The geodiversity potential of *Tanah Datar* District developing into a geotourism asset as a geopark in Indonesia

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**Abstract.** This study aims to determine the geodiversity potential of Tanah Datar District, developing into a geotourism asset as a Geopark in Indonesia. This type of research is qualitative descriptive research. The research data acquisition technique was carried out by observation, literature study, interview, FGD (Focus Group Discussion), the method used to determine the delineation of the geoheritage area using the Geographic Information System (GIS) using GIS Arc Software 10.5. The results of geodiversity potential research in Tanah Datar District consist of 3 geosites; 1) Mount Marapi, Mount Singgalang-Tandikek, Straightness of Five Fault Lake (5) Fault Lake and Active Sectional Tectonic Lake 2) Waterfall from hot spring 3) Straightness of Andesite Intrusion. The Geo Area Tabek Patah Salimpuang Normal Fault includes geosite; 1) Straightness of Fault and Fault Talent 2) Lineage of Telaga Line Saga Telaga Air Pakis and Telaga Air Taranang. Geo Lintau Buo Karst Area with Geosite 1) Eoksokarst 2) Sinkhole 3) Underground River 4) Goa / Ngalau with Stalactite-Stalagmite 5) Dolina. The potential of this geodiversity is Geotourism Assets and the potential for the development of Indonesian Geopark.

**1. Introduction**

Geodiversity or geological diversity is a description of the existence and spread of various geological components found in an area, whose conditions can represent the process of diving geological evolution a available time space [1]. The Sumatera fault zone consists of a number of major depression which extends from the northeast of the gorge. This geological diversity will be a geotourism asset.

Geotourism is sustainable tourism with the main focus is the evolution of the earth and geological features that encourage understanding of environment and culture, appreciation and conservation and benefit local communities, geotourism also involves geological and geomorphic features that contribute to the formation of a sense of place for each geosite. Specifically these features include various types of landscapes, landscape, rock outcrops, rock types, sediments, soil as well as rock crystals [2]. For geotourism development has several indicator of feasibility and redness (site evaluation) for geotourism that is 1) physical geological of geology site and naturally formed geographic features that are the focus of geotourism planning and development. That Have access that can be taken by vehicles to geotourism (accessibility) 2) Economic sustainability, encouraging economic feasibility of the community and management of the area with sustainable principles, and conservation can develop the capacity of tourism with sustainable principles in the geotourism area without damage the environment, there is not
destroying authenticity and the beauty of the area and is responsible for the use of the geotourism area. 3) Educative, informative in the presence of interesting and educative interpretive media, which can increase the awareness of tourists about educational environmental conservation 4) Community participation is the involvement of local communities in the management of the area. 5) Tourist satisfaction is a special impression that tourists get when visiting the geotourism area. If all indicators can be met, then a new area is feasible to be used or developed geotourism activities [5,6].

The types of geotourism activities and attractions include; 1) Sightseeing geo-sites recreation or sightseeing by enjoying the landscape from the unique geography formation 2) Geo-Sport sports related to the earth's topography 3) Geo-Study activities in the outdoors, including geological heritage observation, geo-landscape photography, field trips for geological interests 4) Geo-conservation and Geo-education, conservation programs on earth potential for the sake of education or preservation 5) Geo-festival events created for the continuation of geological resources or promotional platforms for conservation programs 6) Geo-Tours facilities are independent interpretations (Geotourism Map) or tour guide facilities 7) Health and Wellness Geotourism in the form of health or relaxation facilities such as spa therapy, stone therapy, and mud therapy 8) Geo-Trek travels to explore the potential of the earth by observing and understanding the process of forming the earth.

Geopark is built in Bottom-Up which is an implementation of appreciation of natural, non-biological and cultural natural resources which are the essential wealth of the Regional Government that aims to respect the earth with all its contents in full, as a tool to develop regions sustainably based on the pillars of conservation, education and growth local economic value, Geopark is built and developed to glorify the earth's heritage and prosper society [3]. Geopark uses geological heritage that is associated with aspects of natural heritage and cultural heritage for educational purposes, increasing awareness and understanding of problems faced by the community such as how to recognize and make use of earth resources (geo, bio and culture) in a sustainable manner, reduce the impact of geological disasters and how to improve people's welfare by safeguarding the earth's heritage. In carrying out the Geopark concept, a supporting activity for sustainable economic activities is needed in the form of Geotourism activities [7,8]. Geotourism is one of the important activities for take place of a Geopark because geotourism is created and developed based on the principle of sustainable development because the object and attractiveness can be derived or inherited for the future generations.

2. Research Methods
This research method uses qualitative descriptive data analysis method. This research was conducted in three stages; first, the data collection and inventory stage by collecting secondary data then formed a field working group and provided assistance in the inventory of data followed by work inline using social media, interviewing respondents is the community at the geodiversity potential location. Second stage of field observation on the geological site (geosite). The third stage of data analysis and assessment is descriptive by conducting FGD involving agencies related to geological sites to develop the geodiversity potential of Tanah Datar District, the community, stakeholders. Then do regional delineation mapping using ArcGis 10.5 software.

3. Results and Discussion
Geology Map Sheet Padang, Sumatra [10], maps the Great Sumatera Fault (Great Sumatra Fault) in Tanah Datar District in the southwest foot of Marapi mount with coordinates 100025'00" LS and 0024'30" LS around Nagari or Koto Baru Village, then the fault appears again in Nagari / Paninjau Village with coordinates of 10026'30"BT and 0027'15"LS continues to merge with the river valley of the Sumpur River, continuously passing the east wall of Lake Singkarak (second picture). Chronologically the fault is categorized as active. Not all of these fault faults can be identified. To the south of the New Koto Nagari to Nagari / Aia Angek Village, some activity from secondary deposits from Mount Marapi is thought to have buried traces of the natural fault phenomenon. The fault that crossed at the foot of Marapi westward passed through the Nagari / Batipuh Village, Mount Rajo, Pitalah and entered Lake Singkarak.
Based on the results of field observations found the Geodiversity Potential of Tanah Datar Regency including: 1) Fault Lake, there are five (5) Lake Faults which are in a straight line towards Northwest - Southeast in the direction of the Sumatera Fault [2]. The Lake Fault / Sagpond referred to are Talago Batupalano / KotoBaru, Talago Kayu Tanduak, Talago Aia Angek and Talago Paninjau. 2) Sumatrae fault faults, 3) Identified River Flow and hill ridge curvature formed from Quaternary-aged Volcanic sedimentary rock units, the earth's surface age was hit by a thick layer of ice so called the ice age (Diluvium era) [4]. Can be seen in first picture below;

Figure 1. Satellite image of the Maninjau Lake area, Mount Marapi, Mount Tandikek, Mount Singgalang and Singkarak Lake, (Source: SRTM Image)

Figure 2. Map of five lake faults in the Sianok segment
Solok Sumatera [11] Geological Map Sumatra [11] shows Salimpaung and Sungayang Subdistricts passed normal / down faults with the azimuth N320E north side lifted (Horst) composed by Filit and Flake Member rocks from the Ku-Perm (Carbon) Formation of Perm-Carbon consisting of shale, filit, slate, quartzite, silt stone, flint and lava flow. The south side has decreased (Graben) compiled by Quaternary Andesite rock products of the Quaternary Mountain consisting of breccias, lumps of lava, lapilli, tuff and sediment lava along a fault line formed a depression (Depression) extending in the direction of a fault line which partially filled with water and became lake or Telaga and called Telaga Sesar. In Tabek Patah Salimpaung area, Fault Lake is formed, namely Lake Air Pakis and Telaga Air Taganang. This fracture process produces landscapes with hills overgrown with evergreen plants to be a panoramic tourist attraction Tabek Patah with steep slopes of Gawir Sesar while the Lowlands part is used as agricultural land and settlements. For the geology of Tanah Datar Regency can be seen there is the third picture following;

![Image](image_url)

**Figure 3.** Geological map, Tanah Datar Districts

Morphology of the Karst Region in Lintau Buo Subdistrict was identified by Remote Sensing analysis on satellite imagery, aerial photographs and topographic maps of towering small hills (Menara Karst) with tight and circular contour karst features. This area is composed by limestone rocks of the Kuantan Formation (PKkl) consisting of limestone, filite, shale, and quartzite. This karst area consists of the morphology of EksoKarst, Sinkhole, Underground River, Goa / Ngala with Stalactites, Dolina. In this karst area there are two Ngala / Goa which have Archaeological sites. In Ngala Jambu found fossils of human teeth estimated to be 60-70 thousand BC, Ngala Kapalo Lakuak or Ngala Bundo Kanduang contained ancient carvings patterned with Tumpal, Rhombus, Arrows, and Anthropomorphic / human motifs with an older age than megalithic civilization or the great stone age is thousands of years after the age of human life in caves and niches [12].

Geotourism assets consisting of the Tanah Datar geo-bio-cilutediversity district are currently supported by amenities, accommodation, adequate accessibility while the activities and attractions related to Geotourism are still very limited. Cultureheritage flat land is Istano Basa better known as Istana Pagaruyung and Kampung Minang Nagari Sumpur which show the nuances of the old Minangkabau life with the Rumah Gadang building which is also used as a home stay in addition to various historical heritage menhirs which are generally spread in Sungayang District. The next geodiversity aspect is bioheritage namely Andaleh tree and Bilis fish or Bilih fish is an endemic fish found only in Singkarak lake.

The whole potential that has been inventoried and assessed through FGDs into several geoheritage, bioheritage and cultureheritage potentials in geospatial maps is mapped using ArcGis 10.5 software which produces a geoheritage delineation map of Tanah Datar District. Can be seen in fourth picture the following;
Based on the Regional Delineation map in Figure 4, Tanah Datar District Geodiversity is divided into three Geoareas, namely Geoarea Paninjau Volcano Tectonic, Normal / Lower Fault Salimpaung Tabek Patah, Lintau Buo Karts area. This marriage delegation will be a Geoarea proposal for the development of the Tanah Datar District Geopark.

4. Conclusion
   a. Geodiversity Potential Tanah Datar District as a whole consists of three geo areas; Paninjau Geoarea Vulcano Tecktonic, Geoarea Tabek Patahan Normal Patah Salimpaung, Geoarea Karst Lintau Buo. Geological sites are supported by potential culturediversity potential biodiversity.
   b. From the results of assessments through the Tanah Datar District Geodiversity Potential FGD supported by biodiversity and specific culturediversity Minangkabau culture is a geotourism asset with facilities, accommodations and accessibility is quite good, while aspects of activities and activities are still very less.
   c. Geodiversity potential supported by biodiversity and culturediversity in Tanah Datar Regency, including one of the earth's heritage sites that has the potential to be submitted as a Geopark Candidate in Indonesia.

Acknowledgments
Thank you to the Geologists, Ir. Ade Edward, Progress of Geospatial Data and GIS Yusra Agusti S. T and Data Inventory Team Geopark Tanah Datar, Chair of the Indonesian Geopark Network Dr. Yun Yunus, and all parties involved in this research.
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