

POTENTIAL OF LIMESTONE AND QUARTZ SAND IN ROSWAR ANDRUMBERPON DISTRICTS, TELUK WONDAMA REGENCY, WEST PAPUA PROVINCE

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ABSTRACT

Indonesia complex tectonic order to bring the positive impact of abundant natural resources. However, the distribution of potential natural resources with economic value is not evenly distributed. Teluk Wondama Regency has potential of minerals/mining, including limestone and quartz sand. The mining sector is one of the secondary sectors in Teluk Wondama Regency which contributes to Teluk Wondama gross regional domestic product per capita (GDP). Mining, processing, and industry activity relies on mineral exploration. So it is necessary to identify the potential and feasibility in the mining sector through a qualitative approach and descriptive-analytic. The Roswar and Rumberpon districts have the potential for natural resources in the form of limestone quarries and quartz sand as well as geothermal manifestations in the form of hot springs. However, technically (quantity and quality) and environmentally, the commodities of limestone and quartz sand are not exploitation profitable. Meanwhile, the hot springs are directed as a tourist destination.

Keywords: Natural Resources; Mineral Resources; Geothermal Manifestation; Teluk Wondama

INTRODUCTION

Indonesia is formed from three large tectonic plates, namely the Indo-Australian plate, the Eurasian plate and the Pacific plate. The Indo-Australian plate meets the Eurasian plate in western Indonesia, while in eastern Indonesia three tectonic plates collide with each other. The eastern part of the Sunda Arc Trench, which is part of the large Eurasian plate, is being pushed due to Australia moving north, while the Pacific plate is pushing west. This is what makes the tectonic order of eastern Indonesia more complicated than that in western Indonesia (Naryanto, 2019).

Eastern Indonesia is a geologically complex area. Until now, the research carried out in Eastern Indonesia and its surroundings is still not comprehensive, so further research and research continues to be carried out. Exploration carried out in Eastern Indonesia is increasingly intensive in line with the growing need for geological knowledge in this area. The

increase in information about new areas that have prospects also increases geological knowledge in this area of Eastern Indonesia. Research that continues to be carried out in Eastern Indonesia, especially in the Bird's Head area, provides various hypotheses regarding the structure and tectonics that developed in the area. The hypothesis is that Bird's Head is experiencing rotation or is a micro continent that is still expanding. This gives an idea that there was an active structure at 5 mya and explains that the phenomenon of the movement of the Pacific Plate towards the Northwest Australian Plate is still active today, considering the relatively young structure that influences the rotation of the Bird's Head. Papua's Bird's Head, is the only basin in Eastern Indonesia that has been fully explored and produced (Ningrum et al, 2023).

Therefore, Indonesia has an abundant diversity of natural resources. However, the economic distribution of natural resources is uneven. Mineral resources are a concentration or occurrence of material that has economic value in or above the

earth's crust, with a certain form, quality and quantity that has a reasonable prospect of ultimately being able to be extracted economically (SNI 4726:2011 Guidelines for Reporting, Resources, and Mineral Reserves). Mining, processing and industrial activities rely on mineral exploration. Mineral exploration has different characteristics compared to other resource sectors, one of which is that mineral resources are mostly located in hidden locations.

Teluk Wondama Regency is a New Autonomous Region resulting from the expansion of Manokwari Regency in 2002, which was inaugurated and obtained autonomous status on April 12 2003. Development needs to be carried out in a balanced manner so that inequality does not arise, one of which is in the development of the region's superior potential in the natural resources sector. Teluk Wondama Regency has several economic sectors that can be relied upon to play a positive role in increasing regional economic growth.

Based on the results of the inventory and evaluation carried out in Teluk Wondama Regency, Potential Mineral Resources available in this District it is classified as a Non-Metal Mineral namely limestone, sandstone and shale (Haluk,2019). Teluk Wondama Regency is part of West Papua Province which is located in the bird's head area of Papua Island. Part of this Regency area is on the mainland of Papua Island, and the islands and the other part are water areas (Cenderawasih Bay National Park). Geographically, the Wondama Bay district is located between 132°35'- 134°45' East Longitude and 0°15'-3°25' South Latitude.

Teluk Wondama Regency has a land area of approximately ± 4,996 Km2 and its capital is Rasei in South Wasior District. Teluk Wondama Regency consists of 7 districts/sub-districts, namely: Wasior District, North Wasior District, South Wasior District, West Wasior District, Windesi District, Wamesa District, and Rumberpon District. The location of the investigation is located in the Roswar District and Rumberpon District and surrounding areas where this area is included in the administrative area of Teluk Wondama Regency, West Papua Province. To the west it is bordered by Teluk Bintuni Regency, to the north by Manokwari Regency, to the east by Nabire Regency and to the south by Kaimana Regency.

West Papua Bird's Head, namely the northern part of the peninsula which is connected to the main body by a narrow neck. The Bird's Head area experienced compression to the south from the Oligocene to the Recent. Geologically, the research location is part of the Tertiary basins, namely the Bintuni, Berau and Salawati basins. The main structural elements are the Sorong Fault, the Kemum-Plateau Ayamaru Block in the north, the Ransiki Fault, the Lengguru Fold-Flip Line and the Bintuni and Salawati Basins in the east and the Tarera-Aiduna Fault, the Misool- Onin Kumawa Anticline and the Berau Basin in the south and west power (Figure 1).

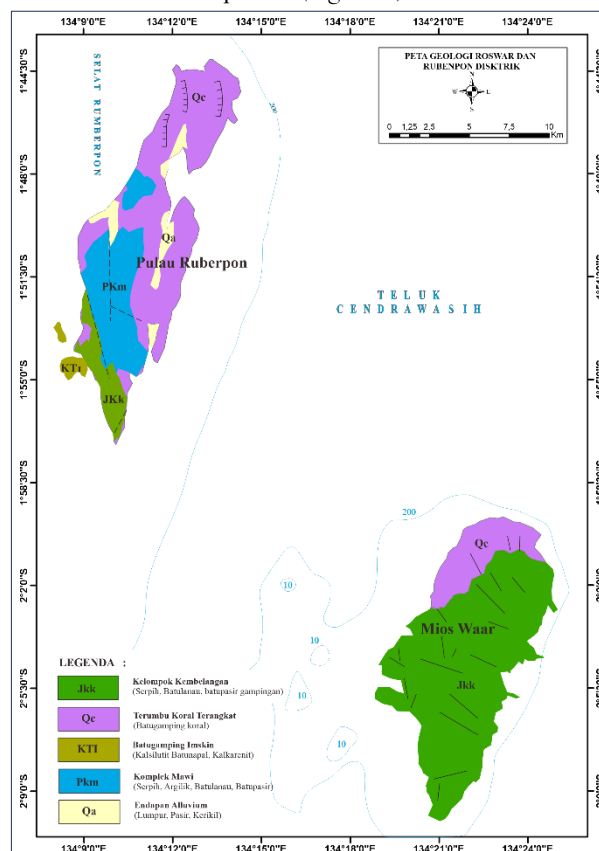


Figure 1. Geological map of Teluk Wondama Regency

Potential natural resources found in Roswar and Rumberpon districts, Teluk Wondama regency are quartz sand and limestone. Quartz sand is a mineral that consists of silica (SiO₂) crystals. Quartz sand has a combined composition of SiO₂, Fe₂O₃, Al₂O₃, CaO, MgO and K₂O, clear white or other colors depending on the impurity compound. Based on research from the Center for Mineral and Coal Resources, the potential for quartz sand in Indonesia is around 4.48 billion tonnes and from data from the Industrial Research and Development Agency, there are several areas that have quite large potential for quartz sand (Rijaludin et al, 2021).

Limestone is a sedimentary rock that is mostly composed of calcium carbonate, (CaCO₃) which comes from the remains of marine organisms such as shellfish, sea snails and dead coral. Limestone is formed organically, mechanically and chemically. One of the areas that has potential for limestone is the Warmare area, Manokwari Regency, West Papua Province. This limestone is included in the Maruni limestone formation which consists of limestone lithology, algae-foraminifera biomicrite with a little fine-grained biocalcarenite which is of Early Miocene – Middle Miocene age (Tabuniet al, 2021)

METHOD

The research methods used in relation to the potential of limestone and quartz sand in the Roswar and Rumberpon Districts include the following:

1. Literature review
2. Data Collection, The data collection carried out was divided into secondary data collection and primary data collection. Primary data collection such as observing outcrops, mapping the location of potential natural resources, evaluation and temporary analysis in the field
3. Data processing
4. Data Outout

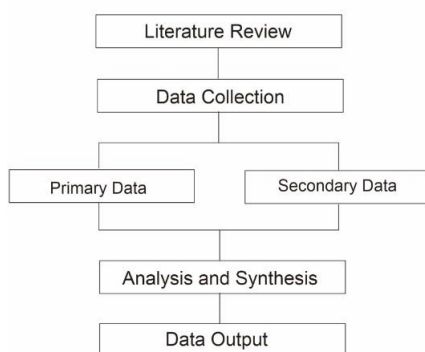


Figure 2. Research flow chart

RESULT AND DISCUSSION

In the research area in the Roswar and Rumberpon Districts, field geological surveys were carried out including geomorphological, stratigraphic and geological structure surveys. From the results of geological mapping, it was found that the Roswar and Rumberpon districts have natural resource potential. The natural resources found in the Roswar and Rumberpon Districts include mineral resources in the form of limestone and quartz sand as well as hot springs as a manifestation of geothermal heat.

DISCUSSION

The Roswar District area is an island formed from structural and denudational origins, divided into two geomorphological units, namely homoclinal hill units and coastal plains. The topography of the Roswar district (figure 3) clearly shows the morphology of the area. The appearance of the morphological division of the research area shown in figure 4.

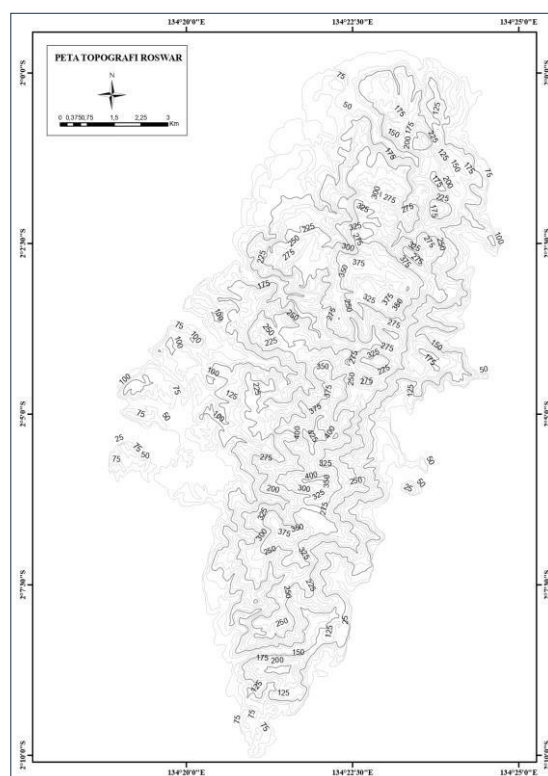


Figure 3. Topographic map of Roswar District

Homocline hill unit is located in the north and south of Roswar District. It has an area of around 90% of the total area of Roswar District. Apart from that, it has a slope of 8-50. This unit is composed of sedimentary rocks (siltstone and clay). Coastal plain unit is located along the coastline of Roswar District. It has an area of around 10% of the total area of Roswar District. Apart from that, it has a slope of 0-5°. This unit is composed of fluvial sediment lithology and loose sand deposits.



Figure 4. Appearance of the homocline hill morphology unit and the coastal plain morphology unit in Roswar District

Based on regional stratigraphy, the Rumberpon District area is divided into two rock formations, namely Qc (raised coral reef) and JKk (kembelangan group). Raised coral reefs are composed of algae coral limestone, biocalcarenite, biocalcirudite. The calcareous group includes shale, siltstone, calcareous and non-calcareous sandstone: a little biocalcarenite, conglomerate. Based on geological observations carried out in the Roswar District, it was found that the type of rock that makes up it is sedimentary rock. Found outcrops of sedimentary rock, siltstone, reddish brown, clay - silt (<math><1/256\text{ mm} - 1/16\text{ mm}</math>), glauconite, slightly altered and metamorphized. Spread to the south of Roswar District (Figure 5).



Figure 5. Lithological appearance of metal clay

Based on the results of a survey conducted in the Roswar District, Teluk Wondama Regency, no potential for economical minerals to be explored was found, but anomalous geothermal manifestations were found, namely hot springs (Figure 6). This phenomenon indicates the existence of heat source activity in the research area. Utilization of hot water resources is better directed at natural tourist destinations. The Rumberpon District area is an island formed from structural origins and is an area experiencing karstification, in contrast to the Roswar District which is composed of sedimentary rock lithology. The limestone hill units are located in the north and south of Rumberpon District (Figure 7). Has the total area of the Rumberpon District area. Apart from that, it has a slope of 8-50° (Figure 8). This unit is composed of limestone lithology with a kessarstification process that continues to develop.



Figure 6. Appearance of hot springs



Figure 7. Appearance of the morphological unit of limestone hills

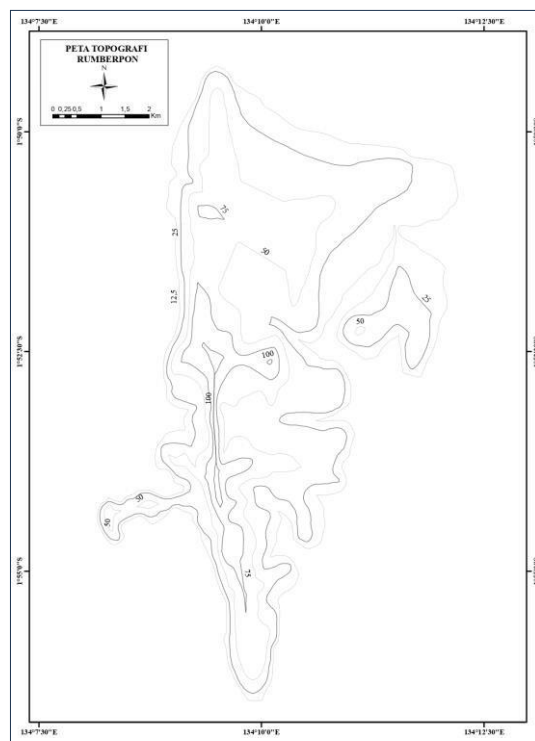


Figure 8. Topographic Map of Rumberpon

Based on regional stratigraphy, the Rumberpon District area is divided into five rock formations, namely Qc (raised coral reef), PKm (mawi complex), Qa (alluvium deposits), JKk (kembelangan group), and KTi (imskin limestone). Raised coral reefs are composed of algae coral

limestone, biocalcarenite, biocalcirudite. The Mawi complex is composed of shale, argillite, siltstone, sandstone, very low grade rock. Alluvium and littoral deposits include mud, gravel sand, peat, and plant material. The calcareous group includes shale, siltstone, calcareous and non-calcareous sandstone: a little biocalcarenite, conglomerate. Meanwhile, Imskin limestone consists of calcilutite, marlstone: a little calcarenite.

Based on geological observations carried out in the Rumberpon District, it was found that the rock type is dominated by limestone lithology. Figure 9 shows a non-clastic limestone outcrop, in the middle part non-clastic limestone is found. Fresh color white, weathered color gray to brown, found shell fragments, monomineralic calcite, amof with coral composition; gastropods; algae; and cephalopods. At the bottom it is composed of reef limestone (boundstone).



Figure 9. Appearance of non-clastic limestone Based on the results of a survey conducted in the Rumberpon District, Teluk Wondama Regency, several minerals have been found, namely limestone and quartz sand. Limestone minerals in the Rumberpon District area were found scattered in several locations. Figure 10 shows an outcrop of reef limestone (boundstone).



Figure 10. Appearance of reef limestone Limestone mining resources in the Rumberpon District are advised not to be exploited because they are related to the

availability of clean water in the area. As limestone develops, it will undergo a karstification process which will form a subsurface water system which becomes a source of parentheal springs. Beach sand in Rumberpon District is quartz sand mixed with weathered limestone (Figure 11). The quality of this quartz sand is lower compared to quartz sand in the Wasior District. The potential for quartz sand minerals has no economic value, because in terms of quantity it is very limited. Apart from that, in terms of quality, there are a lot of impurities.



Figure 11. Appearance of quartz sand

CONCLUSION

The results of identifying natural resources in the Roswar and Rumberpon Districts show that the types and potential of natural resources found in each district vary. The exposed rocks generally come from sedimentary rock deposits of tertiary and quaternary age. The mineral resources found are non-metallic minerals, namely limestone and quartz sand. However, it is recommended that no mining activities be carried out because it is related to the conservation of water sources and the economic feasibility of excavated materials. Resources in the form of geothermal manifestations identified are hot springs. It is recommended that geothermal manifestations be managed as tourist destinations.

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