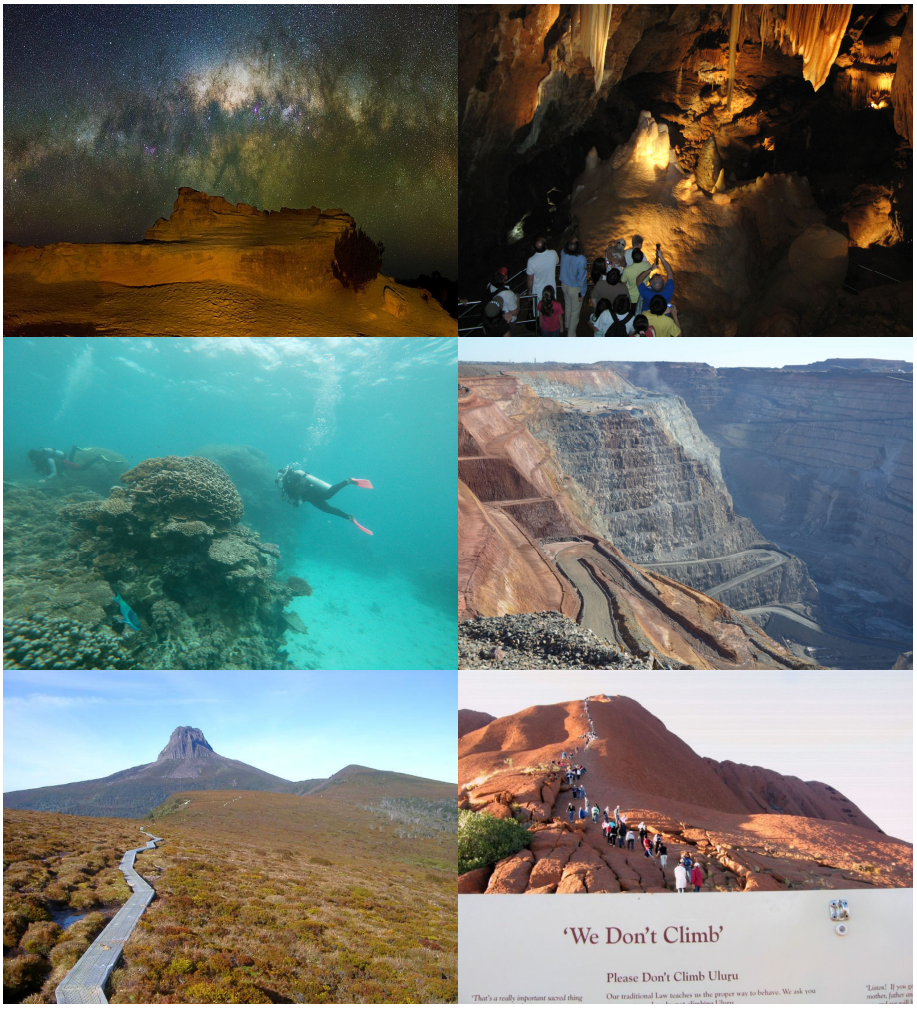

Figure 1. Examples of geotourism experiences across Australia, clockwise from top left: astrotourism in the Pinnacles, Western Australia (Note. From Milky Way Setting Over The Pinnacles Western Australia [Photograph] by Jesus NuÑez, 2016, https://commons.wikimedia.org/wiki/File:Milky_Way_Setting_Over_The_Pinnacles_Western_Australia_(187209847).jpeg (accessed on 06 March 2026), CC BY 1.0); cave interpretation in Jenolan, New South Wales (Note. From Temple of baal 2 [Photograph] by "vlad", 2006, Flickr https://www.flickr.com/photos/88112377@N00/329912240/ (accessed on 12 May 2025), CC BY-NC 2.0); Super Pit mining tourism in Kalgoorlie, Western Australia (Note. From Day 5—Super Pit Gold Mine Kalgoorlie WA [Photograph] by Sascha Grant, 2012, Flickr https://www.flickr.com/photos/oflittleinterest/7353814690/ (accessed on 12 May 2025), CC BY-NC-ND 2.0); Uluru as a formerly climbed, now protected geocultural experience in the Northern Territory (Note. From Westcott & Anderson [Photograph], Opentext https://opentextbc.ca/introtourism2e/chapter/tourism-and-Indigenous-human-rights/ (accessed on 12 May 2025), CC BY 4.0); the overland track experience in Cradle Mountain National Park, Tasmania (Note. From track to Famous Barn Bluff Mountain in Tasmania [Photograph] by Photo Everywhere, n.d., https://photoeverywhere.co.uk/east/tasmania/slides/barn_bluff9160.htm (accessed on 12 May 2025), CC BY 2.5); and diving in the Great Barrier Reef, Queensland (GBR Marine Park has outstanding universal value of geodiversity recognised under criteria VIII) (Note. From Scuba Diving the Great Barrier Reef [Photograph], by Nicholas Cole, 2019, Flickr https://www.flickr.com/photos/ncole458/47568933402/in/album-72157677696337847(accessed on 12 May 2025), CC BY 2.0).

Previous attempts to promote regional geotourism include the Australian National Landscapes (ANL) program, which was hampered by a top-down approach in deciding the scope of these landscapes, power imbalances and stakeholder conflicts, a destination marketing focus over development and a lack of efforts to foster collaboration [21]. Sub-

sequently, the UNESCO Global Geoparks (UGGps) concepts were developed almost in parallel with early geotourism identity in Australia as the 'highest level' of geotouristic expression and experience. However, these attempts were marred by an initial unsuccessful UGGp that did not attain revalidation over a decade ago, and only some states have initiated local geoparks in the past two years [22]. Since then, formal governmental support for geoparks in Australia has diminished, despite continued global growth of the UNESCO Global Geopark Network [23]. Nevertheless, geoparks continue to be recognised internationally as a mechanism for sustainable geotourism and geoheritage conservation [24].

The geotourism concept has been adopted with an emphasis on the integrated relationship between geological, ecological and cultural values in Australia. By foregrounding geology and geomorphology alongside ecological and cultural expressions derived from these foundations, geotourism is understood to enhance both nature-based and cultural tourism, including Aboriginal tourism, through an holistic ABC (abiotic–biotic–cultural) framework [25]. In response to the Australian context, the Australian Geoscience Council Inc. (AGC) released the National Geotourism Strategy in 2021 to promote geotourism as a driver of economic growth, employment and community education [26]. It also endorses activities associated with the achievement of SDG's 15 Life on Land, and SDG11 Sustainable Cities and Communities, through geoconservation-affirming activities and interpretability. Building on this strategy, the GeoRegion concept was introduced, and three thematic GeoRegions currently exist in Australia: the Murchison GeoRegion in Western Australia, the Ku-ring-gai GeoRegion in New South Wales and the Glen Innes Highlands GeoRegion in regional New South Wales, each emerging from locally driven initiatives but with differing motivations and spatial contexts [27,28].

While the flexibility of the GeoRegion approach supports local autonomy and inclusion, it also presents governance and implementation challenges. Previous research indicates that geotourism initiatives must balance diverse stakeholder objectives, navigate intergovernmental relationships, address power asymmetries and secure sustainable funding arrangements [21] in order to be truly embracing of sustainable development. Studies of regional tourism policy development in Australia have previously opined that, if left unchecked, regional geotourism and other forms of regional identity and activity soon experience a dominance of economic imperatives at the expense of environmental and social considerations [29]. Effective community engagement is, therefore, critical to avoiding misconceptions surrounding geotourism and UNESCO designations, including concerns related to land-use conflicts, external control or cultural incompatibility [30]. Professional and institutional actors may play an important role in bridging the gap between high-level guidance and on-ground implementation [31], which may be critical to the further design, development, refinement, implementation and establishment of additional GeoRegions.

In Australia, meaningful engagement with state or territory Geological Surveys is widely regarded as essential for the legitimacy and long-term viability of major geotourism initiatives. Without such support, GeoRegions or comparable initiatives are unlikely to secure broader governmental recognition or alignment. Accordingly, the AGC has recommended that proponents consult the relevant state or territory Geological Surveys early in the GeoRegion development process to identify jurisdiction-specific requirements [25]. However, as geoconservation or activities with a geological theme are only one part of the geotouristic 'experience' that is a GeoRegion and due to their intentionally flexible approach and establishment to date, it is important to understand more about *what it means to be a* GeoRegion. GeoRegions may one day in the future become UGGps, and should this occur, it is imperative that present and future GeoRegions embrace sustainable development in a geotourism context, embracing the 'ABC'. Against this backdrop, this research seeks to

refine what a stakeholder-informed, pre-assessment framework to support proponents in evaluating potential GeoRegion initiatives prior to formal consultation and implementation might look like, using the input of professionals with experience in local tourism initiatives, geotourism, protected areas or regional planning.

2.2. Questions Guiding This Research

The aim of this research was to develop a conceptual systematic model for GeoRegional establishment, informed by expert participation to enhance stakeholder and proponent decision-making. Because this research adopted an interpretivist, qualitative methodology, it did not posit formal hypotheses in the positivist sense. Instead, it articulated guiding research questions:

a. What characteristics of an area motivate creation of a GeoRegion?
b. What factors influence the 'boundaries' of a GeoRegion?
c. How do these characteristics and factors interact with each other to influence the outcomes of a GeoRegion?
d. Are these characteristics affirming of geotourism that sustains the character of a place and promotes the wellbeing of its residents [32]?

3. Materials and Methods

3.1. Authors' Positionality

The authors are from technical backgrounds who, in the past, have adopted positivist positionalities in approaching the research context and work. Design thinking (DT) was adopted to structure this research for a reflexive, interdisciplinary approach, integrating technical expertise with interpretive qualitative methods. Our positions thus embrace the recognised interdisciplinary perspective to analyse participatory perspectives. The initial phases of DT associated with stakeholder inputs, understandings and learnings were employed in this research. The 'GeoRegional essentials' distilled from this research were an ideation of sustainable regional development facilitators and enablers.

3.2. Design-Thinking Approach for Stakeholder-Informed GeoRegions

Design thinking (DT) is a collaborative systematic problem-solving approach widely used beyond traditional product design fields [33]. It involves tailoring the design specifications to the needs of the end user—a necessity in complex social, economic and environmental problems. The use of DT has been shown to broaden the horizon of stakeholders and increase the diversity of data and solutions, improving the effectiveness of decision-making for local authorities [34]. Numerous other examples exist to demonstrate the effectiveness of DT in decision-making [35–37]. Lee & Park [38] suggest that DT has five stages:

1. Empathise: A qualitative exploration of the user experience and/or expectations.
2. Define: Use the knowledge from empathising to create actionable problem statements.
3. Ideate: Solutions explored and evaluated in response to the problem.
4. Prototype: Solutions translated into executable actions to create an initial product.
5. Test: Deployment of a prototype, evaluable through user feedback or measurement against expected performance.

The early stages of design-thinking research and development involve empathising with stakeholders who require a designed solution and then defining the scope of this design (the 'problem statement' viz. Wilkerson & Trellevik [39]). This research applies these early stages of DT by 'empathising' with the stakeholders through an analysis of semi-structured interviews with 13 expert stakeholder participants, leading to the definition of key themes in GeoRegional establishment that could be used to develop a conceptual model for a GeoRegion.

3.3. Semi-Structured Interviews with GeoRegional Stakeholders

The initial participant pool self-identified from contact with Geotourism Australia. Snowball techniques were used to include more prospective participants from the interviewees themselves. A semi-structured interview with fifteen questions (Table 1) was conducted with the participants, and verbatim transcripts from an in-built zoom function were used for further analyses (UTAS HREC ID: H0031168). The semi-structured nature of the interviews allowed for consistent thematic exploration while enabling participants to introduce context-specific insights [40,41]. Participant size for this study was adequate, as data saturation (although context-dependent) normally occurs after around twelve interviews [42,43]. For a related research example in terms of the size of the participant pool, Yuliawati et al.'s [44] study of 10 personnel regarding geotourism in Indonesian geoparks found that, while geoparks were rich in resources for geotourism and education, they lacked conservation, interpretation and resource management.

Table 1. Alignment of research objectives with interview questions * and semantic analysis of transcribed data.

Objective	Interview Question(s)
Assign pseudo-persona to each participant for response contextualisation	What best describes your field of expertise?
	Tell me about your recent work or activities?
Address objective 1: to understand what regional attributes and characteristics are perceived to motivate GeoRegional creation	What is your definition of a GeoRegion?
	Do you agree with the (peak body) definition of a GeoRegion?
	What do you think should be the objectives for GeoRegional establishment?
	What change(s) would establishing a GeoRegion (in your area/more broadly) bring?
Address objective 2: appreciating participant-perceived factors influencing GeoRegional boundaries	What role do you think Indigenous nation and cadastral boundaries should play in defining GeoRegional extent?
	What resources do you think would be required to operationalise a GeoRegion?
	What challenges would you expect to face in the process (of establishing a GeoRegion)?
	What/would you expect/want legislative (or other governance) support to support challenges or changes brought on by GeoRegional initiation or establishment?
	Do you agree that GeoRegions are a good approach to geoconservation in Australia?
Evolve research to canvass new participant experts and develop a deeper understanding of the research topic	Can you suggest someone that I should interview for this research?
	Would you like to contribute anything extra to this interview that you believe might be relevant (to this research)?
Address objective 3: how do participant-informed characteristics and factors interact to potentially influence GeoRegional outcomes?	[Semantic analysis of interview transcripts and themes]

* Semi-structured interview techniques were used, meaning that questions were re-worded or explained in more detail to ensure that participants understood the meaning of what they were being asked, if necessary or requested.

A similar approach is followed here with participants selected using purposive expert sampling to capture perspectives from stakeholders involved in geoconservation, tourism, governance and regional development. This approach unifies participants around a shared interest in GeoRegions and possessing expertise in executing similar concepts, ensuring data saturation occurs within the sample size.

3.4. Interview Analyses

Participants were grouped into primary field of work categories based on responses to questions one and two. Categories were kept broad to avoid revealing personal identities but still useful when contextualising responses. Participants mentioning experience in geology or related fields were classified as geoscience professionals, and those involved in non-geoscience facilitative or leadership fields were classified as management professionals. Participants were assigned pseudo-personas (random names representing the diversity of Australia) that bear no indication of the gender, ethnicity or any other personality trait of the participants (Figure 2).

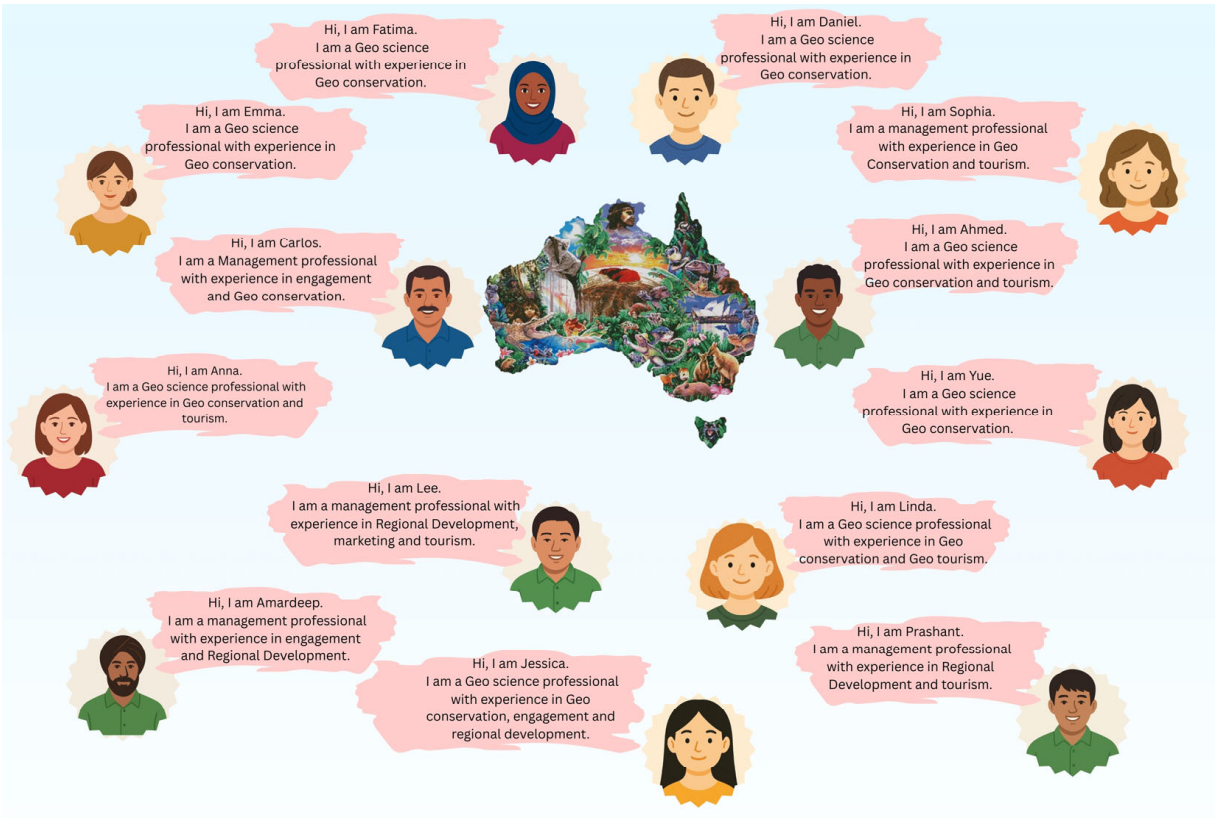

Figure 2. Pseudo-persona characteristics of the interview participants. Graphic: M. Sharma, Canva.

Transcribed data was translated into concise meaningful themes [45] and analysed as codes of common themes and concepts, problems or sentiments using the auto-code feature of NVivo 15.1.2 [46]. Data saturation occurred around the tenth interview, after which the emergence of new themes dropped significantly, and then, the themes were refined via iterative coding (Table 2).

The coding process revealed 90 open themes associated with the ABC; 17 axial codes related to the significance of the regional geology, culture, tourism experiences and many others; and eight refined codes (Figure 3).

Table 2. Coding formats used in participant interview thematic analysis.

Classification	Description of Approach
Open Coding	The semi-structured nature of the interview and diverse range of responses necessitated semantic codes aligned with the major themes of the interview discourse, such as 'geology', 'land tenure', etc. These were mapped in nVIVO as open codes.
Axial Coding	Open codes were grouped to identify common themes emerging from the interviewee opinion. For example, 'land tenure' and 'government & policy' are linked through planning, legislation and protected areas conservation. These axial codes as linkages were used to create a conceptual framework.
Selective Coding	Axial codes were filtered to select the actionable themes used to answer the research question. For example, the geoheritage values and community support were identified as central themes to answer research question a—What characteristics of an area motivate creation of a GeoRegion?

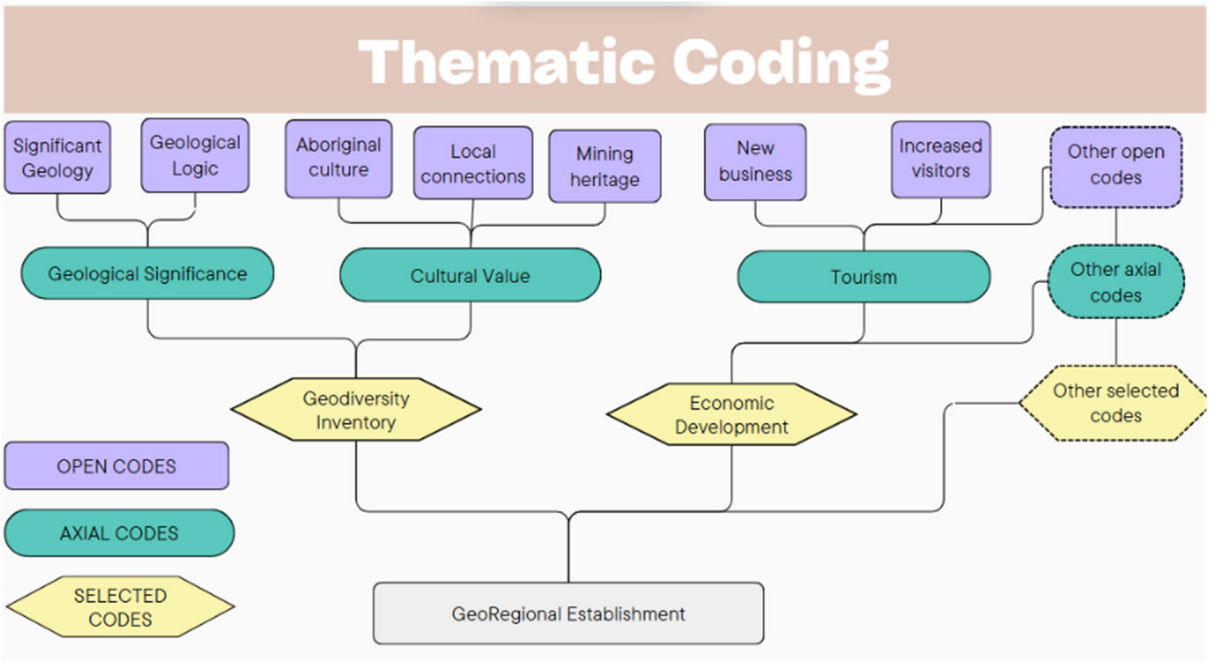

Figure 3. Workflow for thematic coding with some example codes showing how codes from the transcript were filtered and refined to identify common themes related to GeoRegional establishment. The figure presents an illustrative subset of codes only due to the large number of codes generated during analysis, and several open codes retain participant phrasing (in vivo codes) reflecting stakeholder language rather than author-defined concepts; Graphic: M. Sharma, Canva.

3.5. Developing a Conceptual Framework from the Analysis

After empathising with the stakeholders and defining the scope and considerations for GeoRegional establishment, the themes were grouped as inputs or outputs of GeoRegion based on desires and expectations of the interviewees. Once the problem statement was defined [42], the interlink between these variables was identified to establish a conceptual framework for GeoRegional establishment.

4. Results

4.1. GeoRegional Stakeholders: Construction of a Diverse Participant Group

The following findings present themes derived from the stakeholder interviews addressing factors influencing GeoRegion establishment. The diverse participant selection reflected the multifaceted cohort interested in conceptualisation and implementation of GeoRegional development (i.e., the GeoRegional concept extends beyond geoscience to include social, cultural and economic domains, especially reflective of regional Australia). The stakeholders were interviewees fitting user classifications of persons with geoscience-based professions (8/13) or professional leadership positions, such as local government or tourism (5/13).

4.2. Design Thinking Phase 1—Empathising with the Stakeholders to Identify the Factors Influencing Putative Future GeoRegional Establishment

Interviewees commonly described GeoRegions as being centred on geological values. Whilst each interviewee had a different story to tell, they consistently placed a strong emphasis on *geology as a fundamental building block* for GeoRegions. Ten interviewees said a potential GeoRegion must have "national and internationally significant," "interesting," or "intriguing" geology. Two geoscientists argued geology was purely geoscience and should be the sole focus: for instance, Emma stated, "I don't like to conflate natural values and cultural values." Others, especially with regional development experience, viewed geology as a foundation for broader values. Amardeep felt the term GeoRegion is "a little bit deceiving because it immediately goes to Geo. . . while it's so much more than that."

The key theme of *community involvement and support* emerged across all responses. Three interviewees emphasised that GeoRegions should only be formed if the local community wants to, and five suggested the importance of 'interesting stories' from local knowledge, including Indigenous knowledge, in identifying sites and values for a prospective GeoRegion. Jessica was strongly in favour of community rights and stated, "You cannot force the people to accept what has been decided by you." Daniel was clear that GeoRegions should cater to the community needs by stating "the aim has to be about the people who live there."

Increased awareness of geodiversity values was identified by interviews as an expected outcome of establishing a GeoRegion (10/13 interviewees). Prashant highlighted that the purpose of a GeoRegion should be to "be able to celebrate an area's diversity in a [sic] holistic way." The remaining three interviewees, who did not mention it as an objective, still considered a better understanding of the values as an effect of a GeoRegion. Half of the participants mentioned that *geoeducation* is one of the possible outcomes of a GeoRegion. The presentation of values was, however, also identified as a challenge, with Emma and Yue noting that interpretation of geology and landforms can be quite difficult.

In response to the promotion and interpretation of Indigenous narratives and culture and European colonist history within GeoRegions, a key theme emerged: *cultural stories add value to a GeoRegion* (11/13 interviewees). Amardeep mentioned that human connection will help people understand or relate to the geological values: "when we're establishing a GeoRegion, if we're just talking about the geology and the landforms not everyone will go there. . .. I think that's where the other parts of that come into it. . .and you're talking about Aboriginal culture, there's opportunities for people to engage you know whether it's with art, tours, activities." "The cultural values must be underpinned by a geological logic," Daniel noted, "the stories, the interaction (must be about) the geodiversity and its development, and how that has interacted with the human culture rather than 'here's a human culture. Oh, there's some rocks'."

Sustainable use of geodiversity values in the form of tourism emerged as a strong theme. Four interviewees explicitly mentioned economic development as an objective while also talking about tourism through the interviews. Eight interviewees explicitly mentioned "tourism" as an objective, although two of them mentioned tourism only if the community wants it. The remaining five interviewees had raising awareness, appreciation, conservation and economic development as objectives. All participants agreed that GeoRegions will increase tourism, even if it was not an explicit objective for some. For Yue, who lived in a metropolitan area, a GeoRegion was *more about education* than just tourism. Eight interviewees mentioned *interpretive materials* such as websites, signage or QR codes would be required. Linda suggested that "we do require additional resources, mainly around the interpretation side of things. . . and these signs [could help] to interpret the importance of the geosites and the connection."

When asked about a potential legislative or planning process that could help tackle the challenges of establishing a GeoRegion, a key theme was identified that *government could play a facilitatory role* rather than a prescriptive one (11/13). Two interviewees stated that the idea of legislation is in contradiction to the concept of a GeoRegion and may in fact be detrimental. Conversely, two interviewees were concerned about the possible damaging effect of increased visitation and mentioned that there needs to be legislation to protect the sites against activities such as defacement or destruction.

Most interviewees (10/13) agreed that GeoRegions require some *funding*, while four suggested that a *management committee or motivated people*, or 'champions', would be needed to streamline the process and guide the working committee. Eight interviewees mentioned that interpretive materials and other guidance documents should be produced and, potentially, local policy enacted to establish GeoRegions. Overall, most participants felt that at least some support from state or local government could provide access to the resources required for GeoRegional establishment.

On digging deeper into the definition of a GeoRegion with follow-up questions, *accessibility of sites* emerged as an important theme. Fatima was very clear: "I think it's no good doing a GeoRegion if you can't observe it." Other interviewees did not mention access to sites but acknowledged that *presentation of values* is important. The size of a GeoRegion could also impact the accessibility of sites, with proximity of sites allowing visitors to explore more and travel less. Besides accessibility, Yue and Jessica noted that too big an *area* may become difficult to control. Daniel, however, did not think the area of a GeoRegion mattered at all or even that it should be confined to a single area, "so it could be perhaps somewhere very small and discreet, or it could be somewhere very large with scattered locations". The concept of *boundaries* was not consistent across all interviewees, with Jessica claiming that boundaries should be defined for efficient management of the area while Sophia opined that GeoRegions should essentially be 'boundaryless'.

In response to the potential impact of the different land tenures in Australia, a key theme identified was that GeoRegions are *not restricted by land tenure*. Half of those interviewed liked that GeoRegions could be unrestrictive in nature, with Yue stating "as far as geology is concerned, geology cuts across all of those land tenures." Sofia clarified "a GeoRegion is non-presumptive and that allows people to have a discussion about it without getting any ideas or prejudices or resistance to a concept, because you're not presuming an outcome from the day one."

Any problems or constraints thought to be associated with diverse land tenures in a GeoRegion were seen by the participants to be more related to *competing land use* rather than a specific tenure itself. As Anna put it, "I think the big challenge is competing land use." Finally, three participants suggested that more stakeholders, or certain stakeholder groups, could make the establishment process more challenging. Linda said "Aboriginal consulta-

tion remains as a challenge and probably will," whilst other stakeholders emphasised that industry stakeholders sometimes clash with landowners and residents.

The interviewees suggested that geological values when combined with natural and cultural values can create a new product to attract stakeholders, as Lee said "incorporating the stories and exploration of experiences that connect with geology." Interviewees consistently emphasised the need for *strong stakeholder engagement processes*, with decision-making powers concentrated in communities and the government playing a supportive role.

4.3. Design Thinking Phase Two—Defining the Problem for Decision-Making Tool: The Conceptual Model for GeoRegional Establishment

From the input of the stakeholder interviewees and the themes derived from their responses, it emerged that GeoRegions required some resources as inputs into their establishment and were expected to bring some benefits to the area as outputs or outcomes of the process. The complexity of the linkages highlighted the dynamic nature of the GeoRegions where availability or scarcity of one factor may lead to restructuring or modifications in the GeoRegion. The analysis of stakeholder responses identified that sustainably developed, geotourism-embracing GeoRegions required 'ingredients' or inputs—funding, knowledge inputs, resources and human factors (Figure 4)—to succeed:

1. Community support: The needs and expectations of the community are the primary drivers of the existence of a GeoRegion.
2. Knowledge: A mix of available scientific knowledge and new knowledge that can be created by mixing the local, Indigenous as well as Western (non-Indigenous), with expert knowledge, will create attractive stories linking the A, B and C of the region. The local knowledge can only be obtained if community support is there.
3. Geoheritage: The knowledge is used to valorise the geoheritage of the region. The very idea of a GeoRegion is to present the geodiversity of the region, and accessibility or ease of visiting helps visitors connect with the values. This can also limit the size of the GeoRegion to enable visitors to explore the area in a single visit.
4. Human resources: The GeoRegions require somebody to take the lead and champion the process. The champion can be an individual or a group that can have expert, local or not much scientific knowledge of the GeoRegion but will engage with owners of such knowledge as well as other interested stakeholders to guide the process.
5. Funding: To keep moving the process sustainably, funding is required for all other inputs, whether it is for engagement processes to gain community support or develop the knowledge and interpretive products. The Ku-ring-Gai GeoRegion has mostly relied on volunteers to further the process, but adequate funding will encourage such champions in other prospective GeoRegions.

Stakeholder discussions also identified a range of expected outcomes associated with GeoRegion establishment, which are the following:

1. Interpretive Materials: The knowledge is made available in a presentable format for the visitors. This can include website, physical signages or QR codes, though likely a mix of these, which will aid tourism and education.
2. Geoeducation: Presentation of geoheritage values and use of interpretive materials will inform users, both casual visitors and formal students.
3. Geotourism: Nomination as a GeoRegion may be supplemented with marketing initiatives (e.g., a website such as developed for the Ku-ring-gai GeoRegion www.kuringgaigeoregion.au) will lead to increased visitation.
4. Economic Development: A direct result of geotourism if marketed with a view to increase visitor spending in the area. It can also be a means to secure funding in the

first place. An attractive return on the investment can motivate public or private investment into the prospective GeoRegion.

5. Community Pride (Sense of Identity): An awareness of the significance of the values of the region alongside economic development will foster a sense of pride in the community and, in turn, increase community support for the GeoRegion.
6. Conservation: While conservation may or may not be an explicit objective or the primary driver of a GeoRegion, the combination of all other inputs is expected to facilitate conservation through awareness and value recognition.

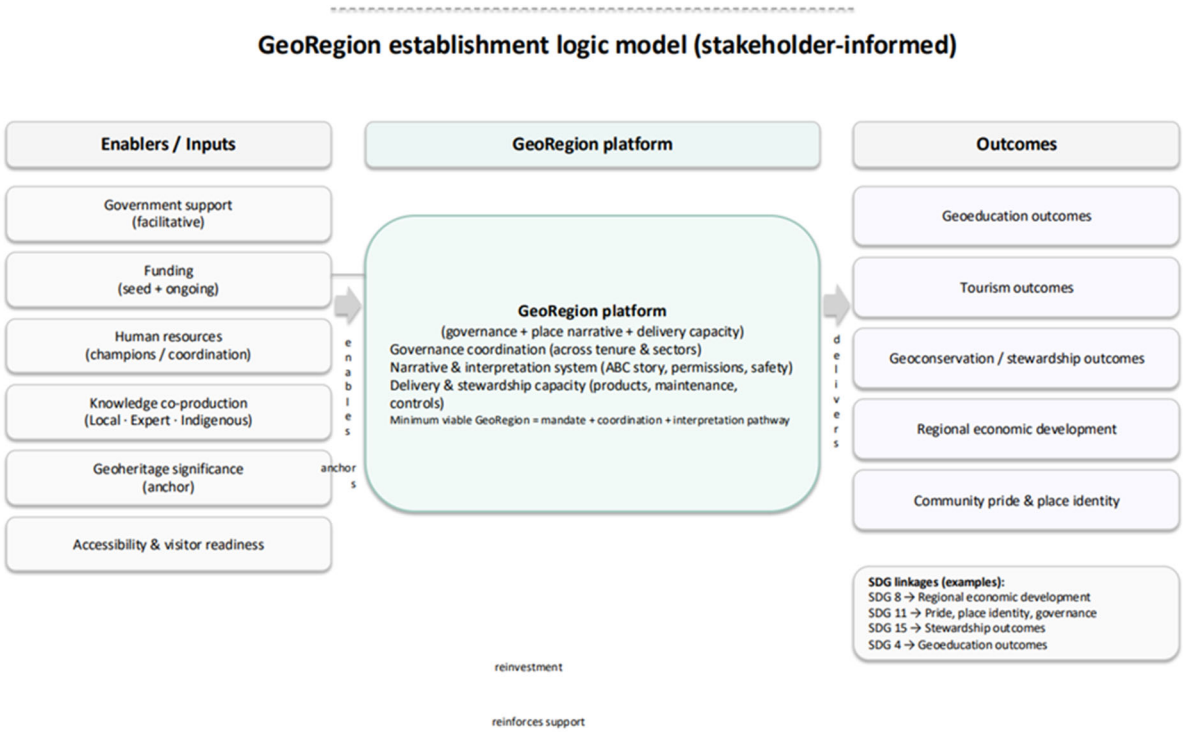

Figure 4. Ideated, stakeholder-informed GeoRegion establishment logic model (design-led synthesis of expert participant contributions and semantic themes). The model differentiates enabling inputs (e.g., facilitative government support, funding, human resources, knowledge co-production, geoheritage significance and accessibility) from the core GeoRegion mechanisms that convert these inputs into outcomes (geoeducation, geotourism, geoconservation, regional economic development, and community pride/place identity). Reinforcing loops represent how outcomes can strengthen ongoing delivery through reinvestment and social licence.

In stakeholder discussions, tourism was often framed in practical or leisure development terms, while education and conservation emerged as parallel objectives; accordingly, the model (Figure 4) presents these outcomes as inter-related rather than hierarchically structured.

The summary of knowledge of interviewee stakeholders engaged in geoconservation and geotourism development indicated that a strong community foundation is important for GeoRegional establishment. From this, the conceptual model development showed how this could be operationalised: interview themes supported a community-led bottom-up approach to utilise geological and cultural heritage for education and economic development, embedded with a conservation attitude to ensure sustainability. From stakeholder interviewees, we also learned that there was support for government to play a supportive rather than prescriptive role and that the overarching benefit of GeoRegional establishment will be community pride and/or a 'sense of place' (Figure 4).

5. Discussion

5.1. GeoRegions as a Middle-Layer Model for Geotourism Development

Our research explored an Australian solution to a trade-off that prospective geotourism proponents face in that they often have to choose between formalised, top-down approaches requiring significant resources and capacity or otherwise be left to pursue locally grounded initiatives. In this research, we explored these choices by consulting stakeholder experts in our aim to develop a conceptual model for GeoRegional establishment as the 'middle ground' between the current options of statutory geoconservation protections, the pursuit of UGGp designation and area-specific, informal approaches. What we found was that the expert participants in our study were more inclined to support formal and organised government intervention as a mechanism for GeoRegional implementation but that the flexibility afforded by localised identity-oriented approaches was also well-liked. Though UGGps are common across the world, Australia does not have any, and like many other nations (especially in the Americas and Africa), we lack government support and some facets of sustainable development capacities to implement these. Therefore, other approaches are needed if geotourism is to be sustainable and incorporate credible local narratives for geology and landscape.

We found through our interviews with the participants and via the construction of our GeoRegional establishment workflow that GeoRegions will be particularly useful in facilitating cross-territory or cross-tenure regional identity and via localised informal or statutory governance that focuses on local inventory. However, where UGGps differ is that internationally significant geology is a mandatory component of a nomination as well as the requirement for formal governance and trading relationships, which may not always be feasible in remote locations with very few potential participants to recognise or establish the significant management of any area. The contributions of geoparks towards sustainable development have been well documented [4,47,48], including opportunities for rural regions via mandated indigenous and cultural participation, training and identity narratives [49]. Effectively managed geoparks combine economic development with local community involvement to conserve geoheritage along with raising awareness regarding these values [49]. GeoRegions use a similar 'ABC' narrative, which is akin to geoparks, indicating that geotourism is expected to be multifaceted. Although underpinned by geology, both GeoRegions and UGGp are supposed to combine these with broader natural and cultural values to celebrate the geographical region as a resource for all.

However, in this research, the interviewees indicated a strong preference for geology as the highest order focus in a GeoRegion, even when they were from non-geological backgrounds. Geoscience professionals often value geodiversity quite differently than persons with a non-geoscience background [50]. The participants recognised this and stressed that a mix of expert and local knowledge is required to identify a wide variety of geoheritage sites and to link them through a geological logic—however much of Australia's most superlative geology is either already in other formalised conservation reserves (e.g., Commonwealth Protected Areas or IUCN I or II World Heritage Areas and National Parks). Instead, interviewees indicated a preference for GeoRegions to serve as outdoor classrooms, which is consistent with the UNESCO guidelines for a geopark that require the "...develop(ment) and operat(ion of) educational activities for all ages to spread awareness of our geological heritage" [51], but yet for much of regional Australia, the populations are too small to replicate this at an international scale. We, therefore, recommend that future research on localised or middle-layer initiatives be expanded to include consultation from other community members to assure that identity and branding make sense and facilitate a range of 'higher-level' opportunities such as geoparks when the time is right or the community deems it appropriate.

5.2. Community Governance, Stakeholder Participation and Institutional Support

Interviewees liked the concept of GeoRegions to develop a new tourism product that is unrestrictive, tenure-free and community focused, providing an opportunity to expand nature-based tourism beyond protected areas. The results showed that interviewees hold the view that such a grassroots level approach empowers the local communities but, at the same time, necessitates that any such proposal must first attain local support and mandate. This is reflective of the global views that stakeholder support involving local and Indigenous communities in planning and management typifies goals of geoheritage conservation and sustainable use through tourism [52]. However, our participants also indicated that government or institutional support would be valuable to enable such partnerships in terms of funding and training of experts for effective communication with local communities [53]. Though the latter sentiment aligns with geopark scholarship that stresses that designation alone is insufficient and sustainable outcomes depend on operational capacity, coordinated management and continuous delivery [49,54], it also highlights the fundamental paradox facing locally organised geotourism initiatives—where there is insufficient expertise, political or social will, or internationally significant geodiversity available for a geopark—does this mean that only these ingredients will result in geotouristic success?

It is important to note that the interviewees in this study often expected the government to be the primary source of funding or to support the necessary structures for sustainable development, which reflects the composition of the participant group rather than the universal truth. The participants were mostly professionals already working within institutional, geoscience or tourism governance contexts, and hence, their responses may emphasise structured implementation pathways more strongly than would be observed among local residents or visitor communities.

5.3. The GeoRegion Establishment Model and Place-Based Identity

In our findings, the participants suggest that, once the minimum viable inputs are secured, the GeoRegional model can lead to a circular flow of rewards, where the results further strengthen the inputs (Figure 4). This is reflective of the opinion that sustainable geotourism development can happen at grass root levels in incremental steps [51,55]. The stakeholder-informed GeoRegion model developed in this research has ideated what this middle layer could look like by clarifying what proponents must be able to secure before a GeoRegion becomes likely to reap expected rewards (Figure 5). The proponents must work to secure the necessary inputs, i.e., community mandate, knowledge co-production, leadership and interpretive materials, to ensure the outputs are achievable. The framework supports progressive capacity building that may eventually enable designation as a formal geopark but does not depend upon it, leading to incremental rewards for each.

The character of a place is not a singular reality but an assimilation of the different values that the place holds for different individuals [56]. The interview responses strongly resonated with this fact by emphasising the need to involve diverse stakeholders to bring out the stories that may otherwise go unnoticed in a purely scientific assessment. The sustenance of this character is essentially tied to the wellbeing of its residents, with their involvement increasing appreciation and support for preservation of the values of the place [5]. However, the influence of stakeholders on tourism collaboration is dependent on their power and legitimacy [57]. The interview responses echoed this fact by stressing local community involvement throughout the development process. As GeoRegions scale up with the passage of time, the continuous engagement with local and Indigenous communities will provide them both legitimacy and empowerment.

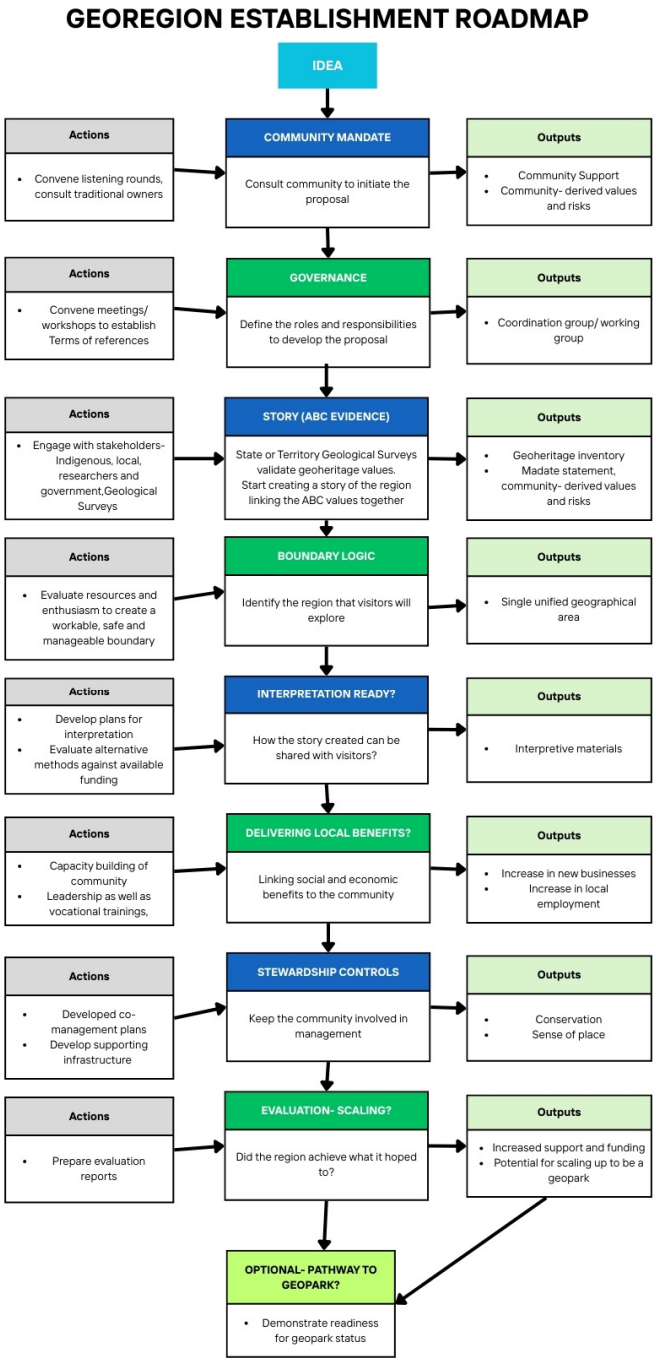

Figure 5. GeoRegion establishment roadmap to augment existing establishment guidance and mandates in the AGC (2023) protocol [11]. Here, proponents can align themselves with sustainable development actions and plan for outputs that empower regional communities through education, geoconservation, cultural participation and economic development.

The conceptual model developed in this research is the first step towards identifying the building blocks of a prospective GeoRegion. It can be utilised to identify strengths and limitations in existing resources of a GeoRegion, guide the stakeholder engagement strategy, and refine the objectives based on stakeholder needs. However, it was derived from international and local research and geologically or geotouristically aligned stakeholders who were mostly positively aligned with the concept of GeoRegions. Local communities as well as visitors who have considerable interest in GeoRegions, or similar operational middle-layer frameworks in other parts of the world, were not included in this research but could provide rich data for future research.

5.4. Indigenous Participation, Capacity Constraints and Geoheritage Communication

Additionally, many participants indicated that they felt Indigenous participation in GeoRegional establishment was critical but that they did not know 'how to make this happen.' Sangha et al. (2020) [58] showed the economic opportunities, including cultural tourism, ecotourism and land management, that were unrealised in the Northern Territory by not meaningfully engaging with Indigenous communities. Lack of community involvement impedes resilience in tourism development and leaves regions vulnerable to environmental hazards, as Pyke et al. (2018) [59] determined when analysing tourism resilience in Harrietville, Victoria after a major bushfire in 2013. The research highlights both the importance of engagement as well as support from the government in terms of funding and capacity building.

Funding, human capital and time were identified as key constraints for (Geo)Regional development in this research. Economic benefits from UGGp for local communities have been identified in other studies [5,60], but similar research is now required in the three existing or any future GeoRegions, which could help aide cost–benefit allocation of both financial and human capital resources to the establishment process. Additionally, GeoRegions are expected to create awareness and appreciation in the communities, but in the absence of directed efforts, it may not necessarily do so [61]. Stolz & Megerle (2022) [54] found in Germany that the presence of interpretive materials, including signage on geosites, is not the sole indicator of effective regional geoeducation. In addition, interpretation of geodiversity for persons with a non-geoscience background to achieve the dual objective of disseminating scientific knowledge and creating conservation awareness is a very complicated task [50,62,63], a concern also raised by interviewees in this research. This finding also highlights an implicit challenge of limited geoheritage literacy among stakeholders, which may constrain the effective development of GeoRegion proposals. A future study on the design of interpretative materials using a mix of physical signboards and digital technologies to support educational objectives is needed; considering these factors will be useful so that one of the key purposes of a GeoRegion, geoeducation, is not lost in favour of economic or marketing interests.

5.5. Governance Challenges and the Limits of "Lighter" Geotourism Frameworks

Our research suggests that, in settings without an established UNESCO Global Geopark (UGGp) pathway, GeoRegions can lower barriers to entry and provide greater flexibility for regional groups wishing to establish geotourism ventures. However, as stakeholders indicated, neither GeoRegions as a concept nor the suggested framework for their establishment automatically solve governance and capability deficits that the UGGp and other researchers have found to impede bottom-up or locally organised sustainable development initiatives. Our stakeholders were nearly unanimous in suggesting that Indigenous stakeholders and knowledge were critical for authentic GeoRegional development, yet frequently, localised initiatives have been criticised for their over-reliance on designation or branding instead of genuine empowerment. Our GeoRegional model recognised that success would only come from the promotion of 'local champions', and perhaps, these are Indigenous champions capable of modelling and transforming their participation into power sharing and outcomes. Hence, where resources are stretched and proponents are interested in facilitating GeoRegions or similar endeavours, our stakeholders recognised that they should prioritise Indigenous participation and leadership to mitigate another system reproducing marginality, weakening accountability, and providing limited resourcing for interpretation and benefit sharing (e.g., capacity, financing, monitoring) in ways that have been criticised for other Indigenous tourism initiatives [64].

However this is difficult, and even where intentions are community-oriented and participatory, projects stall on operational barriers (skills, finance, management), structural barriers (elite capture, weak intergovernmental coordination), and cultural barriers (misalignment with local authority and knowledge systems) [65]. Our findings and previous insight into the past history of the Australian geoparks experience also caution that geopark-like efforts succeed only when governance is explicitly designed and resourced. For example, after the withdrawal of the Australian Kanawinka from UNESCO status due to lack of government support, progress towards reasonable and appropriate geotourism initiatives came only when geotrails/GeoRegions were designed, supported and promoted through embedded cross-agency coordination, community programming and interpretation quality, not simply a lighter designation [22]. From a geoscience-communication perspective, relying on grassroots enthusiasm without robust interpretive design risks promotional substitution of identity for appropriate knowledge sharing [66], but at least with a GeoRegion framework, the progression towards 'acceptable knowledge' that can be communicated to visitors need not be at the standard of internationally benchmarked geoconservation and geointerpretation status.

Like our stakeholders, we too are concerned about how Indigenous participation occurs in places like GeoRegions. Internationally, it has been shown that so called 'sustainable' developments can sometimes be 'psuedo-consultations', and informal or local geotourism initiatives may occur without redistributing decision rights, ensuring Indigenous data sovereignty, or budgeting for long-horizon relationship work [67], which greatly diminish the social licence to operate [64]. Our establishment model relies heavily on local empowerment principles, and we see these as critical path dependencies inherent in a 'community governance architecture" to reduce existing inequalities and mitigate local conflicts [65]. Indeed, the pathway to GeoRegional establishment in the post-Kanawinka era was evidentiary in showing how locally informed and community-derived geotrails/GeoRegions worked best where these were specifically aligned with local identity, cross-tenure agreements and iterative stakeholder programming [22]. Through our stakeholder-derived model, we can also argue that we have been very cognisant and supportive of including cultural-landscape meanings into the bioscience geoscience story of a local geotourism initiative as a GeoRegion. However, we will require an additional step to next determine if the local interpretation is co-produced and tested with target audiences [66]. Taken together, these strands imply that GeoRegions will be easier than UGGps only where proponents pair the lighter framework with our suggested design for consent, co-governance and iterative learning; otherwise, the same participation and legitimacy risks could reoccur.

However, we are not claiming—and nor did the stakeholders—that GeoRegions are inherently easier in every single way to establish than UGGps or other destination or nature-based tourism. They are administratively lighter—but the critical thresholds for success sit elsewhere: (i) institutional capacity(coordination roles, skills, and funding), (ii) quality of interpretation (beyond inventory-centric outputs), and (iii) monitoring of outcomes (learning, livelihoods, conservation), which are chronic gaps in applied geotourism/geoheritage establishment [66,68]. In Australia, GeoRegions have so far proved valuable as an implementation scaffold precisely because they internalised the approaches akin to our model logic and have pursued state survey endorsement and community-designed and expert-designed geotrails, and in some places, they have staged product development and iterative engagement to 'build credibility' [22]. The broader CBT literature cautions that, where local capacity, finance, and governance are thin, any model will face the same barriers unless these enablers are explicitly resourced and insulated from elite capture [65]. GeoRegions are, therefore, 'easier' only when the flexible, tenure-light frame is coupled with the governance, consent, interpretation and evaluation disciplines that sustainable-tourism

and Indigenous-tourism research identify as non-negotiable [22,64,66], and, hence, why stakeholders and ourselves recognised these key elements in our establishment model.

6. Recommendations for Future Research and Practise

The Australian experience illustrates that constraints on geoparks arise less from a shortage of geoscientific expertise and more from government endorsement, institutional fit, and perceived political risk. The 2009 communiqué reported in an Australian sector newsletter recorded ministers' concerns about applying the UNESCO geoparks concept domestically "especially without government endorsement," judged existing mechanisms sufficient, and requested that UNESCO take no further action on Australian proposals without prior formal agreement [69]. This policy position—though it has recently improved—is consistent with many other parts of the world [70].

In Australia, this has meant that GeoRegions are the domestic geotourism strategy that retain geopark-like aims while reconfiguring the pathway into a nationally legible, flexible mechanism. The Australian Geoscience Council's guidelines define GeoRegions as single, unified areas linking sites and landscapes of geological significance around a central natural or cultural value, with a bottom-up approach combining conservation and sustainable development. Additionally, they position GeoRegions as an exploratory step accepted by state/territory Geological Surveys and suited to consultation and cross-tenure problem-solving [11]. Subsequent guidance recommends using GeoRegions to pursue alternative geotourism development options where UNESCO endorsement is "not currently" possible, thereby decoupling regional development and identity work from the geopark brand [71]. Consequently, some of Australia's most recent GeoRegion developments present as community-led initiatives that span multiple protected and urban/regional areas, deploy geotrails and interpretation, promote conservation/education/sustainable tourism, and are framed as a first step that may later support UNESCO candidacy [72] but need not if this is never appropriate or possible.

However, not all countries without UGGps are like Australia, where trust in governance and statutory protections plus geological capacity are high, but people capability and other resourcing are potentially low in the very areas that potentially exciting geotourism experiences can be found. In fact, for many other countries without UGGps, the economic benefits derived from having a geopark would be transformative, but communities lack resources or capacity to get there. Nonetheless, our stakeholder-informed GeoRegion establishment logic model maps inputs (community mandate, knowledge co-production across scientific/local/Indigenous sources, accessible geoheritage, human resources/champions, funding—supported by facilitative government) to outcomes (interpretation, geoeducation, geotourism, conservation, economic development, community pride/place identity) that is transferrable to a number of different territorial and cultural contexts and is capacity-sensitive for non-UGGp settings [73]. It also directly addresses a persistent evidence gap in that research has consistently identified that geoheritage/geotourism establishment logic focuses on geoscientific inventories at the outset, with "sustainable development" often inferred rather than demonstrated through comparable outcome measurement [10,74]. The GeoRegion conceptual establishment model suggested by the stakeholders and through our development is the sequence inputs → mechanisms → outcomes, which supplies the intermediate causal architecture required for SDG-aligned claims to be credible and testable. We also posit that it provides low-barrier uptake of UNESCO's 2024 geotourism manuals on product standards, visitor management, and monitoring in non-designated contexts [10,73,74].

Although the model was developed within the Australian context, the bottom-up, stakeholder-driven process involving landowners, Indigenous groups, tourism providers,

and, where possible, local governments or similar territorial authorities echoes similar initiatives elsewhere. Similarly other large countries or those with few or no geoparks (e.g., USA, Brazil, Bulgaria, and Egypt) possess significant geological diversity, large territorial extents, and established geological institutions—characteristics that align well with UNESCO's requirements for geological heritage of international significance and for community-anchored sustainable development [75–77]. Moreover, many nations operate multi-tier geopark systems (e.g., provincial–national–global in China [78]) coordinated through existing governmental structures, showing that local adaptation of an overarching conceptual framework is not only feasible but increasingly common. Thus, while local governance arrangements, regulatory environments, and political cultures differ, the conceptual logic of a GeoRegion, integrating heritage, community participation, and sustainable economic development, remains directly transferable to large federal or semi-federal systems with heterogeneous landscapes and decentralised governance capacities.

There is no single global legal instrument governing geoparks; instead, UNESCO Global Geoparks operate through voluntary national frameworks and are evaluated against UNESCO's Operational Guidelines, which define the institutional structure, criteria, and functions required for designation. Countries typically integrate geoparks into their existing environmental, land-management, heritage, and tourism legislation rather than creating entirely new statutory systems [79,80]. Similarly, Australian GeoRegions (including aspiring GeoRegions) function under existing state endorsement and adopt existing land classifications within their boundaries but act as framework overlays rather than statutory reclassifications. Potentially, other countries interested in localised geotourism initiatives that could one day be UGGps or stay grounded as credible community minded activities could use a framework similar to the one developed in this research to promote locally authentic geocultural narratives for their special places.

7. Conclusions

Our research advances both conceptual understanding and practical capacity for community-led geoconservation and sustainable geotourism practice. A primary implication of our findings is that GeoRegions can be understood as a governance and capability intervention, not simply another tourism designation that would ultimately entrench disparity and responsibility divides between urban and regional locations. Participants consistently emphasised that geologically significant places are necessary but insufficient; it is the capacity to co-produce legitimate narratives, provide access-ready interpretation, and coordinate actors across tenure and sectors that determines whether geoheritage can 'deliver' sustainable regional value. From previous research and practitioner observations, it is evident that designation of geological significance or cultural importance does not guarantee sustainability outcomes; rather, outcomes depend on institutional arrangements, local partnerships, interpretive quality, and sustained resourcing [23,51,79]. In this respect, how our findings influenced our ideation model is directly relevant to SDG implementation: SDG 11 (Sustainable Cities and Communities) and SDG 15 (Life on Land) require that recognition of place-based values is coupled with mechanisms for stewardship and management, while SDG 8 (Decent Work and Economic Growth) requires that visitation growth translates into local employment and enterprise rather than leakage to external operators. The recurring emphasis on champions/committees, interpretive investment, and facilitative government support that our participants suggested as being important ingredients for GeoRegions are also contingent or causative elements of sustainable development and geotourism.

This study contributes to geotourism and geoconservation scholarship by empirically identifying stakeholder-derived factors influencing GeoRegion establishment within

the Australian context. Through qualitative analysis of expert interviews, the research demonstrates that successful GeoRegions depend not only on geoheritage significance but also on community support, knowledge co-production, governance flexibility, and locally driven leadership. The resulting stakeholder-informed conceptual model provides a structured framework linking enabling inputs to social, educational, conservation and economic outcomes, thereby offering a practical pathway for regions seeking to advance geoconservation and geotourism outside formal designation-based systems.

The ideation model logic identifies the factors that can influence the decision-making process in GeoRegional development. We posit that the next logical step in this research should be to advance this ideation towards a design phase supporting user decision tools. One possibility is to explore avenues for measuring the impact of these variables and develop a set of criteria, which can be used to make an objective decision on GeoRegional potential, placement or establishment. GeoRegions, being essentially a space-based problem, lend themselves to opportunities in utilising the benefits of GIS in assessing the criteria in novel ways for community planning and development in an analogous fashion to other geoconservation or geotourism needs (e.g., Williams et al. 2024; 2025 [36,81]).

To date, GeoRegions are a flexible, community-centric model for integrating geodiversity, culture and economic development, each representing one of the three pillars of sustainability. Our research supports this model and shows, through an expert-informed design-led approach, how equitable, sustainable, and locally meaningful geotourism initiatives could be established across diverse regions. Our model has direct policy utility for aligning GeoRegions with SDG-oriented regional development, despite this not being the primary motivator of the research nor its original focus. The model framework clarifies that SDG alignment through GeoRegional establishment could be achieved by designing measurable pathways under SDG 8 (through local enterprise development, workforce skills, and visitation-linked value retention); SDG 11 (through strengthened place identity, participatory governance, and geoconservation); and, SDG 15 (through stewardship behaviours, threat awareness, and [where applicable] integration with protected-area management objectives). If implemented carefully, GeoRegions should promote the attainment of SDG 4 (Quality Education) through formal and informal geoeducation pathways enabled by interpretation and partnerships with schools and universities.

Together, these findings position GeoRegions not as an alternative designation but as a governance process capable of strengthening regional readiness for sustainable geotourism and geoconservation development.

8. Limitations

As an exploratory qualitative study, several methodological limitations should be acknowledged.

Firstly, the stakeholders were identified from a limited pool of experts with a snowball approach to expand the pool. However, since the GeoRegion is a new and unique concept to Australia, the final participants were mostly restricted to geoscience or geotourism professionals. This selection also limited the stakeholders to those who are positively aligned with the concept of GeoRegions. Local communities as well as visitors who have considerable interest in GeoRegions were not included in this study but could provide rich data for future research. However, the purpose of this research was to synthesise the expert knowledge to guide and evaluate GeoRegional potential and establishment considerations. Secondly, the framework represents a conceptual and stakeholder-informed model that has not yet been empirically tested through operational implementation. Future research should, therefore, examine the application of GeoRegions in practice, including

governance outcomes, stakeholder engagement processes and measurable geoconservation and tourism impacts.

Finally, the research is grounded in the Australian governance and geotourism context. Hence, the transferability to other regions may require contextual adaptation, although the general principles and concepts are likely ubiquitous.

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Institutional Review Board Statement: This study was conducted in accordance with the Declaration of Helsinki and approved by the Human Research Ethics Committee of University of Tasmania (HREC31168 dated 31 October 2024).

Informed Consent Statement: Informed consent was obtained from all participants involved in this study.

Data Availability Statement: A more detailed summary of the data and coded research themes can be obtained from the authors. This is de-identified to maintain participant anonymity.

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Conflicts of Interest: The authors declare no conflicts of interest.

Abbreviations

The following abbreviations are used in this manuscript:

AGC	Australian Geoscience Council
HREC	(University of Tasmania) Human Research Ethics Council
UGGp	UNESCO Global Geoparks

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