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The 5th Geotourism Festival & International Conference

Ijen - Rinjani - Sydney

26 June - 19 July 2024

ABSTRACT BOOK

The 5th Geotourism Festival & International Conference was held in Ijen UGGp, Rinjani-Lombok UGGp and Sydney – Australia with the theme of Volcano as a World Class Geotourism Sustainable Development. The main event, which had the agenda for scientific parallel class took place in Rinjani-Lombok UGGp from 4 – 6 July 2024. There were 4 topics discussed in this conference:

- Geotourism Development
- Linkage between Geological, Biological and Cultural Diversities in Geotourism
- Disaster Risk Reduction in Geotourism
- Wallacean Avifauna in Volcanic Landscape

Table 1 Scientific Committee of the 5th Geofest

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TABLE OF CONTENT

SUB THEME : VOLCANO GEOTOURISM DEVELOPMENT 4

INTEGRATING PARTICIPATORY RURAL APPRAISAL AND CASE STUDY RESEARCH FOR SUSTAINABLE TOURISM DEVELOPMENT IN DESA SEDAU, LOMBOK BARAT, INDONESIA 4

GEODIVERSITY AND GEOHERITAGE ANALYSIS OF BASALT CAVE IN GIRIMULYO VILLAGE, MARGA SEKAMPUNG DISTRICT, EAST LAMPUNG REGENCY, LAMPUNG PROVINCE 5

INDONESIAN VOLCANO TOURISM 7

THE IMPACT OF GEOTOURISM ON PHYSICAL ENVIRONMENT, DAILY EXPERIENCE, AND HUMAN-NATURE RELATIONSHIP: A CASE STUDY OF UNESCO GLOBAL BATUR GEOPARK IN BALI, INDONESIA 8

UNDERSTANDING THE CHALLENGES OF GEOTOURISM DEVELOPMENT FROM THE PERSPECTIVE OF PARTICIPATORY PLANNING 9

SUSTAINABLE TRANSPORTATION POLICY FOR RINJANI MOUNTAIN AS WORLD CLASS GEOTOURISM DESTINATION IN LOMBOK ISLAND, INDONESIA 10

CIREMAI VOLCANO EVOLUTION GEOTOURISM: EXPLORING THE TRACE OF AN ANCIENT VOLCANO, MAAR LAKES AND VOLCANIC SPRING BELT 11

UTILIZATION OF GEODIVERSITY OF MOUNT GAMALAMA ERUPTION PRODUCTS AS GEOTOURISM ACTIVITIES ON THE BATU ANGUS GEOTRAIL, ASPIRING TERNATE GEOPARK 12

PROMOTING GEOTOURISM BY UNDERSTANDING THE RELATION BETWEEN SUBJECTIVE NORM AND EXPERIENCE INTENTION IN VOLUNTOURISM 13

SUSTAINABLE TOURISM DEVELOPMENT PRACTICES IN INDONESIA: LESSONS FROM VOLCANO GEOPARK RINJANI AND BATUR 14

STRATEGIC PLANNING FOR COMMUNITY-BASED TOURISM DEVELOPMENT OF GEOPARK GLOBAL UNESCO RINJANI TO SUPPORT SUSTAINABLE ECOTOURISM IN WEST LOMBOK INDONESIA 15

TOPOGRAPHICAL MAPPING FOR GEOTOURISM DEVELOPMENT "GEO-EDU PARK" TELETUBBIES HILL IN WUKIRHARJO VILLAGE, PRAMBANAN, SLEMAN, SPECIAL REGION OF YOGYAKARTA 16

EVALUATING GEOTOURISM ASPECTS TO UNVEIL HARMONY WITH VOLCANO-GEOTHERMAL DEVELOPMENT: CASE STUDY OF 17

THE DIENG VOLCANIC COMPLEX 17

CHARACTERIZATION OF GEOTRAILS AND 18

DEGRADATION RISK ANALYSIS ON GEOSITES IN PURWODADI VILLAGE, TIRTOYUDO DISTRICT, MALANG REGENCY 18

ASSESSMENT AND DEVELOPMENT OF HOTSPRINGS GEOTOURISM AROUND MOUNT LAWU, CENTRAL JAVA, INDONESIA 19

GEOTOURISM POTENTIAL DEVELOPMENT OF HARIANPANGURURAN DISCTRICT AT SAMOSIR REGENCY, NORTH SUMATRA PROVINCE 20

VOLCANIC GEOHERITAGE OF THE TERNATE ISLAND, NORTH MOLUCCAS, INDONESIA 21

SUB-THEME: LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM 22

GEODIVERSITY OF THE GRAVATÁ TRAIL IN FLORIANOPOLIS-SC 22

INVENTORY OF PLACES OF HERITAGE INTEREST 22

GEOFORMS IN SOUTHERN CANYONS PATHWAYS UNESCO GLOBAL GEOPARK - BRAZIL: POTENTIAL FOR GEOTOURISM 23

IDENTIFICATION OF POTENTIAL GEOLOGICAL CONSERVATION FOR SUSTAINABLE GEOTOURISM CASE STUDY WEST MANGARAI , EAST NUSA TENGGARA 24

EXPLORING MORE THAN 27 MILLION YEARS OF VOLCANIC EVOLUTION WITH SENSORY EXPERIENCE IN PURBALINGGA AND KEBUMEN AREA 25

ENHANCING THE GEOTOURISM EXPERIENCE: A STUDY OF GEOTRAIL DEVELOPMENT IN THE PRAMBANAN AREA UTILIZING GEOLOGICAL, GEOPHYSICAL, AND CULTURAL DATA 26

IDENTIFICATION AND VALORISATION OF MOROCCO'S GEOLOGICAL HERITAGE : FIRST INVENTORY AND ASSESSMENT OF THE GEOHERITAGE OF REHAMNA REGION (CENTRAL JEBILET, MOROCCO) 27

LOCATING GEODIVERSITY HOTSPOTS THROUGH 28

GRID-BASED SPATIAL INDEXING: LOMBOK, INDONESIA 28

GEOTRAIL PROPOSAL AND PENTAHELIX FRAMEWORK APPLICATION IN THE ASPIRING SUNDA GEOPARK 29

THE CULTURAL DIVERSITIES IN THE *MANDALIKA* SUSTAINABLE *GEOTOURISM* DESTINATION 30

RESTORATION PLAN OF CORAL REEF ECOSYSTEM IN KARIMUNJAWA NATIONAL PARK 31

PETRIFIED FOREST OF UGGP MERANGIN-JAMBI: DESIGNING STORYTELLING IN MEDIA FOR GEOBRANDING IMPLEMENTATION 32

APPLYING DIGITAL COMMUNICATION IN THE CONTEXT OF SUSTAINABLE TOURISM DEVELOPMENT: STUDY IN BUKIT PERAMUN, BELITONG UGGP 33

GEOSCIENCE POPULARISATION IN GEOPARKS: A COMMON WORKFLOW FOR DIGITAL OUTCROP MODELLING 34

THE IMPACT OF GEOTOURISM ON PHYSICAL ENVIRONMENT, DAILY EXPERIENCE, AND THE CONNECTION BETWEEN HUMANS AND NATURE: A CASE STUDY OF UNESCO GLOBAL BATUR GEOPARK IN BALI, INDONESIA 35

SUB-THEME: DISASTER RISK REDUCTION IN GEOTOURISM 36

MITIGATION OF COSEISMIC HAZARDS, A COMPARISON STUDY OF SISTER GEOPARKS 'RINJANI-LOMBOK UGGP & ASO UGGP 36

APPLICATION OF INFILTRATION WELLS AND DRAINAGE IN OVERFLOWING WATER: A CASE STUDY OF TEBA MURIN WATERFALL 37

THE EARTH IS SHAKING, THE SLOPES ARE 38

COLLAPSING; PREPARE TO FACE LANDSLIDES IN LUNYUK SUB-DISTRICT 38

DETERMINATION OF MITIGATION PATH AND PLACEMENT OF DISASTER POSTS IN THE MERAPI SLOPE GEOTOURISM AREA BASED ON ANALYSIS OF MICROTREMOR DATA IN CANGKRINGAN DISTRICT, SLEMAN REGENCY, SPECIAL REGION OF YOGYAKARTA 39

TSUNAMI DISASTER MITIGATION IN COASTAL GEOTOURISM: CASE STUDY OF PUTIH SAND BEACH, LUNYUK SUMBAWA 40

FLOOD REDUCTION EFFORTS IN GEOTOURISM AREA (CASE STUDY: LIANG BUKAL CAVE) 41

VEGETATION DENSITY INDEX ANALYSIS IN BATUR UNESCO GLOBAL GEOPARK WITH MSARVI METHOD BASED ON MACHINE LEARNING GOOGLE EARTH ENGINE 42

FOREST FIRE VULNERABILITY MODELING ON GEOTOURISM SITES IN INDONESIA USING MACHINE LEARNING MAXIMUM ENTROPY (MAXENT) AS A GIS-BASED DISASTER RISK EDUCATION STRATEGY 44

SUB-THEME: WALLACEAN AVIFAUNA IN VOLCANIC LANDSCAPE 45

AVIFAUNA SPECIES DIVERSITY OF TERNATE IN SUPPORTING GEOTOURISM DEVELOPMENT IN GEOPARK ASPIRING TERNATE 45

Migrant Raptor Bird Population in Rinjani-Lombok Unesco Global Geopark Area 46

abstract 46

SUB THEME : VOLCANO GEOTOURISM DEVELOPMENT

INTEGRATING PARTICIPATORY RURAL APPRAISAL AND CASE STUDY RESEARCH FOR SUSTAINABLE TOURISM DEVELOPMENT IN DESA SEDAU, LOMBOK BARAT, INDONESIA

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

This study employs a cutting-edge methodology that integrates Participatory Rural Appraisal (PRA) and Case Study Research to develop a strategic framework for Community-Based Tourism (CBT) in Desa Sedau, Lombok Barat, Indonesia. Characterized by its rich agricultural and cultural heritage, Desa Sedau presents significant, yet unrealized, potential for ecotourism. This is particularly evident through attractions such as the Gunung Jae Camping Ground and the area's unique cultural practices. The integration of PRA and Case Study Research methodologies allows for an in-depth exploration of Desa Sedau's tourism development dynamics. This approach highlights collaborative efforts among local governance (Pemerintah Desa), community organizations (Pokdarwis), village enterprises (BUMDES), and the broader community. The study identifies critical challenges, including environmental vulnerabilities, economic instability, and issues in organizational coordination. Concurrently, it showcases the community's innovative solutions and strategic initiatives to capitalize on its tourism assets.

Notably, the research underscores the pivotal role of digital marketing in promoting Desa Sedau's ecotourism and the importance of integrating agriculture with tourism to create authentic experiences for visitors. The findings propose actionable strategies aimed at enhancing community engagement in tourism activities, diversifying financial mechanisms for tourism development, and encouraging youth participation to increase sustainability and resilience. This methodological synergy not only provides a comprehensive understanding of the local context and stakeholder perspectives but also fosters a participatory process in strategic planning for CBT. The study contributes to the field by demonstrating how a combined methodological approach can facilitate a more nuanced and participatory planning process for sustainable tourism development. The insights gained from Desa Sedau offer valuable lessons for other communities aiming to develop tourism in a sustainable, inclusive, and community-led manner.

KEYWORDS: *Community-Based Tourism, Participatory Rural Appraisal, Case Study Research, Sustainable Development, Village*

GEODIVERSITY AND GEOHERITAGE ANALYSIS OF BASALT CAVE IN GIRIMULYO VILLAGE, MARGA SEKAMPUNG DISTRICT, EAST LAMPUNG REGENCY, LAMPUNG PROVINCE

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

Indonesia is considered to be one of the countries that has major volcanic activity caused by the subduction zone. One of the products of this volcanic activity can be found in Lampung Province which is a lava cave composed by Basalt Sukadana (Qbs). Due to the study of this area is still limited, not many people know that this area can be a very potential place to become a geoheritage. This study aims to reveal the potential geological heritage of lava caves located in Girimulyo Village, Margasekampung District, East Lampung Regency. To identify the geological heritage potential, it is necessary to conduct a geodiversity assessment in the first place. The geodiversity assessment consists of several subdivision assessments including scientific values, educational values, tourism values, and risk of degradation value. Based on the geodiversity assessment that has been carried out, it was found that three caves have high assessment values namely Pandan Cave, Kubah Cave, and Kelelawar Cave. These three caves also have a big entrance so it will be possible to explore deep into the cave. Besides that, these caves are also rich in unique volcanic features such as pahoehoe, bread crust, A'a, columnar joints, and others which can give historical information regarding the formation of the caves. With the support of biodiversity and cultural diversity of this area, it will be a promising site to become one of the geoheritage in Indonesia. This uniqueness and rarity are believed to have a big potential to become an international attraction if properly developed.

KEYWORDS: *Basal Cave, Geotourism, Geodiversity, and Geoheritage*

STAKEHOLDER INVOLVEMENT IN POST-DISASTER GEOTOURISM DEVELOPMENT: A CASE STUDY OF GEOSITE SEMBALUN IN 2021

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

Geotourism has become a significant focus in harnessing natural potentials for sustainable tourism, especially in Geopark areas. This article explores the involvement of stakeholders in post-disaster geotourism development activities at Geosite Sembalun in 2021. The research methodology employed was qualitative research with a case study approach. Data were gathered through in-depth interviews, participatory observation, and document analysis. The findings reveal that various stakeholders were involved in the post-disaster geotourism development at Geosite Sembalun in 2021, including local government agencies consisting of regional government organizations, the BP-RLUGGp, and "*pemangku wilayah"*; communities; professional associations; academia; media organizations; and volunteers. The local community and tourists specifically served as subjects and objects in the development of post-disaster geotourism at Geosite Sembalun in 2021. Collaborative efforts among stakeholders played a crucial role in expediting the post-disaster geotourism recovery and development process. Despite facing various challenges such as conflicting interests and resource constraints, stakeholder involvement has managed to create synergies that strengthen sustainable geotourism development efforts at Geosite Sembalun. Additionally, the researchers identified another category of stakeholders, referred to as alienator. The presence of alienator categories needs to be acknowledged by other stakeholders as they significantly contribute to the success of various activities in post-disaster geotourism development at Geosite Sembalun. The practical implications of this research underscore the need for stronger collaborative strategies among stakeholders to enhance the effectiveness of post-disaster geotourism development, as well as the importance of empowering the local community in this process.

KEYWORDS: *Geotourism, Stakeholders, Sustainable Tourism, Disaster*

INDONESIAN VOLCANO TOURISM

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Sub-Theme : Volcano Geotourism Development

Abstract

Indonesia is a tourist area full of unique and natural tourist objects. One of the natural tourism objects that needs to be developed in accordance with the potential value of its natural resources, namely volcanoes whose tourism object resources can be developed into volcanic tourism.

Indonesia is a country rich in volcanoes, has about 500 volcanoes, 129 of which are active volcanoes spread over a 7000 km volcanic route stretching from the islands of Sumatra, Java, Bali, Nusa Tenggara, Banda to Halmahera and North Sulawesi, for many volcano regions tourism represents a welcome economic advantage. Active and dormant volcanic attractions therefore provide a valuable natural resource for tourism including geotourism, adventure tourism, and ecotourism. Often the aftermath of a violent eruption will bring increased numbers of visitors, which links volcano tourism frequently to disaster tourism or dark tourism with Tambora, a popular example of a World Heritage site, which is based on the devastation caused by a volcanic eruption more than 200 years ago.

Volcano tourism is tourism activities in volcanic areas by utilizing volcanic resources and their supporting resources as tourism objects, both specific/special or general/ordinary.

Volcano Tourism Objects include Main Tourism Objects consisting of volcanic landscape tourism, volcanic product tourism, volcanic symptom tourism, volcanic eruption tourism and volcanic disaster mitigation tourism, while Supporting Tourism Objects consist of panoramic volcanic tourism, recreational/sports tourism, and cultural tourism /tradition/art.

KEYWORDS: *Volcano tourism, volcano tourism object, supporting tourism object.*

THE IMPACT OF GEOTOURISM ON PHYSICAL ENVIRONMENT, DAILY EXPERIENCE, AND HUMAN-NATURE RELATIONSHIP: A CASE STUDY OF UNESCO GLOBAL BATUR GEOPARK IN BALI, INDONESIA

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

This study focuses on the Batur UNESCO Geopark, founded in 2012 in Bali, Indonesia. Using the theoretical lens of Landscape Political Ecology, the research explores how the UNESCO geopark has influenced the urban landscape, human-nature interactions, and daily life in Batur, Indonesia. Employing qualitative methods including document analysis, observation, and semi-structured interviews, the study investigates these transformative effects. The findings of this research highlight significant changes in the physical landscape of Batur, demonstrated by the emergence of new clusters of cafes and restaurants boasting stunning views, as well as the construction of hotels and resorts near Batur Lake, subsequent to the establishment of the UNESCO geopark. This development has led to increased job opportunities in the tourism sector, thereby encouraging younger residents to remain in the area. However, challenges in social dynamics have surfaced, particularly concerning the distribution of new businesses in tourist hubs. Overall, these physical and socio-economic transformations have altered the relationship between the local community and nature, transforming the volcano from a sacred site into a source of livelihood. It demonstrates how geotourism serves as a catalyst for broader socio-environmental changes. This case study not only documents these changes but also enriches the discourse on Landscape Political Ecology by illustrating the intricate linkages between geotourism, local economies, and cultural landscapes. To ensure sustainable development and preserve the cultural heritage of the Batur Geopark, it is recommended to implement a comprehensive geotourism management plan. This plan should involve local stakeholders in decision-making processes, promote environmentally friendly practices, and establish guidelines to balance commercial interests with the protection of nature.

KEYWORDS: Batur UGGp, geotourism, human-nature interaction

UNDERSTANDING THE CHALLENGES OF GEOTOURISM DEVELOPMENT FROM THE PERSPECTIVE OF PARTICIPATORY PLANNING

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

Indonesia is home to ten UNESCO Global Geoparks (UGG), which are areas with geological heritage of international significance. Notably, to be designated as a UNESCO Global Geopark, it is essential to establish a sustainable geotourism activity. However, there is a limited understanding of Indonesian UNESCO Global Geoparks in developing their geotourism potential, such as Rinjani-Lombok UGGp. While primarily known for its incredibly wide range of geological and natural attractions, Rinjani-Lombok UGGp faces challenges in growing its geotourism offering, despite the area having been designated as a UGGp since 2018. This paper seeks to explore the challenges in Rinjani-Lombok UGGp in developing geotourism activities that could meet the needs of education, conservation, and community empowerment while simultaneously attracting more visitors. Data were primarily gathered through semi-deep interviews with stakeholders and participant observation. The result indicates the geotourism theme is not well-represented and well-understood by local stakeholders; there is an absence of key stakeholders in the development of geo-interpretation; and there is a lack of initiative from the local community. The finding suggests that it is important to involve relevant experts and local communities at all stages of geotourism planning and development, and although interpretation guidelines are necessary, there should also be space for local communities to contribute and co-create the interpretation to enhance visitor experiences.

KEYWORDS: *geotourism, geoparks, participatory planning, interpretation*

SUSTAINABLE TRANSPORTATION POLICY FOR RINJANI MOUNTAIN AS WORLD CLASS GEOTOURISM DESTINATION IN LOMBOK ISLAND, INDONESIA

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

The tourism activities in UNESCO Global Geopark Rinjani-Lombok have been increasing in numbers after the 2018 Lombok Earthquakes disaster and the 2020 Covid-19 pandemic. This requires a sustainable transportation policy to ensure Rinjani-Lombok as a world-class geotourism destination. Embracing renewable energy options with lower Greenhouse Gas emissions and establishing a comprehensive multi-modal transportation network are the main strategies for sustainable transportation policy and planning. However, the transportation system to reach Rinjani Mountain has not been planned as part of a multi-modal transportation system that connects air, sea, and land transportation. This research aims to address the gap by analyzing the spatial planning and existing geotourism development from the transportation aspect. The output contributes to developing Rinjani Mountain as a world-class geotourism destination, aspiring to equal Swiss Alps in Europe. Key research questions focus on assessing the current infrastructure and identifying challenges to implementing sustainable transportation policies, considering economic, sociocultural, and environmental perspectives. Further, the research analyzes how the local stakeholders and residents can benefit from implementing sustainable transportation policy. Using data collection from planning documents, spatial data analysis, semi-structured interviews, and media perceptions, the research aims to develop a model of an ideal sustainable transportation system for Lombok Island. Incorporating the aesthetic considerations, the model plays the role as a game changer and provides an early assessment of the potential routes for nodes at the island level for further field survey and detailed analysis and informs policymakers at the national, provincial, and local government levels. Ultimately, the research outcomes contribute to shaping the long-term development plans in Lombok, as well as the central and local government policies and planning for achieving Sustainable Development Goals (SDGs).

KEYWORDS: *Governance, Policy, Sustainable Transportation*

CIREMAI VOLCANO EVOLUTION GEOTOURISM: EXPLORING THE TRACE OF AN ANCIENT VOLCANO, MAAR LAKES AND VOLCANIC SPRING BELT

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

The active Ciremai volcano and the traces of ancient volcanoes around it which occupy three districts, namely Cirebon, Kuningan and Majalengka in West Java Province, are a challenging area for geotourism development. The evolution of large volcanoes over a long period of time has certainly created a variety of volcano geotourism destinations. They are important and unique to Ciremai Volcano, such as the traces of old volcanoes, maar lakes, and volcanic springs belt that are scattered around the volcano. This article will present their traces of geotourism based on a study of primary and secondary data regarding geological diversity which are trace of the evolution of the Ciremai volcano which includes the area of Ciremai summit, Gegerhalang caldera, the Mount Kromong complex and nearby natural hot springs, volcanic gasses extrusion such as in Cipanas crater and Manuk crater. Also, several maar lakes such as Situ Sangiang and Setu Patok; and a number of springs from the Ciremai volcano spring belts. From the results of this study, some volcano geotourism routes that can be taken are also introduced, complete with key storytelling narratives at selected geotourism destinations as an introduction to geotourism on the topic of the evolution of the Ciremai volcano in the area.

KEYWORDS: *Ciremai volcano, traces of ancient volcano, volcano geotourism, maar, volcanic gasses extrusion, volcanic spring belt, story telling, evolution of volcano.*

UTILIZATION OF GEODIVERSITY OF MOUNT GAMALAMA ERUPTION PRODUCTS AS GEOTOURISM ACTIVITIES ON THE BATU ANGUS GEOTRAIL, ASPIRING TERNATE GEOPARK

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SUB-THEME: ***VOLCANO GEOTOURISM DEVELOPMENT***

ABSTRACT

Mount Gamalama is an active strato-type volcano composed of volcanic material consisting of lava, pyroclastics and lahars. Geographically, it is located at 0° 48' N and 127° 19.5' E with a height of 1715 meters above sea level. Administratively it is located in Ternate City, North Maluku Province. The first known eruption was in historical times in 1538. The eruption activities of Gamalama Volcano produced various volcanic materials which ultimately became a geological diversity on Ternate Island. Where the identified geodiversity consists of rock types, landscapes, beaches, hot springs and underwater geology which are very beautiful and interesting. In an effort to support the development of geotourism activities in the Aspiring Ternate geopark area, research is needed regarding the use of geological diversity, especially in the Batu Angus Geotrail, to provide an overview of how it can be utilized in geotourism activities and at the same time create opportunities for economic growth. This research uses a qualitative approach utilizing the inventory of geological diversity issued by the Geological Agency, 2017 with mapping and field observations related to geological diversity and its use in geotourism activities. The geological diversity resulting from the eruptive activity of Mount Gamalama, namely producing aa lava flow, blocky lava, spatter cone, spatter vent, lava tumuli, hornito lava, lava tube, channel lava, blocky lava flow, blocky lava smoother, accreted lava, lava walls and fracture. The geological diversity contained in the Batu Angus Geotrail is used for geotourism activities in the form of trekking activities, sport tourism activities (trail running, jogging, gymnastics, yoga), adventuring, research activities, jeep tours, Geo-Edu (field trips and excursions), art attraction stages & culture and conservation activities. Utilization of the geological diversity of eruption products from Mount Gamalama provides opportunities for local communities and regional governments to develop sustainable tourism activities in the form of geotourism.

KEYWORDS: *Geotourism, Geotrail, Batu Angus,Ternate, Geopark*

PROMOTING GEOTOURISM BY UNDERSTANDING THE RELATION BETWEEN SUBJECTIVE NORM AND EXPERIENCE INTENTION IN VOLUNTOURISM

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

Sibandang island is one of geosites of Toba Caldera UGGp. Sibandang island is designated as a geotourism-based rural area based on Peraturan Bupati Tapanuli Utara Nomor 33 Tahun 2023, so the tourism development in must be inline with geotourism values. Geotourism attracts special interest tourists, particularly those interested in nature, culture, and local wisdom. One of the tourism type of special interest is voluntourism. Voluntourism refers to the practice of taking part in volunteer activities while also engaging in tourism. The individuals participating in these programs seek both personal fulfillment and the opportunity to contribute to the communities they visit. When making a decision to travel, tourists consider the subjective norms of their surroundings. Subjective norms, on the other hand, refer to the perceived social pressures and expectations that individuals believe they should comply with in a particular situation. According to the Theory of Planned Behavior, subjective norms play a crucial role in shaping individuals' behavioral intentions. The in-depth interview method was used in this research by interviewing 20 voluntourists, who joined voluntourism in Sibandang island to examine the relationship between subjective norms and voluntourism experience intention. In the context of voluntourism, subjective norms can greatly impact individuals' intentions to participate in these programs. Based on this research positive subjective norms, such as encouragement and support from one's social circle, can strengthen individuals' intention to engage in voluntourism experiences. This research also shows that voluntourism appreciates social and cultural aspects, making people's daily activities an attraction, which is inline with the values of geotourism. This research can be a guideline to develop the marketing strategies to promote voluntourism in geotourism. This research also can contribute to sustainability and positive impact of voluntourism in geotourism.

KEYWORDS: *geotourism, subjective norm, theory of planned behavior, voluntourism experience intention.*

SUSTAINABLE TOURISM DEVELOPMENT PRACTICES IN INDONESIA: LESSONS FROM VOLCANO GEOPARK RINJANI AND BATUR

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

This research will analyze the development of geopark-based tourism destinations in Indonesia, focusing on Geopark Batur and Rinjani as they are prominent tourism locations in the country and have each received international status (UNESCO Global Geopark) in 2012 and 2018, respectively. The development of tourism in the Rinjani and Batur geopark destinations contributes to the improvement of the local economy. This is evidenced by the increase in investment in accommodations in the Sembalun District (Rinjani), which has grown 2.3 times, and the growth of restaurants in the Kintamani District (Batur), which has grown 1.8 times over the past 5 years. There has been a shift in the employment of the local community from traditional agricultural sectors to the tourism sector due to high demand from tourists. However, there are still several issues occurring in both Rinjani and Batur destinations. Uncontrolled waste accumulation (amounting to 5.4 tons in July 2022) due to tourism activities has not been fully managed. Additionally, environmental degradation has occurred due to the numerous restaurant investments lacking building permits in the area. These practices stem from a lack of awareness among tourism stakeholders in both destinations, who still prioritize short-term economic benefits. Future development of geopark-based destinations requires (i) the preparation of master plans containing development directions, conservations, and calculations of tourist carrying capacity, (ii) strengthening tourism products based on agricultural produce, (iii) promoting community-based and village tourism, (iv) risk mitigation, (v) encouraging high-value tourism investments, and (vi) partnerships and collaboration. By studying the experiences of Geopark Rinjani and Batur, policymakers, researchers, and practitioners can gain valuable insights into effective strategies for sustainable tourism development in Indonesia. These lessons can inform future initiatives aimed at promoting responsible tourism practices and preserving the country's natural and cultural heritage for future generations.

KEYWORDS: *batur, geo-tourism, rinjani, sustainable, volcano*

STRATEGIC PLANNING FOR COMMUNITY-BASED TOURISM DEVELOPMENT OF GEOPARK GLOBAL UNESCO RINJANI TO SUPPORT SUSTAINABLE ECOTOURISM IN WEST LOMBOK INDONESIA

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

This study aims to develops a strategic framework for enhancing Community-Based Tourism (CBT) in Sedau Village, West Lombok, Indonesia. Sedau Village is marked by its agricultural and cultural assets that show potentials for ecotourism as highlighted by many attractive tourist destinations, such as Sedau Spice for Live Program (vanilla-biodiversity) and Gunung Jae Camping Ground. Ecotourism in Sedau Village is nurtured by Geopark Global Unesco Rinjani Lombok Indonesia. Using Strength, Weakness, Opportunity, and Threat (SWOT) analysis and Analytical Hierarchy Process (AHP), this study identified strategies for advancing CBT by addressing the village's challenges like climate vulnerability and economic instability. Key findings underlined the importance of cohesive efforts among local tourism stakeholders and the significance of digital marketing of Sedau Village's unique offerings. The study suggests an integrated approach to tourism development and emphasizes the need for improved coordination between tourism awareness groups and village enterprises. Despite some challenges, such as waste management issues, youth outmigration, and reliance on government support, this study also identified agriculture-linked tourism as a niche for attracting visitors seeking authentic experiences. Strategic recommendations were focused on increasing community participation in tourism, diversifying funding sources, and encouraging youth involvement to ensure sustainability. This study contributed to the strategic planning of CBT by proposing adaptable strategies that acknowledged local specifics, socio-economic viability, and environmental sustainability. By leveraging Desa Sedau's strengths and considering its challenges, the proposed strategic plans were designed to foster a sustainable, community-led tourism that benefits both residents and tourists.

KEYWORDS: *Community-Based Tourism, Strategic Planning, Village, Ecotourism, Geopark*

TOPOGRAPHICAL MAPPING FOR GEOTOURISM DEVELOPMENT "GEO-EDU PARK" TELETUBBIES HILL IN WUKIRHARJO VILLAGE, PRAMBANAN, SLEMAN, SPECIAL REGION OF YOGYAKARTA

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

Yogyakarta is known for its beautiful natural tourism potential and for storing many geological sites that inherit various unique landscapes and geomorphological phenomena. One of them is Teletubbies Hill which is located in Wukirharjo Village, Prambanan District, Sleman Regency, Special Region of Yogyakarta. In addition, since its status as a tourist attraction, Teletubbies Hill has not facilitated tourists with education to get to know its geological and geomorphological characteristics. Evidenced by the absence of geotourism educational infrastructure for tourists. With these problems in mind, we are trying to raise the theme "Geo Edu Park Bukit Teletubbies" as an educational spot and park designed to convey information about natural landscapes, rocks, geological structures and earth history. In addition, plans to build additional facilities will help develop its natural beauty potential. The Teletubbies Hill area is influenced by the remnants of a Semilir Ancient Supervolcano, resulting in an abundance of pyroclastic tuff. This volcanic rock, formed from explosive eruptions, contributes to the unique landscape. Notably, the highest point in the area has been measured at 297 meters above sea level (Masl), while the lowest point lies at 240 meters above sea level (Masl). These elevation variations play a significant role in shaping the terrain and contribute to the area's geotourism potential. Geotourism development is carried out using field data that has been taken using mapping tools including Total Stations, and processed to produce output in the form of Azimuthal System Polygon Maps and Coordinate System Polygon Maps, Topographic Maps, Trajectory Maps, Geological Map, Geomorphological Map, Situation Map, and site plan development map. Knowing this information can help us estimate the existing potentials for planning the utilization of the Teletubbies Hill area as Geotourism.

KEYWORDS: *geological mapping, geotourism, teletubbies hill, topographic*

EVALUATING GEOTOURISM ASPECTS TO UNVEIL HARMONY WITH VOLCANO-GEOTHERMAL DEVELOPMENT: CASE STUDY OF THE DIENG VOLCANIC COMPLEX

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

The Dieng Volcanic Complex (DVC) is one of the Quaternary volcanoes with geothermal energy potential, located in Central Java, Indonesia. The DVC has a 60MW geothermal power generation and also has geotourism potential from its volcano-geothermal features and cultural heritages. The development of geotourism alongside geothermal development could enhance the socio-cultural acceptance of geothermal energy within the society. This study aims to evaluate the sustainable geotourism potential based on its geoheritage, ecotourism, and cultural heritage. Additionally, it seeks to demonstrate the possibility of harmonizing geothermal development with geotourism activities. Through a combination of literature review, field data collection, and social assessments, this research identifies 16 geosites related to the geological diversity of the volcano-geothermal features and 3 sites of cultural heritage. Quantitative assessments based on Kubalikova (2013) used for these geosites determine their feasibility for geotourism development. The assessment was conducted on the intrinsic, scientific, educational, economic, conservation, cultural, ecological, and aesthetic values of each site. The findings reveal that 11 out of the 16 geosites, such as Sikidang Crater, Pangonan Savanna, Sikunir Hills, Warna Lake, Batu Pandang Ratapan Angin, Mountain Prau, Mountain Bisma, Cebong Lake, Watu Lancip Rock Climbing, Sileri Crater, and Sikarim Waterfall, have high geotourism potential with scores exceeding 0.5. Meanwhile, 5 geosites such as Wisata Batu Lik-lik, Ngandam Hotspring, Pulosari Hotspring, Sipandu Hotspring, and Bitingan Hotspring exhibit scores lower than 0.5. Several geosites are directly linked to the Dieng geothermal system, such as Sikidang Crater and Sileri Crater, which are the upflow zone and the distribution of hot springs as the outflow zone. This shows that geotourism activities can serve as a direct-use of volcano-geothermal processes. Recommendations for geotourism development emphasize economic and educational aspects in geosites with low geotourism scores. Meanwhile, geosites with high geotourism scores can serve as focal points for local tourism developers.

KEYWORDS: *Dieng Volcanic Complex, geo-tourism, Volcano-geothermal*

CHARACTERIZATION OF GEOTRAILS AND DEGRADATION RISK ANALYSIS ON GEOSITES IN PURWODADI VILLAGE, TIRTOYUDO DISTRICT, MALANG REGENCY

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

In 2023, Purwodadi Village in Tirtoyudo District, Malang Regency is one of 75 villages that received the title of Indonesian Tourism Village Award (ADWI), so it is necessary to increase tourism potential, one of which is the development of geology-based tourism (geotourism). The southern part of Malang, particularly Purwodadi Village, is part of the Southern Mountain Zone, dating back to the Paleogene to Neogene Period, marking the traces of the Old Andesite Formation (OAF). The OAF consists of a unique and diverse composition of geological features and history that has been eroded, making it susceptible to degradation effects. The geodiversity potential in this area provides opportunities to develop geotrails as the main attraction in geotourism development. Therefore, research is needed to characterize geotrails and analyze the degradation risk at geosites in Purwodadi Village. The research method refers to the Technical Standards for Geological Diversity Inventory and Geological Heritage Identification issued by the Geological Agency in 2017, with an additional 4A analysis (Attraction, Accessibility, Amenities, Ancillary), and the Weighted Overlay method using parameters such as slope, rainfall, land cover, and soil type to evaluate the potential risk of degradation at geosites. From the inventory results, 9 geosites were identified with moderate to outstanding values, including: Watu Kuning, Kedung Paimo, Lenggoksono Beach, Banyu Anjlok, Kleta'an Bay, Bolu-Bolu Beach, Wedi Putih Beach, Wedi Awu Beach, and Lowo Cave. The characterization of geotrails in Purwodadi Village resulted in the main theme "Ancient Volcanic Traces in Purwodadi Village" with 3 geotrail routes. High degradation risk was found at the Kedung Paimo and Watu Kuning geosites, necessitating preventive and mitigation measures to protect the sustainability of these geosites. The results of this research can be taken into consideration in a sustainable geotrail management strategy based on developing geotourism and geological heritage conservation in Purwodadi Village.

KEYWORDS: *degradation, geosite, geotourism, geotrail, Purwodadi Village*

ASSESSMENT AND DEVELOPMENT OF HOTSPRINGS GEOTOURISM AROUND MOUNT LAWU, CENTRAL JAVA, INDONESIA

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

This study investigates the geotourism potential of four hot springs—Bayanan, Ngunut, Balong, and Pablengan—around Mount Lawu in Central Java, Indonesia. This region is known for its rich geothermal activity and cultural heritage, offering a significant yet untapped opportunity for sustainable tourism development. This research aims to perform a qualitative assessment of these geothermal sites, evaluating their scientific, educational, and economic values, as well as the challenges related to accessibility, facilities, and environmental sustainability, and also the efforts to increase the potential of geothermal tourism based on the assessment score. To quantify these sites' tourism potential, geosite and geomorphosite analyses were employed. This method involves assessing a landscape's aesthetic and functional attributes that enhance its value as a geotourism destination. According to the framework established by Kubalikova (2013), our findings indicate that the feasibility values for tourism development at Bayanan, Ngunut, Balong, and Pablengan are 69.75%, 51.66%, 47.33%, and 68.55%, respectively. These values reflect each site's overall potential for development, considering scientific and intrinsic value, educational and economic value, and the challenges they face regarding accessibility, facilities, and environmental sustainability. Despite promising scores, several barriers were identified, including inadequate infrastructure, limited local awareness of geotourism, and significant environmental concerns. Based on the assessment, this paper proposes a framework for the sustainable development of hot springs geotourism around Mount Lawu. Strategies include infrastructure improvements, environmental protection measures, educational programs about geothermal processes and conservation, and community-based tourism initiatives to ensure local benefits and cultural integrity. Developing these hot springs as geotourism destinations offers a pathway to sustainable tourism, providing economic benefits while preserving the natural environment and promoting geoscientific knowledge. This study contributes to the broader discourse on geotourism development and serves as a reference for policymakers, developers, and researchers in similar geothermal regions.

KEYWORDS: *geothermal sites, geotourism, hot springs, Mount Lawu, sustainable development*

GEOTOURISM POTENTIAL DEVELOPMENT OF HARIANPANGURURAN DISCTRICT AT SAMOSIR REGENCY, NORTH SUMATRA PROVINCE

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Sub-Theme: *Volcano Geotourism Development*

ABSTRACT

Extensive government-led infrastructure development in the North Sumatra region, particularly on Samosir Island, has significantly enhanced the area's natural tourism appeal. The proximity of Harianboho Sub-district to the popular Rohani Sibea-bea tourist area is a key factor driving the development of this tourism hub. Among the natural wonders already drawing visitors to this sub-district is Efrata Waterfall, renowned for its breathtaking scenery. However, it is imperative to consider the potential risks posed by natural disasters when developing tourism in this region. Located near the Pusuk Buhit Volcano and designated as a high earthquake-prone zone according to data from the Geological Agency's disaster mitigation portal, the Harianboho Sub-district requires careful planning to ensure the safety of tourists and residents alike. Establishing evacuation gathering points and implementing standardized procedures for evacuating disaster victims are essential steps in harnessing the geotourism potential of this area.

This paper discusses the development and mitigation of disasters from natural tourism in Harianboho District. In addition, it also resumes other tourism development strategies that will have a positive impact on the economy of the people in Harianboho District. The tourism development strategy in this sub-district takes the form of tourism development with a "back to nature" concept such as farming activities and building homestays with direct views of Lake Toba. This paper uses some methods such as literature study and documentation study to develop geotourism potential in Harianboho Sub-district.

KEYWORDS: *Harianboho, Geotoruism development, mitigation, strategy, and economic impact*

VOLCANIC GEOHERITAGE OF THE TERNATE ISLAND, NORTH MOLUCCAS, INDONESIA

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SUB-THEME: *VOLCANO GEOTOURISM DEVELOPMENT*

ABSTRACT

The Ternate Island is mainly composed of the products of the active Gamalama stratovolcano. The eruptive history of the Gamalama volcano is very well documented since the 16th century. Seventy seven (77) explosive eruptions of this volcano have been recorded, indicating Strombolian and Vulcanian-types of eruptions. These numerous volcanic processes presented a huge volcanic geodiversity, which is potentially important as geological heritage sites. This study aimed to evaluate the geological heritage of the Ternate Island based on their scientific, geotouristic and geoeducation values to establish geoheritage sites (geosites) as the key basis for geopark development. The results of both inventory and evaluation works show 19 (nineteen) potential geoheritage sites that have strong geological significance related to volcanic features, particularly volcanic deposits, volcanic morphology, volcanic craters, beaches, structural geology and paleotsunami deposits. Their identification and valuation allowed for establishing protection, geo-education, and sustainable tourism. Most of these volcanic geoheritage sites are accessible and warranting national recognition. Therefore, volcanic geoheritage in the Ternate Island has enormous educational, geotourism, and cultural potential that can be studied in more detail, aiming to develop a national geopark and a global geopark in the future.

KEYWORDS: *Volcanic geoheritage, Ternate Island, Aspiring geopark, Geotourism*

SUB-THEME: LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM

GEODIVERSITY OF THE GRAVATÁ TRAIL IN FLORIANOPOLIS-SC INVENTORY OF PLACES OF HERITAGE INTEREST

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

Geodiversity encompasses the diversity of abiotic elements within nature, including landscapes, rocks, landforms, and soils. When these elements hold significant scientific, historical, or cultural value for communities, they are designated as Geoheritage. The Gravatá trail, located in Santa Catarina State, Brazil, features a landscape shaped by climate dynamics, has fostered diverse geodiversity sites and ecosystems that provides values for communities. This research endeavors to value the geodiversity sites along the Gravatá trail. Three field trips were conducted for the identification, selection, and characterisation of putative sites. For the places selected we conducted an intensive identification throught several criterias: Location; Category; Observation Scale; Typology; Accessibility; Scientific Potential; Scenic Potential Highlight in the landscape, Potential for use and management; Educational Potential; Cultural Potential; Conservation indicators; Degradation Indicators; Current use; Rarity; Representativeness. Five geodiversity sites were identified along the trail: 1 - Large rock with well-marked vertical erosion of the fluting-type; 2 - Residual rock that presents several tafoni-type erosions in a honeycomb shape. 3 – Residual rocks composed of large structures clustered where weathering occurs in layers and in a vertical position featuring fluting-type erosin-on. 4 - Locally known as “Onda” it is the most popular and visited place on the trail. This is tafoni-type erosion, forming a structure that resembles a sea wave. 5 –Rock with erosion of the type tafoni showing weathering from the bottom up, causing the rock to appear hollow inside. These sites hold potential for scenic, scientific, educational, and tourist enhancement, drawing interest from visitors intrigued by their natural characteristics. Moreover, the inventory of these abiotic elements facilitates guided tours aimed at enriching understanding of the landscape and its geological framework. Such initiatives promote awareness among both local residents and tourists regarding the importance of conservation and sustainable tourism practices, thereby fostering geotourism initiatives.

KEYWORDS: *Geoconservation, Geodiversity, Geoforms, Brazil, Granite landforms.*

GEOFORMS IN SOUTHERN CANYONS PATHWAYS UNESCO GLOBAL GEOPARK - BRAZIL: POTENTIAL FOR GEOTOURISM

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ABSTRACT

Geoforms refer to relief features caused by the action of time and endogenous and exogenous processes, being considered as elements of geodiversity. When these geoforms have their own peculiar geometry, and in the imagination, they can be associated with animals, objects, or human faces, this psychological phenomenon is called Pareidolia. In this way, this paper aims to identify geoforms with potential for appreciation through Pareidolia in the UNESCO Global Geopark Caminhos dos Cânions do Sul - Brazil. A field trip was conducted for the identification, selection, and characterisation of putative sites. From the seven sites visited, we selected three places for intensive identification. The refinement process employed an unstructured conversation with Geopark leaders and members of community, in order to determine first-person, validated site descriptions and cultural values. Through the interviews with local residents from Três Barras region – State of Santa Catarina, Brazil, it was possible to ascertain their profound intangible connection with these geoforms, as evidenced by a strong sense of belonging and orientation that shapes and influences their daily routines. Two important geoforms were observed for the community of Geopark: "O Cavalo" ("The horse") and "A Janelinha" ("The little window"). "A Janelinha" is visualized on a wider scale and is evident when arriving in the municipality of Morro Grande, at the top of Morro Realengo. The Horse is seen on a rocky wall on the trail that leads to Morro do Realengo, in this case, requiring a little more imagination/abstraction and concentration. This study highlights the potential of Pareidolia as a tool for valuing geoforms, facilitating the recognition and conservation of abiotic elements. By fostering empathy among visitors to these geoforms, it can engender a sense of identity, connection, and belonging. This enhances interactivity and makes the process of valuing geodiversity more accessible and effective.

KEYWORDS: *Geoconservation, Geodiversity, Geoforms, Geopark, Pareidolia*

IDENTIFICATION OF POTENTIAL GEOLOGICAL CONSERVATION FOR SUSTAINABLE GEOTOURISM CASE STUDY WEST MANGARAI , EAST NUSA TENGGARA

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

West Manggarai Regency, home to the city of Labuanbajo, serves as the gateway to the Komodo Islands, a UNESCO World Heritage Site. Labuanbajo, a small port city spanning approximately 2,947.46 km^2, accommodates a population density of around 257,582 people. Beyond its renowned archipelago, the mainland boasts diverse geological features ripe for preservation and geotourism development, alongside its distinctive forests and culture. This research employs geological conservation methodology comprising modified geoheritage assessment, geological uniqueness determination, and AHP (Analytic Hierarchy Process) environmental geology zonation to delineate core conservation and limited cultivation zones. Initially, there were thirteen (13) potential scattered objects in West Manggarai, however after identification and research, there are six (6) geological conservation scattered objects emerge: Cunca Wulang Waterfall, Sano Nggoang Lake, Batu Cermin Cave, Pota Wangka Fossil Wood, Rangko Cave, and Columnar Joint Waraloka. These objects are valued for scientific, educational, and tourism potential, presenting opportunities for sustainable regional development and geotourism alternative destinations in West Manggarai.

Keywords: Geological Conservation, Amalytic Hierarchy Process, Sustainable Geotiurism

EXPLORING MORE THAN 27 MILLION YEARS OF VOLCANIC EVOLUTION WITH SENSORY EXPERIENCE IN PURBALINGGA AND KEBUMEN AREA

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

Purbalingga and Kebumen districts are regions that have geosite related to volcanic products. The Kebumen area already has the Karangsambung - Karangbolong National Geopark, which contains some of tourist attractions about volcanic products aged from Late Oligocene to Miocene. This research proposes to connect these geosites to the Purbalingga area as well, which has Miocene to Holocene volcanic products into a geotrack. Increasing tourist satisfaction is a major concern by implementing itineraries and experiential marketing that focus on sense experiences. The conception of this geotrack is carried out by considering the diversity of geology, culture, access, scientific features, and history, including tourist attractions. This geotrack conception was carried out by considering the diversity of geology, culture, access, scientific privileges and history, including tourist attractions. The sensory experience is planned by compiling a geological tour guide scenario and determining the five human senses that will be satisfied at each tourist attraction. This geotrack wants to ensure that all human senses have an impressive experience. The success of the sensory experience in this geotrack will be validated by reviews from visitors after visiting the geosite. This itinerary is expected to increase tourist interest and government awareness regarding the potential for education and conservation-based geotourism. The arrangement of this geotrack can be used by geologists or non-geologists to conceptualize travel, geological field trip, or develop research related to existing geosites.

KEYWORDS: *geotrack, sense experience, volcano, menganti, purbalingga*

ENHANCING THE GEOTOURISM EXPERIENCE: A STUDY OF GEOTRAIL DEVELOPMENT IN THE PRAMBANAN AREA UTILIZING GEOLOGICAL, GEOPHYSICAL, AND CULTURAL DATA

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

Geotourism is increasingly recognized as a strategic means to unlock geological wealth, deepen comprehension, and bolster regional and national economies. Yogyakarta stands out for its rich natural tourism potential, harboring numerous geological sites showcasing unique landscapes and geomorphological wonders. Despite this, much of the geological potential, particularly in Prambanan, remains underutilized. Realizing this potential necessitates a comprehensive analysis involving mapping the area and cataloging various geotourism parameters. Geological mapping of Prambanan Sub-district employs diverse surface techniques, encompassing detailed geomorphological observations, thorough outcrop analysis, structural geological studies, overlay scoring and kubalikova analysis for geotourism potential assessments. The study identifies six distinct landform units and typical drainage patterns characterized by Parallel and Sub dendritic patterns. Stratigraphic analysis delineates four rock units, from the oldest to the youngest, including Kebo-Butak Sandstone Unit, Semilir Mudstone Unit, Merapi Volcano Unit, and Alluvial Deposition Unit. The identification of a left-lateral fault exhibiting a northeast-southwest and east-west orientation is a notable finding. Utilizing gravity geophysical data and complete Bouguer anomaly values obtained from 48 data acquisition points, corrected and analyzed through polynomial fitting, and a slope-derived filter, the study highlights the consistent presence of an anomaly associated with the Opak Fault segment. Interpreting these findings lays the foundation for future geological disaster mitigation strategies. Geotourism potential assessment in Prambanan Sub-district and surroundings considers geological, biodiversity, and cultural diversity, evaluating various geosites such as Prambanan Temple, Breksi Cliff, Abang Temple, Sentonorejo Japanese Cave, Banyunibo Cliff, Sambirejo Control Dam, Teletubbies Hills, and Pillow Lava Berbah. To optimize visitor experiences and foster sustainable development, geosite development in the Prambanan area necessitates constructing a geotrail equipped with viewpoints, interpretation panels, stops, and informative timetables. It is expected that Prambanan Geotrails can be one of the media to socialize earth education as part of the promotion and development of geotourism.

KEYWORDS: *Geotourism, Geotrails, Gravity, Opak Fault, Prambanan*

IDENTIFICATION AND VALORISATION OF MOROCCO'S GEOLOGICAL HERITAGE : FIRST INVENTORY AND ASSESSMENT OF THE GEOHERITAGE OF REHAMNA REGION (CENTRAL JEBILET, MOROCCO)

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

Morocco, with its diverse geological features, offer an amazing landscape that includes mountains, plains, deserts, plateaus, and coastlines. This natural diversity provides unparalleled opportunities for scientific exploration and tourism. Geotourism, which aims to preserve and showcase Morocco's geological treasures, holds great promise. However, challenges such as underdevelopment and limited awareness persist, emphasizing the urgent need for concerted efforts to advance geotourism and ensure sustainable conservation for future generations.Our current study focuses on the Rehamna area, which is part of the Marrakech-Safi region. This region presents numerous geomorphological and mining sites of scientific and scenic interest, making them educational and tourist attractions for both professionals and the general public. In our research, we have shed light on previously unknown geosites within the Rehamna region. These sites have been meticulously inventoried, mapped, and described from the perspective of their morphogenetic formation. Notable examples include Bousissone's Shale, the Granites of Oulad Ousslam, and historic mines like Sidi Bouazouz, Frag El Ma, and Bir N'hass. Recognizing the significance of this potential geological heritage, the region of Rehamna is actively engaged in efforts to protect and preserve it through extensive studies and various initiatives. This commitment serves multiple objectives, including scientific advancement, cultural enrichment, educational outreach, and socioeconomic development. By promoting sustainable development practices alongside eco-tourism initiatives, Rehamna is committed to ensuring the long-term preservation of Morocco's natural treasures.

KEYWORDS: *Geotourism, Geodiversity, Rehamna, Morocco, Community-Based Tourism*

LOCATING GEODIVERSITY HOTSPOTS THROUGH GRID-BASED SPATIAL INDEXING: LOMBOK, INDONESIA

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY, BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

Locating geodiversity hotspots across large areas poses a challenge for further geopark development in Indonesia, especially on Lombok Island, which spans 5,435 km². A geodiversity hotspot is an area rich in geological features, encompassing lithology, geomorphology, hydrology, and paleontology. A practical approach is necessary to identify these hotspots and prioritize areas for conservation. This study employed a grid-based spatial indexing method to pinpoint potential geodiversity hotspots in Lombok. The entire island was covered using 238 grids of 5 × 5 km² for this study. The technique applied five main parameters: geological formation, drainage systems, soil distribution, and topographical landscapes. The identified geodiversity hotspots were validated through ground checking. The study pinpointed six priority hotspots with significant geodiversity: Gangga, Sikur, Bayan, Sembalun, Sambelia, and Gerung-Kuripan. These areas showcase diverse geological formations, including at least 12 lithological types, ranging from Oligo-Miocene to Plio-Pleistocene rocks. They also contain distinct marine and terrestrial fossils and minerals. Geothermal and natural springs are particularly prevalent in the southeast of the Rinjani Volcano. Soil characteristics vary, including eutric regosols, vitric andosols, and lithosols, which facilitate the biodiversity of Lombok Island. The dense natural drainage systems in these areas play a crucial role in hydrology and generate breathtaking waterfalls located within these hotspots. The varied topography contributes to fascinating landscapes that support ecosystems at different elevations. Some spots, such as in the Sembalun and Gerung-Kuripan areas, are well-known tourist sites. However, other sites, such as Sambelia, Gangga, Sikur, and Bayan, remain less popular. Therefore, local governments should consider these areas for further development and integration with local traditional culture. Conservation efforts are essential to ensure sustainable development amidst recent rapid economic growth. This study provides a fresh perspective on understanding the prospects of geotourism, particularly in supporting the sustainable development of the Rinjani-Lombok UNESCO Global Geopark.

KEYWORDS: *Geopark, Geotourism, Sustainable development, Geoconservation, grid-based spatial indexing.*

GEOTRAIL PROPOSAL AND PENTAHELIX FRAMEWORK APPLICATION IN THE ASPIRING SUNDA GEOPARK

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY, BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

Comprehending the urgencies of geo-tourism development in the aspiring Sunda Geopark, the aim is to establish geo-trails that narrate the geological history shaping the Bandung Basin. Through field observation, imagery processing, tourist aspect assessment, and Pentahelix Framework application, recommendation on development direction was designed. Analysis of tourism patterns from satellite imagery and field observation results lead to the proposal of three geo-trails showcasing distinct geological events influencing the biology, environment, and cultural values of the aspiring Sunda Geopark. The Guha Pawon geo-trail, nestled within the karstic limestone of the Rajamandala Formation, elucidates the pivotal role of geological phenomena in sustaining local ecosystems. In contrast, the Sanghyang Heuleut geo-trail, situated amidst the heavily structured terrain of the Citarum Formation's anticlines and synclines, illustrates the vast scale of geological forces molding the Bandung Basin. Meanwhile, the Cirendeu Villages, situated within a Quaternary Volcanic-influenced setting, offer a poignant resemblance of cultural adaptations to the current geological condition of the Bandung Area. A comprehensive evaluation of the tourism aspects namely attractions, accessibility, amenities, activities, and accommodation, inherent within these geo-trails underscores the need for further development identified through the Pentahelix Framework, which highlights the gap that governmental bodies, academia, industries, the public, and media should fill. An intriguing revelation gleaned from the Pentahelix Framework's assessment underscores the imperative for governmental initiation to promote geo-tourism activities. Currently, with only limited resources, locals rely on developing tourism facilities, presenting an opportunity for industries and academia to be indulged further in the development. Ultimately, the establishment of these geo-trails promises to galvanize the inception of geo-tourism ventures within the aspiring Sunda Geopark, thereby catalyzing a surge of geo-tourism interest in this distinctive locale.

KEYWORDS *Bandung, geo-trail, geo-tourism, Pentahelix, Policy*

THE CULTURAL DIVERSITIES IN THE *MANDALIKA* SUSTAINABLE *GEOTOURISM* DESTINATION

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY, BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

This paper is aimed to describe the linkage between the Geology, Biology and Cultural Diversities in *Geotourism* in Mandalika, Lombok, Indonesia. The variables of the discussion are some aspects of *Geology* and *Biology*, also more importantly the cultural diversities embedded in *Sasak* tribe, the native residents of Lombok island. The culture terminology in this paper refers to the language used as both verbal and non verbal means of communication utilized as symbols of cultural expressions. As Hall (2011) explains, language represents the identity of the users. Annually, at-the end of February the event called *Bau Nyale* is celebrated by the people in Central Lombok, to preserve the local wisdom, values and folktale of the *Mandalika* princess. The research questions the cultural values embedded in the event of *Bau Nyale* and how the local Government of Central Lombok has preserved this value through education at school level. The research method of this paper is qualitative, specifically a library research based. The geology and biology aspects will be explained in the beginning of the research as some general information to the *Nyale* worm found in the southern coast of Lombok. Whereas, the cultural diversities will be referred to as the core of the research elaboration. The findings of this research elaborate a strong correlation between the geology, biology and cultural diversities in supporting the *Mandalika* sustainable Geotourism. The sea worm or the *Nyale*, defined as Polychaeta worms (Bachtiar, 2019) found in the tenth month of *Sasak* calender, is believed by the *Sasak* to become the transformation of the Princess *Mandalika*, symbolizing fertility and prosperity. This *Nyale* festival is one the most wanted events in Lombok island. Culturally rich in terms of language, performances and other social related matters occurred within the festival making Lombok worth the world a visit. Further, it is expected that this research will contribute some new insights to the society and articulate the gap probably found in some previous relevant studies.

KEYWORDS: Cultural diversities, language, communication, value

RESTORATION PLAN OF CORAL REEF ECOSYSTEM IN KARIMUNJAWA NATIONAL PARK

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

Karimunjawa Islands is a landscape that has more than one ecosystem, forming the characteristics of the region and has been designated as a national park area. National park management is carried out systematically through planning, protection, preservation, utilization and control activities. In recent times, managers have been faced with various challenges to the integrity of the area. The threat of decreasing the quality of coral reef ecosystems by exploitation of fish resources and the negative impacts of tourism activities and threats due to "vessel grounding" on coral reefs and causing damage. The decline in the quality of coral reef ecosystems leaves traces in the form of habitat destruction and indications of open areas. Based on the identification results, there are several locations that have faced degradation that require recovery efforts. Ecosystem restoration is needed as an effort to maintain a balanced and dynamic ecosystem in its development. Ecosystem restoration aims to fully restore the integrity of the ecosystem to its original level and to desired future condition in accordance with the management objectives of the Karimunjawa National Park area. The impact of coral damage leaves a bed of coral fragments and dead chunks, coral fragments cannot be overgrown with coral saplings, while coral chunks can be overgrown with coral saplings. If the damage is predominantly by coral fragments, it is necessary to approach physical restoration with the help of artificial reefs combined with coral transplantation to speed up the succession process.

KEYWORDS: *artificial reef, coral reef, national park, restoration, transplantation*

PETRIFIED FOREST OF UGGP MERANGIN-JAMBI: DESIGNING STORYTELLING IN MEDIA FOR GEOBRANDING IMPLEMENTATION

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SUB-THEME:

LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM

ABSTRACT

UGGp Merangin-Jambi is renowned for its concealed woodlands that have petrified (fossil) over time. That is the level of uniqueness that this destination possesses. This distinctiveness is also a legacy that must be preserved for the purposes of education and preservation. Geobranding is a strategic approach to branding that focuses on geoparks. It aligns with the Three Pillars of Geopark Development in Indonesia and is intended to be a key program in promoting sustainable development. To investigate the stages of geobranding, research was conducted, focusing particularly on the identity and launch stages. The stages of geobranding include identity, launch, implementation, and monitoring. Data was gathered by document and media content analysis, as well as through observations and interviews conducted between September and December 2023. A qualitative technique was employed to develop a formula for using the petrified forest as a narrative tool in storytelling, applicable to various forms of media output. The aim of this research is to provide valuable insights for geopark stakeholders and professionals involved in content creation for destination branding.

KEYWORDS: *destination_branding; digital_content; geobranding, mass_media _research; storytelling*

APPLYING DIGITAL COMMUNICATION IN THE CONTEXT OF SUSTAINABLE TOURISM DEVELOPMENT: STUDY IN BUKIT PERAMUN, BELITONG UGGP

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SUB-THEME:

LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM

ABSTRACT

Bukit Peramun management has expedited their digital transformation by developing an application that combines virtual reality and augmented reality technology. This software program is referred to as Peramun Hill. This program offers a virtual tutorial that may be conveniently accessible within the application itself. This technique signifies a transition from the utilization of virtual reality to augmented reality, leading to a heightened level of immersion for consumers. Digital communication has been extensively utilized in multiple sectors, including the economic development sector, to facilitate sustainable tourism. Digital communication refers to the use of digital media to facilitate communication. This study employs a qualitative methodology utilizing a case study design. The objective of this study is to examine the impact of incorporating digital communication in the process of digital transformation on the growth of ecotourism in Peramun Hill. The research findings indicate that the utilization of digital communication, such as websites, social media, and smart guide applications, plays a crucial role in enhancing information accessibility, broadening promotional reach, and facilitating visitor interaction with tourism destinations. Nevertheless, the challenges of technology accessibility and limited digital literacy within local communities must be addressed in order to enhance the effectiveness of digital communication deployment. This research provides valuable insights into the impact of digital communication on the development of sustainable tourism. It also offers recommendations for enhancing digital communication practices in the context of sustainable tourism in the future.

KEYWORDS: *CSR; digital_communication; digital_literacy; geopark, sustainability_tourism.*

GEOSCIENCE POPULARISATION IN GEOPARKS: A COMMON WORKFLOW FOR DIGITAL OUTCROP MODELLING

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

Geodiversity has garnered increasing attention, prompting geoscientists to advocate for its recognition to promote holistic nature conservation. UNESCO Global Geoparks (UGGps) have expanded globally, promoting geoheritage and contributing to geoconservation and sustainable tourism. In this framework, the IGCP 714 project, "3GEO – Geoclimbing & Geotrekking in Geoparks," launched in 2021, aims to use Geographical Information Technologies (GIT) to enhance geoscience communication within UGGps. However, there is still a significant need for a repeatable, accessible, low-cost, and effective workflow to integrate these digital technologies into geoscience communication effectively. This study aims to develop a workflow for creating Digital Outcrop Models (DOMs) of geosites and geodiversity sites used for recreational climbing and trekking. Using technologies such as UAVs and Smartphones, the workflow generates DOMs integrated into web-GIS applications and Virtual Reality experiences, offering interactive educational content. Four examples are described, illustrating the implementation of the DOM workflow from the outcrop scale (La Pedriza Granitic Batholith, Spain, and Etna Volcano Lava Tube, Italy) to the terrane scale (Organ Pipes Columnar Jointing, Australia, and Ossola Valley Metamorphic Uplift, Italy). The workflow proved effective in public and student engagement, demonstrating its potential for broader educational and geoconservation applications. Moreover, the workflow aims to build capacity among Geopark practitioners and researchers by improving techniques for creating content on geoheritage features and enhancing geoscience communication. For this, the workflow is designed to be repeatable by employing common or low-cost GIT tools. Investment in capability, software, and hardware is necessary to equip Geopark practitioners with the skills required to implement this workflow effectively. By integrating DOMs with other GIT tools, the workflow enhances the appreciation of geodiversity, supports education and research, and promotes sustainable geotourism. Ultimately, the workflow contributes to a better understanding of geoheritage, fostering improved geoconservation practices within UGGps.

KEYWORDS: *Digital Outcrop Models; Virtual Reality; Web-GIS; Geoheritage; Geotourism; Geoparks*

THE IMPACT OF GEOTOURISM ON PHYSICAL ENVIRONMENT, DAILY EXPERIENCE, AND THE CONNECTION BETWEEN HUMANS AND NATURE: A CASE STUDY OF UNESCO GLOBAL BATUR GEOPARK IN BALI, INDONESIA

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SUB-THEME: *LINKAGE BETWEEN GEOLOGY , BIOLOGY & CULTURAL DIVERSITIES IN GEOTOURISM*

ABSTRACT

This study focuses on the Batur UNESCO Geopark, founded in 2012 in Bali, Indonesia. Using the theoretical lens of Landscape Political Ecology, the research explores how the UNESCO geopark has influenced the urban landscape, human-nature interactions, and daily life in Batur, Indonesia. Employing qualitative methods including document analysis, observation, and semi-structured interviews, the study investigates these transformative effects. The findings of this research highlight significant changes in the physical landscape of Batur, demonstrated by the emergence of new clusters of cafes and restaurants boasting stunning views, as well as the construction of hotels and resorts near Batur Lake, subsequent to the establishment of the UNESCO geopark. This development has led to increased job opportunities in the tourism sector, thereby encouraging younger residents to remain in the area. However, challenges in social dynamics have surfaced, particularly concerning the distribution of new businesses in tourist hubs. Overall, these physical and socio-economic transformations have altered the relationship between the local community and nature, transforming the volcano from a sacred site into a source of livelihood.

KEYWORDS: *Geopark, Geotourism, Landscape Political Ecology, Bali*

SUB-THEME: DISASTER RISK REDUCTION IN GEOTOURISM

MITIGATION OF COSEISMIC HAZARDS, A COMPARISON STUDY OF SISTER GEOPARKS 'RINJANI-LOMBOK UGGP & ASO UGGP

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SUB-THEME: *DISASTER RISK REDUCTION IN GEOTOURISM*

ABSTRACT

Currently there are 213 UNESCO Global Geoparks (UGGps) in 48 countries. Even though they have similar themes, each geopark has its own uniqueness, for example, Rinjani-Lombok and Aso UNESCO Global Geoparks which work together as sister geoparks in the field of geotourism and disaster risk reduction. Aso UGGp experienced severe earthquakes in 2016 (Kumamoto Earthquake) which damaged various infrastructure, causing coseismic landslides and loss of life. Likewise, Rinjani-Lombok UGGp was hit by a series of earthquakes in 2018. The coseismic landslides also damaged the mountain trails on both volcanoes (Aso and Rinjani) and made them closed for tourism. This study was conducted to understand how 2 geoparks with similar themes and disaster events recover and mitigate better. The method used is qualitative (in-depth interviews with purposive sampling method), being combined with reference and image studies. The results show that up to now the coseismic landslides impact due to the earthquakes has not been fully recovered, but on various sides the hazard mitigation has been improved in a better direction. Apart from structural and non-structural efforts are also needed in both geoparks, especially increasing the awareness of tourism actors and guides regarding hazard mitigation.

KEYWORDS: *Aso UGGp, coseismic landslide, DRR, geotourism, Rinjani-Lombok UGGp*

APPLICATION OF INFILTRATION WELLS AND DRAINAGE IN OVERFLOWING WATER: A CASE STUDY OF TEBA MURIN WATERFALL

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SUB-THEME: *DISASTER RISK REDUCTION IN GEOTOURISM*

ABSTRACT

Sumbawa Regency, with an area of 6,638.98 km2, is one of the districts of West Nusa Tenggara Province that has many geotourism potential. One of them is Teba Murin Falls in Lenangguar village, Sumbawa Regency. Murin's Teba Falls were formed by river erosion over many years. The study aims to overcome overflow of water at Teba Murin Falls using a combination of absorption well drainage technology and GAMA Rain Filter. Teba Murin Falls is one of the most famous geotourism sites, but an excessive monsoon can cause disturbances and safety risks for visitors. This research method involves the collection of field data, the analysis of geographical and hydrological conditions of the region, and the implementation of the drainage technology of the reabsorption wells and GAMA Rain Filter. Drainage of catchment wells is used to flow rainwater slowly into the soil, reducing the risk of water overflow. In the meantime, Rain Filter GAMAs are being used to harvest clean water that can be used for a variety of purposes. The research results show that the combination of absorption well drainage technology and GAMA Rain Filter is effective in managing water overflow at Teba Murin Falls. Drainage of catchment wells helps reduce the volume of water flowing to the surface, while GAMA Rain Filter utilizes rainwater to be a source of clean water that visitors can use. By reducing water overflow, the risk of soil erosion or further rock erosion may be minimized. The study made an important contribution to the management of the waterfall in the Teba Murin Falls area. The implementation of immersive well drainage technology and the GAMA Rain Filter can help reduce the risk of overflow, preserve the environment, and improve visitor experience in Teba Murin Falls geotourism.

KEYWORDS: *Drainage, GAMA Rain Filter, Waterfall, Waterflow, Well Absorption.*

THE EARTH IS SHAKING, THE SLOPES ARE COLLAPSING; PREPARE TO FACE LANDSLIDES IN LUNYUK SUB-DISTRICT

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SUB-THEME: *DISASTER RISK REDUCTION IN GEOTOURISM*

ABSTRACT

In the south of Sumbawa, stands the resilient district of Lunyuk, one of the oldest regions on the island that holds the enchanting charm of culture and captivating nature. Cultural diversity is tightly woven in harmony among three major ethnic groups: Samawa, Bali, and Sasak. Lunyuk is not only rich in culture but also in its natural resources. Farming, livestock rearing, and mining are the main sources of livelihood, making Lunyuk the largest contributor to the economy of West Nusa Tenggara, particularly in Sumbawa Regency. However, behind its beauty and prosperity, Lunyuk harbors potential dangers. Being situated in a hilly area with high rainfall, this region is prone to landslides. Awareness and preparedness in facing disasters are key to ensuring the safety of the community and the preservation of Lunyuk. This study utilizes field observations and literature reviews as research methods. The results indicate that the Lunyuk District has a high vulnerability to landslides. Contributing factors to this vulnerability include hilly and steep topography, high rainfall, easily erodible soil types, and human activities such as deforestation and settlement development in landslide-prone areas. It is hoped that this research can assist the community and the government in the Lunyuk District in enhancing their preparedness for landslides. Anticipatory measures for landslides in the Lunyuk District include education and awareness campaigns, area mapping, early warning systems, and disaster mitigation. This research is expected to help minimize the occurrence of landslides, preventing the disruption of transportation routes connecting the Lunyuk District and the city of Sumbawa. It is hoped that this study will provide benefits to the community of the Lunyuk District! By following the provide steps and solutions to minimize the impact of landslides outlined in this research, the community canminimize landslides, maintain smooth transportation routes, and improve their harvest yields, ultimately leading to a more advanced Lunyuk District.

KEYWORDS: *Disaster mitigation, earthquake landslide disaster, Lunyuk District.*

DETERMINATION OF MITIGATION PATH AND PLACEMENT OF DISASTER POSTS IN THE MERAPI SLOPE GEOTOURISM AREA BASED ON ANALYSIS OF MICROTREMOR DATA IN CANGKRINGAN DISTRICT, SLEMAN REGENCY, SPECIAL REGION OF YOGYAKARTA

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SUB-THEME: DISASTER RISK REDUCTION IN GEOTOURISM

ABSTRACT

The Merapi Slopes, Cangkringan District is one of tourist destinations in term of both natural and artificial tourism such as *Bukit Klangon* and *Museum Sisa Hartaku*. This tourist area is popular in the Special Region of Yogyakarta, even out of the province. However, this sub district is on the slopes of Mount Merapi, which is the most active type A volcano, especially on the island of Java. That makes the area have a high level of vulnerability to volcanic disasters. We here to tell geophysical methods to analyze the vulnerability of the land in Cangkringan District to reduce the danger of disasters through determining low risk pathways and placing the disaster mitigation post, especially for the Merapi tourist destination. The result of analysis HVSR microtremor data, with the seismic vulnerability analysis between 0.13 - 5.8 and range peak ground acceleration value is 485 gal - 1350 gal. Analysis of the average shear wave speed value at a depth of 30 m (Vs30) the lowest is 300 m/s and the highest speed is 1,350 m/s with the rock type in the study area categorized as medium hardness and hard soil. The lowest ground shear strain analysis was 4.86 x 10-3 s2 /cm and the highest was 4 x 10-5 s2 /cm. Additionally, gravity data analysis using GGMplus indicated that the area had a range of Bouguer anomaly value from 29.3 to 57.3 mGal. These variations in gravity reflect the lithology of the area. Based on analysis of the data we produce a disaster risk map. From this disaster risk map, for the community and tourists visiting the Merapi Slope, the areas were divided into the zones for no-risk, risk but with mitigation posts, high risk only for research.

KEYWORDS: *geo-tourism, GGMPlus, Microtremor, Mitigation, Mount Merapi.*

TSUNAMI DISASTER MITIGATION IN COASTAL GEOTOURISM: CASE STUDY OF PUTIH SAND BEACH, LUNYUK SUMBAWA

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SUB-THEME: *DISASTER RISK REDUCTION IN GEOTOURISM*

ABSTRACT

Coastal geotourism offers significant economic potential. However, this area is vulnerable to tsunami disasters, which can have fatal consequences for tourists and local communities. Earthquake disasters that occur on the seabed cause tsunami waves that can cause damage to coastal areas. On the other hand, coastal areas in Indonesia are areas that are densely populated with settlements and development. Sumbawa Island is one of the islands in West Nusa Tenggara (NTB) Province which has a high level of vulnerability to tsunami disasters. This is because the southern part of Sumbawa Island faces directly the Indian Ocean, which is the meeting point of two continental plates, namely the Asian continental plate and the Australian continental plate. The tsunami incident in the Lunyuk area of southern Sumbawa in 1997 had psychological and material impacts on the community. In order to reduce the danger of tsunamis, and at the same time to protect coastal areas from damage. For this reason, tsunami disaster mitigation is important to ensure the sustainability of geotourism and the safety of visitors and local communities. This research uses descriptive, qualitative methods with a case study at Pasir Putih Beach, Lunyuk District, Sumbawa Regency. Data was collected through field observations, in-depth interviews with local government stakeholders, geotourism managers, local communities, and analysis of related documents or news. By implementing effective mitigation in the form of increasing education and training about tsunamis for tourists and local communities, building tsunami mitigation infrastructure that is integrated with geotourism aesthetics, as well as strengthening coordination and communication between stakeholders through collaborative forums and media. It is hoped that coastal geotourism on Sumbawa Island can develop sustainably and safely, and minimize the risk of tsunami disasters for tourists and local communities.

KEYWORDS: *geotourism, mitigation, tsunami disaster, white sand beaches*

FLOOD REDUCTION EFFORTS IN GEOTOURISM AREA (CASE STUDY: LIANG BUKAL CAVE)

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SUB-THEME: *DISASTER RISK REDUCTION IN GEOTOURISM*

ABSTRACT

The potential of natural resources and the use of nature by the community are the main capital for sustainable tourism development. The application of the geotourism concept is a tourism strategy that focuses on geological and geomorphological aspects such as faults, folds, karst, volcanic, and so on. The Liang Bukal Cave Geotourism area is located in Batu Tering Village, Moyo Hulu District, Sumbawa Regency, West Nusa Tenggara Province with coordinates 8°40'50.78"S South Latitude and 117°28'29.47"E East Longitude. This cave is located at an altitude of around 145 m above sea level. This area has diverse flora and fauna. One of the problems that occurs in this area is flooding caused by overflowing water from rivers around the area, thus disrupting tourist activities. Forest destruction (loss of natural vegetation). Illegal felling of trees and plants by people (illegal logging) and shifting agriculture are reasons that cause disruption of the hydrological cycle and the occurrence of floods. Economic needs make people change the lands from forests to corn farming areas and to extract woods from forests, thus introducing flooding in the area. The regulations related to land use were taken to reduce areas prone to flooding, by which they can manage communities not to change the function of forest areas in these areas. In addition to that, community's understanding the regulations is needed in minimizing flood disasters. Therefore, several approaches are needed, including the issurance of flood warnings in the village/sub-district levels and the community services to repair river beds and banks and clean up sediments and driftwoods that block water courses. Community involvement is essential in reducing the risk of flood disasters, thereby this would enable tourism to be safe from flood disasters.

KEYWORDS: *geotourism, caves, flood risk, liang bukal*

VEGETATION DENSITY INDEX ANALYSIS IN BATUR UNESCO GLOBAL GEOPARK WITH MSARVI METHOD BASED ON MACHINE LEARNING GOOGLE EARTH ENGINE

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SUB-THEME: *DISASTER RISK REDUCTION IN GEOTOURISM*

ABSTRACT

The development of the Batur UNESCO Global Geopark (Batur UGGp) after being designated as a member of the Global Geopark Network in 2012 brought significant changes, which in the future could affect the density of vegetation in the area. There is no research regarding the density of vegetation in the Batur UGGp, so research on the vegetation density index using the MSARVI method based on the Google Earth Engine machine learning needs to be carried out to better understand the distribution and current conditions of the vegetation in the Batur UGGp. This research utilizes Sentinel-2 MSI: Multi Spectral Instrument, Level-2A Image data using the MSARVI (Modified Soil-Adjusted Vegetation Index) algorithm obtained and analyzed on the Google Earth Engine Platform. The results of the vegetation density analysis show that the Batur UGGp which has high vegetation density has an area of 146.28 km2 or 25%, the area which has medium vegetation density has an area of 150.08 km2 or 26% and the area which has low vegetation density has an area of amounting to 290.12 km2 or 49%. The vegetation density value for the Batur UGGp in 2023 is the lowest value -22.023 and the highest value is 1.154.

KEYWORDS: *Indeks Vegetasi, MSARVI, Google Earth Engine, Geopark Batur.*

VOLCANO-TECTONIC RESEARCH ON THE SUMATRAN FAULT LINE: A MITIGATION-BASED GEOTOURISM APPROACH

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Sub Theme: *Disaster Risk Reduction in Geotourism*

ABSTRACT

This research aims to gain a deeper understanding of volcanic-tectonic activity on the Sumatran Fault Line and apply a geotourism approach in disaster risk mitigation efforts in geopark location. The Sumatran Fault Line developed on a subduction zone that is full of potential for earthquakes, volcanic eruptions and other tectonic activity. By utilizing geotourism methods, this research integrates scientific and tourism aspects to increase local communities' understanding of the dangers and mitigation of natural disasters. This research involved comprehensive field surveys to map geological structures, traces of volcanic activity, and tectonic patterns along the Sumatran Fault Line. Data collected from field surveys will be thoroughly analyzed to identify patterns of geological behavior that may trigger natural disasters in the future. The geotourism approach is to integrate scientific findings into education and training programs for local communities. This involves providing easy-to-understand information about disaster risks and mitigation strategies that can be implemented by local communities. It is hoped that the results of this research can make a significant contribution to the development of early warning and emergency response plans in the areas that are vulnerable to volcanic-tectonic hazards. Apart from that, the application of the geotourism method is also expected to increase public awareness about the importance of disaster risk mitigation. This research not only provides an in-depth understanding of geological processes on the Sumatran Fault Line but also provides a new perspective on disaster mitigation approaches that involve the active participation of local communities. In conclusion, combining geological science and a geotourism approach can be a strong basis for reducing the impact of natural disasters in the areas that are vulnerable to volcanic-tectonic hazards.

Keywords: Geopark, Mitigation, geological education, Geotourism

FOREST FIRE VULNERABILITY MODELING ON GEOTOURISM SITES IN INDONESIA USING MACHINE LEARNING MAXIMUM ENTROPY (MAXENT) AS A GIS-BASED DISASTER RISK EDUCATION STRATEGY

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SUB-THEME: *DISASTER RISK REDUCTION IN GEOTOURISM*

ABSTRACT

Forest fire poses a significant threat to Indonesia's geotourism sites, endangering ecosystems, landscapes, and human lives. To address this challenge and enhance disaster risk education strategies, advanced modeling techniques are essential. One promising approach is Machine Learning Maximum Entropy (MaxEnt), which combines spatial analysis using open-source geographic information system (GIS) data to predict forest fire vulnerability effectively. This paper aims to develop a comprehensive vulnerability modeling framework tailored for Indonesian geotourism sites using MaxEnt-based machine learning techniques. The process begins with gathering and preprocessing relevant data, including temperature, rainfall, vegetation cover, land use, proximity to roads, and human activity. The prepared data is then fed into the MaxEnt model for analysis. MaxEnt utilizes a probabilistic approach to predict the probability of forest fires based on input variables, learning patterns and associations from historical fire data and environmental conditions. The model output provides insights into the spatial distribution of forest fire vulnerability, allowing stakeholders to identify high-risk areas and prioritize mitigation efforts using GIS tools. The author validates the benefits derived from this modeling approach through a comprehensive validation process. This involves conducting questionnaire interviews with young hikers and personalized interviews with senior hikers to gather insights into their perception of the model's effectiveness. Additionally, a Pestle analysis will be conducted to assess the model's alignment with environmental, social, and economic factors. The anticipated outcome of these validation efforts is to demonstrate the significant utility of the modeling approach and its vast potential for replication, dissemination to local communities, and further development. By incorporating MaxEnt-based vulnerability modeling into disaster risk education strategies, Indonesia can enhance preparedness and resilience to forest fires in geotourism areas. Targeted awareness campaigns and community engagement initiatives empower stakeholders to take proactive measures to prevent and mitigate fire risks.

KEYWORDS: *forest fires, geotourism sites, machine learning maximum entropy (MaxEnt), vulnerability modeling, disaster risk mitigation*

SUB-THEME: WALLACEAN AVIFAUNA IN VOLCANIC LANDSCAPE

AVIFAUNA SPECIES DIVERSITY OF TERNATE IN SUPPORTING GEOTOURISM DEVELOPMENT IN GEOPARK ASPIRING TERNATE

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SUB-THEME: *WALLACEAN AVIFAUNA IN VOLCANIC LANDSCAPE*

ABSTRACT

Ternate Island is located in North Maluku Province and is part of the Wallacea archipelago which has rich of biodiversity. Wallacea archipelago includes Nusa Tenggara, Sulawesi, Maluku and North Maluku. It has emblematic characteristic that influenced by Melanesia and Australia, such as parrot like White Cockatoo *Cacatua alba* which found in Ternate. Ternate has huge potential, including cultural history, geology related to the Gamalama volcano eruption, and high biodiversity. A geopark in Ternate requires a balance of four concepts: geology, biodiversity, culture, and conservation. Avifauna has the potential to contribute to biodiversity. With a circumference of 99 km^2, this island is home to 140 bird species. To date, no further research on geopark site in Ternate Island's bird species diversity has been conducted. The purpose of this research is to determine the potential diversity of bird species so that the data can be used to support the Aspiring Ternate Geopark's geotourism development. Primary and secondary data collection methods were used. Primary data was collected using the Mackinnon List method at ten observation points around geopark site from May to December 2023. Primary data collection included gathering information on species encounters discovered outside of the observation period. This is done to enhance the diversity of bird species. Secondary data were gathered using the literature study method. The study found 56 bird species from 33 families and eight of which were endemic to North Maluku. The data is 40% of bird species in Ternate or 16% of of birds species in North Maluku in total. The measurement of biodiversity index H' is 2,88 means that the area has middle rate. Furthermore, avifauna has the potential to become a bird watching tourist attraction, supporting geotourism development. This is because the research facility is also located in the Ternate geopark development area.

KEYWORDS: *avifauna, ternate, geo-tourism, birds, north-maluku, Wallacea*

MIGRANT RAPTOR BIRD POPULATION IN RINJANI-LOMBOK UNESCO GLOBAL GEOPARK AREA

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SUB-THEME: *WALLACEAN AVIFAUNA IN VOLCANIC LANDSCAPE*

ABSTRACT

Based on the population data of migrant raptor birds in the Rinjani-Lombok UGGp area over nine years (2015-2023), we can observe a highly complex population dynamics. The species under study are the Crested Honey-buzzard (Pernis ptilorhynchus), Chinese Sparrowhawk (Accipiter soloensis), and Japanese Sparrowhawk (Accipiter gularis). During the observation period, several significant variations in population numbers were found, indicating remarkable changes from year to year. There were drastic declines observed from 2015 with the lowest population in 2018, but there were also significant increases in the following years, with the highest population recorded in 2023.The Chinese Sparrowhawk is the most abundant species with consistently high recorded individual numbers throughout the observation period. This phenomenon underscores the importance of this species to the ecosystem as raptor birds are also known as the top of the food chain. However, differences in migration patterns are also evident from the data, with each species showing tendencies to arrive at different times and with varying numbers. This raises interesting questions about the factors that may influence their migration behavior. To understand the long-term trends in the migrant raptor bird population in the Rinjani-Lombok UGGp area, a deeper analysis is required. Environmental factors such as habitat changes, climate conditions, and human activities can play a significant role in the population dynamics. Therefore, further studies involving continuous monitoring will be key to developing effective and sustainable conservation strategies. Through a better understanding of the behavior and needs of these species, we can design appropriate protection measures to maintain the sustainability of the migrant raptor bird population in the Rinjani-Lombok UGGp area. Thus, this research not only provides insights into biodiversity but also represents a significant step towards sustainable nature conservation.

Keywords: *Biodiversity, conservation, raptor birds*

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