

TRAFFIC TRIP GENERATION IMPACT ANALYSIS OF DUMAI CITY FOOTBALL STADIUM CONSTRUCTION USING GREENSHIELD AND GREENBERG MODELS

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ABSTRACT

This study aims to analyze the traffic trip generation impact resulting from the proposed construction of the Dumai City Football Stadium on the performance of Arifin Ahmad Road (Dumai–Pelintung) and Bangun Sari Road. The methodology encompasses road capacity analysis following the Indonesian Highway Capacity Manual (PKJI 2023), macroscopic traffic flow modeling using Greenshields and Greenberg methods, PTV VISSIM microsimulation, and parking space sufficiency assessment. Primary data were collected through traffic volume, spot speed, and side friction surveys. The results show that in existing conditions, Arifin Ahmad Road ($C = 2,369$ pcu/hr, $Q = 778\text{--}985$ pcu/hr, $DS = 0.33\text{--}0.42$) and Bangun Sari Road ($C = 2,179$ pcu/hr, $Q = 545\text{--}555$ pcu/hr, $DS = 0.25$) operate stably at Level of Service (LOS) B. Stadium operations generate an additional traffic volume of 6 pcu/hr on normal days and peak at 98 pcu/hr on match days. Greenshields modeling yields the equation $S = 36.03 - 0.37D$ with a jam density (D_j) of 98.10 pcu/km for Arifin Ahmad Road, and $S = 36.69 - 0.75D$ with D_j of 48.64 pcu/km for Bangun Sari Road. Statistical fit confirms that the Greenshields model provides higher accuracy in modeling the traffic characteristics of the study area compared to the Greenberg model. In a 10-year projection with development and without mitigation, Bangun Sari Road experiences a performance decline from LOS B to LOS C ($DS = 0.45$). Under a mitigation scenario expanding Bangun Sari Road's capacity to 2,474 pcu/hr, the degree of saturation decreases to 0.40, successfully maintaining LOS B, while Arifin Ahmad Road achieves $DS = 0.62$ (LOS C). Furthermore, the internal parking facility capacity of 942 motorcycle units, 205 passenger car units, and 6 bus units is sufficient to accommodate visitor parking demand, thereby preventing side friction caused by on-street parking.

Keywords: Traffic Generation, Dumai City Football Stadium, PKJI 2023, Greenshields, Greenberg, PTV VISSIM, Level of Service.