CHAPTER VI
CONCLUSION AND RECOMMENDATION

This chapter consists of conclusion of the research and recommendations for the next research.

6.1   Conclusion

This research has applied Vehicle Routing Problem (VRP) with time windows and multi-trip to determine the route for waste transportation in Nabuang Sarok Program of PT Semen Padang. Exact approach with LINGO Software is used to solve the formulation with clustering the are into three are. The propose route in Lubuk Kilangan Sub-district for 22 collecting points resulted in 12 trips with total cost of Rp76.799,00 and save 37% from current system. For Area 1 consists of 4 multi-trips, Area 2 consists of 3 multi-trips, and Area 3 consists of 5 multi-trips. The use of route determination with VRP can save the cost and make the pick-up process more efficient.

Heuristic solutions (Nearest Neighbor and Tabu Search) is used to propose for more number of nodes and result in Rp90.399,00 or 22% than Exact Approach and 20% than current system. The chosen solution is obtained from Tabu Search's result with total of 13 trips. Area 1 consists of 4 multi-trips, Area 2 consists of 4 multi-trips, and Area 3 consists of 5 multi-trips. Between these two approach solutions, for the problem in this research, exact approach with help of LINGO Software can be applied. However, for additional nodes and waste quantity increasing, heuristic solutions are suggested to be applied to give feasible solutions in reasonable time.

Sensitivity analysis are done towards the increase in waste quantity, vehicle capacity, and time windows. For increase in waste quantity, bigger vehicle or split delivery are needed. Result in changes of time windows are not that significant. Area 2 and 3 shows the same cost but different in routes sequence order.

6.2   Recommendation

1.   Improving the model by adding another objective so it can optimize all the aspects that affect the whole decision.
2.   Using more Metaheuristic Solutions to get the result comparison.
3.   Due to the limitation of vehicle capacity, split delivery, heterogeneous vehicle, multi vehicle are recommended for the next research to obtain more effective transportation when waste quantity increases.