

ABSTRACT

Indonesia faces significant challenges in providing equitable telecommunication access, especially in the underdeveloped, frontier, and outermost (3T) regions, such as Pegunungan Bintang District in Papua. This study designs a telecommunication network utilizing 5G New Radio (NR) with a frequency of 2.3 GHz, a 100 MHz bandwidth, and an Urban Macro (UMa) propagation model. The design is complemented by two main analyses: coverage planning and capacity planning, tailored to the region's geographical conditions.

This study was conducted using the ATOLL application, with significant optimization results achieved through location selection, antenna gain enhancement, and site placement adjustments. In the coverage planning with 220 sites, the area covered reached 100%, with an RSRP of -90.23 dBm, SS-SINR of 24.88 dB, and throughput of 232.07 Mbps. In contrast, in the capacity planning with 14 sites, the coverage area reached only 54.4%, with an RSRP of -118.26 dBm, SS-SINR of 18.88 dB, and throughput of 117.08 Mbps.

This optimization demonstrates a significant improvement in network performance, particularly in coverage planning, while also identifying challenges in capacity planning. This study serves as a foundation for developing more effective telecommunication infrastructure to support connectivity in other 3T regions.

Keywords: 5G New Radio, Urban Macro, 3T, Pegunungan Bintang, ATOLL