

UNIVERSITI TEKNOLOGI MARA

TECHNICAL REPORT

**DIJKSTRA'S ALGORITHM FOR OPTIMAL RECYCLABLE
WASTE COLLECTION SYSTEM IN PORT DICKSON
(P30S22)**

**NUR JAZLINA MOHD ISZAIRI (2021101331)
AINA ZULAIKA MD RAMLI (2021113775)
NURSABRINA SAIFULBAHRI (2021340813)**

**Report submitted in partial fulfillment of the requirement
for the degree of
Bachelor of Science (Hons.) (Mathematics)
College of Computing, Informatics and Media**

FEBRUARY 2023

ACKNOWLEDGEMENT

IN THE NAME OF ALLAH, THE MOST GRACIOUS, THE MOST MERCIFUL

Firstly, we are grateful to Allah S.W.T for giving us the opportunity and strength to be able to complete our final year project which focuses on the Dijkstra's Algorithm for optimal recyclable waste collection system in Port Dickson. Despite all the hardships, we are thankful to be able to reach this far and able to fulfill the requirement for the subject of MSP660. Without His grace and blessings, we will not be able to finish this final year project on time.

We would like to express our sincere gratitude to our supervisor, Dr Zati Binti Zaharudin and our co-supervisor, Puan Najihan Binti Awang @ Ali for their endless advises, guidance, patience, knowledges, and enthusiasm to assist us throughout our journey in finishing this final year project. Not to forget, the lecturer of our MSP660 subject, Dr Rossidah Wan Abdul Aziz, encouraged us throughout the semester by guiding us on how to write a good report. Without their support and help, we would not have been able to come up with a good report writing and this project would not have been possible. We could not have imagined having better supervisors and lecturers who were determined and willing to correct our mistakes and make sure that our final year project is done on the right path.

Lastly, we would like to express our appreciation to our family members who endlessly gave moral support whether physical, mental, or emotional with motivational advises from the very beginning and towards the end. Other than that, we would like to thank our friends for having each other's back along the journey of finishing this final year project.

TABLE OF CONTENTS

ACKNOWLEDGEMENT	ii
LIST OF TABLES.....	iv
LIST OF FIGURES.....	v
ABSTRACT	vi
CHAPTER 1.....	1
INTRODUCTION	1
1.1 Background of study.....	1
1.2 Problem Statements	2
1.3 Objectives	3
1.4 Significant and Benefit of Study	3
1.5 Scope and Limitation of Study	4
1.6 Definition of Terms	4
(i) 1.7 Summary of Introduction	5
CHAPTER 2.....	6
LITERATURE REVIEW	6
(ii) 2.1 Average mean value	6
(iii) 2.2 Dijkstra’s Algorithm	6
(iv) 2.3 Existing studies on Waste Collections Systems by using Dijkstra’s Algorithm	7
(v) 2.4 Existing studies on Dijkstra’s Algorithm applications.....	8
CHAPTER 3.....	12
METHODOLOGY AND IMPLEMENTATION	12
3.1 Methodology Flow Chart	12
(i) Creating route network using Dijkstra’s Algorithms	18
(vi) Assumptions for Recyclable Waste Collection.....	23
(vii) Route Networking Using Excel Solver	24
CHAPTER 4.....	29
RESULTS AND DISCUSSION.....	29
CHAPTER 5.....	34
CONCLUSIONS AND RECOMMENDATIONS	34
REFERENCES	35
APPENDIX	38

LIST OF TABLES

Table 1. Abbreviations and definition	5
Table 2: The summary of past study related to waste collection problem.	8
Table 3: The summary of past studies on Dijkstra’s Algorithm applications.	9
Table 4 List of weighted score for each criterion.....	14
Table 5 Total weighted score for each node.....	15
Table 6: Distance (in meters) from DEPOT to D42 and C13	24
Table 7: Distance (in meters) from C13 to D42	25
Table 8: Distance (in meters) from D42 to DEPOT	26
Table 9: Starting, Collecting and Ending Point.....	26
Table 10 Result of Preliminary Study	29
Table 11 Total Travel Distance (in meters) for Preliminary Study	29
Table 12 The Average Mean Value of Selected Potential Locations.....	30
Table 13 Selected Route Network by Excel Solver from Depot to C13 node.	31
Table 14 Selected Route Network by Excel Solver from C13 to D42	31
Table 15 Selected Route Network by Excel Solver from D42 to Depot.....	32
Table 16 Selected Route Network by Excel Solver	32

ABSTRACT

Irregular waste collection services are among key challenges for establishing waste recycling. Waste collection has been identified globally as a major task consuming a great proportion of the budgetary allocation to waste management authority such as cost allocation for labour, waste collection trucks, or fuel consumption. Having uncollected recyclable waste at the drop-off centers may discourage public engagement in recycling if the allocated containers are constantly full or overflowing, resulting in an odour problem and unclean collection centers. Moreover, waste collection and transportation problems are among the difficult operational problems. A practical recyclable waste collection system would optimize the Waste Management System (WMS), especially in route choice from Depot to each drop-off collection center. An average mean formula is used to determine the recycling collection centers at Port Dickson, Negeri Sembilan. The data are collected from Google Map and are applied in Excel Solver using the Dijkstra's Algorithm. Based on the simulation conducted, the results show the optimal route for the recyclable waste collection with minimum travel distance where the travel distance from Depot to C13 is 2386 meters, from C13 to D42 is 2555 meters and from D42 back to the Depot is 2407 meters. Hence, the total distance for the recyclable waste collection from Depot to each drop-off collection center is 7384 meters.