PROCEEDING

GRADUATE SCHOOL OF UNIVERSITAS SRIWIJAYA
THE 1ST SRIWIJAYA INTERNATIONAL CONFERENCE
ON ENVIRONMENTAL ISSUES
(1ST SRICOENV 2018)

September
26-27, 2018

Horison Ultima Hotel,
Palembang, Indonesia

our partners :

Conference name	**: The 1st Sriwijaya International Conference on Environmental Issues**
Venue	**: Hotel Horison Ultima Palembang, South Sumatera, Indonesia**
Date	**: September 26-27th, 2018**

Group Picture

Chairman : Hermansyah, PhD
Universitas Sriwijaya, Indonesia

Advasory Committe:
Bunyamin Tar'an (University of Saskatchewan, Canada)
Rashid Mehmood (Otawa Hospital Research Institute, Canada)
Tsukasa Inaoka (Departemen of Human Ecology, Saga University, Japan)
Anis Saggaff (Universitas Sriwijaya, Indonesia)
Zainuddin Nawawi (Universitas Sriwijaya, Indonesia)

Steering Committee:
Nurul Huda (Universiti Sultan Zainal Abidin, Kuala Trengganu, Malaysia)
Suryo Purwono (Universitas Gajah Mada, Indonesia)
Prodono (Institut Teknologi Bandung, Indonesia)
Nimmi Zulbainarni (Institut Pertanian Bogor, Indonesia)
Ratna Juwita (Universitas Indonesia, Indonesia)
Fakhili Gulo (Universitas Sriwijaya, Indonesia)
Iskhaq Iskandar (Universitas Sriwijaya, Indonesia)
Aldes Lesbani (Universitas Sriwijaya, Indonesia)
Siti Nurmaini (Universitas Sriwijaya, Indonesia)
Benyamin Lakitan (Universitas Sriwijaya, Indonesia)
Rujito A. Suwingnyo (Universitas Sriwijaya, Indonesia)
M.T. Kamaluddin (Universitas Sriwijaya, Indonesia)

REVIEWER/EDITOR

Mohamad Amin (Universitas Sriwijaya, Indonesia)
Fakhili Gulo (Universitas Sriwijaya, Indonesia)
Iskhaq Iskandar (Universitas Sriwijaya, Indonesia)
Benyamin Lakitan (Universitas Sriwijaya, Indonesia)
M. T. Kamaluddin (Universitas Sriwijaya, Indonesia)
Isni Andriana (Universitas Sriwijaya, Indonesia)
Yuliana (Universitas Sriwijaya, Indonesia)
Henny Fitriani (Universitas Sriwijaya, Indonesia)
Siti Nurmaini (Universitas Sriwijaya, Indonesia)
Aldes Lesbani (Universitas Sriwijaya, Indonesia)
Eddy Ibrahim (Universitas Sriwijaya, Indonesia)
Nurhayati (Universitas Sriwijaya, Indonesia)
Nengyanti (Universitas Sriwijaya, Indonesia)
Rico Januar (Universitas Sriwijaya, Indonesia)
Dessy Adriani (Universitas Sriwijaya, Indonesia)
Indah Widiastuti (Universitas Sriwijaya, Indonesia)
Merynda Indriyani Syafutri (Universitas Sriwijaya, Indonesia)
Sofia Sandi (Universitas Sriwijaya, Indonesia)
Dade Jubaedah (Universitas Sriwijaya, Indonesia)
Herpandi (Universitas Sriwijaya, Indonesia)
Tengku Zia Ulqodry (Universitas Sriwijaya, Indonesia)
Puspitahati (Universitas Sriwijaya, Indonesia)
Afnur Imsya (Universitas Sriwijaya, Indonesia)
Rizky Tirta Adiguna (Universitas Sriwijaya, Indonesia)
Yulisman (Universitas Sriwijaya, Indonesia)
Eli Sahara (Universitas Sriwijaya, Indonesia)
Diah Kusuma Pratiwi (Universitas Sriwijaya, Indonesia)
Laila Hanum (Universitas Sriwijaya, Indonesia)
Rizky Palupi (Universitas Sriwijaya, Indonesia)
Marini Wijayanti (Universitas Sriwijaya, Indonesia)
Rozirwan (Universitas Sriwijaya, Indonesia)
Liliana (Universitas Sriwijaya, Indonesia)
Novrikasari (Universitas Sriwijaya, Indonesia)
M. Bakri (Universitas Sriwijaya, Indonesia)
Fitri Maya Puspita (Universitas Sriwijaya, Indonesia)
Ridho Zulfahmi (Universitas Sriwijaya, Indonesia)

THE KEYNOTE SPEAKERS

1. Prof. Juahir Hafizan (Universiti Sultan Zainal Abidin, Kuala Trengganu, Malaysia)
2. Prof. Jatna Supriatna. Ph.D. (Universitas Indonesia)
3. Prof. Dr. Philipp Wiedemann (Mainhaim University)
4. Prof. Dr. Ir. Fachrurrozie Sjarkowie, M.Sc. PhD (Universitas Sriwijaya)
5. Dr. Duong Van Thao (Thai Nguyen University of Agriculture and Forestry)
6. Assoc.Prof. Dr. Khalida Muda (Universiti Teknologi Malaysia)

Free Access to the whole issue

E3S Web of Conferences

Volume 68 (2018)

The 1st Sriwijaya International Conference on Environmental Issues 2018 (1st SRICOENV 2018)

Palembang, Indonesia, September 26-27, 2018

M. Amin (Ed.)

Export the citation of the selected articles Export

Select all

Open Access

Statement of Peer review

Published online: 27 November 2018

PDF (56.8 KB)

Open Access

About the conference

Published online: 27 November 2018

PDF (816 KB)

Riswandi, Basuni Hamzah, Agus Wijaya, Arfan Abrar, S Agus, Afnur Imsya, Fitra Yosi, Sofia Sandi and Eka Fitriani

Published online: 27 November 2018

DOI: https://doi.org/10.1051/e3sconf/20186801021

PDF (1.632 MB) | References | NASA ADS Abstract Service

Open Access

The Influence of Phytase Enzyme to Laying Performance and Quality of Egg Shell of Golden Arabian Chicken 01022

OK

Eli Sahara, Feni Despedia and Raden Ayu Aminah

Published online: 27 November 2018

DOI: https://doi.org/10.1051/e3sconf/20186801022

PDF (1.430 MB) | References | NASA ADS Abstract Service

Open Access

DNA Barcoding of Swamp Sediment Bacterial Isolates for Swamp Aquaculture Probiotic 01023

Marini Wijayanti, Dade Jubaedah, Januar Ahlan Suhada, Siti Yuliani, Nabilah Saraswati, Tanbiyaskur, Mochamad Syaifudin and Hary Widjajanti

Published online: 27 November 2018

DOI: https://doi.org/10.1051/e3sconf/20186801023

PDF (1.702 MB) | References | NASA ADS Abstract Service

Open Access

The Risk Factors Analysis Occurrence of Chlamydia Infection to Direct Female Seks Workers (DFSW) in Indonesia 01024

Masayu Gemala Rabiah, Rini Mutahar and Rico Januar Sitorus

Published online: 27 November 2018

DOI: https://doi.org/10.1051/e3sconf/20186801024

PDF (1.526 MB) | References | NASA ADS Abstract Service

Open Access

Model of Demand Robust Counterpart Open Capacitated Vehicle Routing Problem (DRC-OCVRP) Simplification by Applying Preprocessing Techniques in Rubbish Controlling in Sematang Borang District, Palembang 01025

Fitri Maya Puspita, Endro Setyo Cahyono, Siti Rahayu and Bauty Lisna Sintia

Published online: 27 November 2018

DOI: https://doi.org/10.1051/e3sconf/20186801025

PDF (1.981 MB) | References | NASA ADS Abstract Service

Model of Demand Robust Counterpart Open Capacitated Vehicle Routing Problem (DRC-OCVRP) Simplification by Applying Preprocessing Techniques in Rubbish Controlling in Sematang Borang District, Palembang

Fitri Maya Puspita[1*], *Endro Setyo* Cahyono[1], *Siti* Rahayu[1],and *Bauty Lisna* Sintia[1]

[1]Mathematics Department, Faculty of Mathematics and Natural Sciences, Universitas Sriwijaya, Indralaya Ogan Ilir Indonesia

Abstract. The activity of rubbish controlling in Palembang is one of the applications of Demand Robust Capacitated Vehicle Routing Problem (DRC-OCVRP). In transporting rubbish in Sematang Borang district by preprocessing and probing technique are needed to obtain the simplest DRC-OCVRP model. The result shows that the optimal routes in those districts after applying the techniques are the same routes. In addition, the reduction of constraints, variables and the reduction of iteration numbers are also obtained. For Sematang Borang district, the reducing is mostly done on the working area 2 (WK 2) that is reducing as much 9 variables and 8 constraints of the initial number of variables as much as 36 and 66 constraints that has been previously obtained in the past research.

1 Introduction

The problem of waste is one of the things that must be handled in Palembang city; this is because the amount of waste produced every day has increased. Therefore, it is necessary to apply the appropriate method of transporting waste that can make waste management efficient. The official of the Sanitation and Hygiene Agency (DKK) of Palembang city transports trash located at the waste disposal site (TPS) by using the garbage-trucking vehicle to the final disposal site (TPA) conducted according to the sub-district by working area (WK). TPS consists of various types, generally in the form of containers, bins made of fiber, iron plate or garbage bin of concrete. The garbage is transported by means of garbage vehicle in the form of arm-roll and dump truck.

Mixed Integer Linear Program (MILP) solution was conducted to survey the solutions using probing techniques and preprocessing techniques that resulted in the reduction of

*Corresponding author: pipitmac140201@gmail.com

border size (both lower and upper limit) as well as reduction of coefficient size in constrain matrix[1] .

Robust Counterpart Vehicle Routing Problem (R-CVRP) method is a problem in VRP that is used to handle data uncertainty constraints such as travel time, cost of travel and demand[2, 3]. While in garbage transportation in Palembang, there is the uncertainty of data in the form of garbage volume at each polling station in each different working area and in controlling the garbage, some research already attempted to obtain the optimal routes in these problem[4, 5]. The problem is classified in Demand Robust Counterpart Open Vehicle Routing Problem (DRC-OVRP) problem, which can be solved by MILP where DRC-OCVRP model previously using the balancing technique included in the preprocessing step of OCVRP[6, 7]. So, the contribution of this current research is to simplify the models previously discussed [4, 5, 8], with the use of preprocessing techniques primarily related to the technique of identifying non-fiscal constraints and redundant constraints, increasing limits and coefficients as well as setting variable values [9].

This study discusses the simplification of the DRC-OCVRP model in the issue of garbage transportation of one of the sixteen sub-districts in Palembang city and then the model that has been formed will be tested its validity. The simplification of the DRC-OCVRP model aims to see a comparison of previous DRC-OCVRP models [3-4] with simplified models, or with the aim of forming models that are more efficient.

2 Materials and Methods

To simplify the model of the transportation system, three stages are conducted as follows.

1. Form the DRC-OCVRP model
   The model is formed according to rubbish transportation data in Sematang Borang District containing the distance from the route of each WK, vehicle's capacity, and rubbish volume. Data were obtained by conducting surveys and interviews to the DKK in Palembang City for Sematang Borang District.
2. Simplify the DRC-OCVRP
   To simplify the model, some steps were taken such as strengthening the bounds of constraint variables, eliminating the redundant constraint and fixing variables.
3. Solve the DRC-OCVRP model
   The solution is the objective function and some decision variables that will display the optimal distance from the route. Then the solution compares before and after the application of the technique

3 Results and Discussions

In this part, the descriptions of the steps of simplifying DRC-OCVRP model using preprocessing techniques were explained. For briefly explanation, the MILP model is only displayed for WK1 and the rest of the WK's will be shown the final optimal routes. The distance data are obtained in previous research [6-7].]

For Working Area 1 Sematang Borang

DRC-OCVRP model after setting up the probing technique is

$$\begin{aligned} \text{Minimize } Z = {} & 16.1y_{01} + 16.7y_{02} + 16.6y_{03} + 15.7y_{04} + 16.1y_{10} + 2.4x_{12} \\ & + 2.0x_{13} + 1.57x_{14} + 16.7y_{20} + 2.4x_{21} + 0.95x_{23} + 3.26x_{24} \\ & + 16.6y_{30} + 2.0x_{31} + 0.95x_{32} + 3.91x_{34} + 15.7y_{40} + 1.57x_{41} \\ & + 3.26x_{42} + 3.91x_{43} \end{aligned}$$

Subject to

$$x_{12} = 1$$
$$y_{02} + y_{20} = 1$$
$$y_{03} = 1$$
$$x_{34} = 1$$
$$y_{04} + y_{40} = 1$$
$$y_{01} + y_{02} + y_{03} + y_{04} + y_{10} + y_{20} + y_{30} + y_{40} + x_{12} + x_{13} + x_{14} + x_{21} + x_{23} + x_{24} + x_{31} + x_{32} + x_{34} + x_{41} + x_{42} + x_{43} \geq 4$$
$$y_{10} + y_{20} + y_{30} + y_{40} - y_{01} - y_{02} - y_{03} - y_{04} + x_{12} + x_{13} + x_{14} + x_{21} + x_{23} + x_{24} + x_{31} + x_{32} + x_{34} + x_{41} + x_{42} + x_{43} \geq 0$$
$$y_{01} + y_{02} + y_{03} + y_{04} = 1$$
$$2000 \leq l_1 < 4000$$
$$2000 \leq l_2 < 4000$$
$$1000 \leq l_3 < 4000$$
$$3000 \leq l_4 < 4000$$
$$l_1 - l_2 + 4000x_{12} \leq 2000$$
$$l_1 - l_3 + 4000x_{13} \leq 3000$$
$$l_1 - l_4 + 4000x_{14} \leq 1000$$
$$l_2 - l_1 + 4000x_{21} \leq 2000$$
$$l_2 - l_3 + 4000x_{23} \leq 3000$$
$$l_2 - l_4 + 4000x_{24} \leq 1000$$
$$l_3 - l_1 + 4000x_{31} \leq 2000$$
$$l_3 - l_2 + 4000x_{32} \leq 2000$$
$$l_3 - l_4 + 4000x_{34} \leq 1000$$
$$l_4 - l_1 + 4000x_{41} \leq 2000$$
$$l_4 - l_2 + 4000x_{42} \leq 2000$$
$$l_4 - l_3 + 4000x_{43} \leq 3000$$

$y_{01}, y_{02}, y_{03}, y_{04}, y_{10}, y_{20}, y_{30}, y_{40}, x_{12}, x_{13}, x_{14}, x_{21}, x_{23}, x_{31}, x_{32}, x_{34}, x_{41}, x_{42}, x_{43}, l_1, l_2, l_3, l_4 \geq 0$

The DRC-OCVRP model is simplified by applying Preprocessing techniques consisting of three stages, namely, strengthen the bounds of constraint variables, eliminate excessing contrains, and fix the variable.

3.1 Preprocessing Technique

3.1.1 Strengthen the Bounds of Constraint Variables

At the boundary strengthening stage, the amplified limit is the limit on the constraint variable. In general, this process considers each of the constraints and investigates whether the constraints are in accordance with the limitations of the variables or whether the variables can be strengthened in each of the boundaries.

Since $y_{01}, y_{02}, y_{03}, y_{04}, y_{10}, y_{20}, y_{30}, y_{40}, x_{12}, x_{13}, x_{14}, x_{21}, x_{23}, x_{24}, x_{31}, x_{32}, x_{34}, x_{41}, x_{42}, x_{43} \in \{0,1,2\}$ and then if each variable has a non-negative restriction and based on the previous calculation the obtained variables are y_{01}=0; y_{02}=0; y_{03}=1; y_{04}=0; y_{10}=1; y_{20}=1; y_3=0; y_{40}=1; x_{12}=1; x_{13}=0; x_{14}= 0; x_{21}= 1; x_{23}=0 ; x_{24}=0; x_{31}=0; x_{32}=0; x_{34}=1; x_{41}=0; x_{42}=0; x_{43}=0

Strengthen the bound for variable x_{12} in (a)

Strengthen the bound for variable y_{02} in (b)

Strengthen the bound for variable y_{03} in (c)
Strengthen the bound for variable x_{34} in (d)
Strengthen the bound for variable y_{04}, y_{40} in (e)
Some variables in (f) cannot be strengthened
Some variables in (g) cannot be strengthened
Strengthen the bound for variable y_{01}, y_{03}, $y_{30}y_{04}$ in (h)

3.1.2 Eliminate Excessing Constraint

Basically preprocessing is a process that changes a formulation in such a way as to eliminate some constraints on a formulation that is considered excessive. An obstacle is said to be excessive if the removal or removal of the constraint does not change the feasible area. Constraints (g) and (h) satisfy the lower limit of non-negative constraints. Since constraints meet the upper and lower limits of the non-negative constraint variable, the Constraints (g) and (h) are said to be redundant and can be eliminated.

3.1.2 Fix the Variable

In Constraints (a) to Constraints (e), all forms of inequality are marked "=", it is defined that the right side value is 1 and the largest coefficient value is 1 then the sum of the largest variable coefficients is 1. At the sum does not exceed RHS, so the variable with the largest coefficients need not be fixed to 0.

The new DRC-OCVRP model are obtained as follows that has been transformed to initial form:

Minimize $Z = 16{,}6y_{03}+2{,}4x_{12}+16{,}7y_{20}+3{,}91x_{34}+15{,}7y_{40}$
Subject to
$x_{12} = 1$
$y_{20} = 1$
$y_{03} = 1$
$x_{34} = 1$
$y_{40} = 1$
$2000 \leq l_1 < 4000$
$2000 \leq l_2 < 4000$
$1000 \leq l_3 < 4000$
$3000 \leq l_4 < 4000$
$l_1 - l_2 + 4000x_{12} \leq 2000$
$l_1 - l_3 + 4000x_{13} \leq 3000$
$l_1 - l_4 + 4000x_{14} \leq 1000$
$l_2 - l_1 + 4000x_{21} \leq 2000$
$l_2 - l_3 + 4000x_{23} \leq 3000$
$l_2 - l_4 + 4000x_{24} \leq 1000$
$l_3 - l_1 + 4000x_{31} \leq 2000$
$l_3 - l_2 + 4000x_{32} \leq 2000$
$l_3 - l_4 + 4000x_{34} \leq 1000$
$l_4 - l_1 + 4000x_{41} \leq 2000$
$l_4 - l_2 + 4000x_{42} \leq 2000$
$l_4 - l_3 + 4000x_{43} \leq 3000$

$y_{01}, y_{02}, y_{03}, y_{04}, y_{10}, y_{20}, y_{30}, y_{40}, x_{12}, x_{13}, x_{14}, x_{21}, x_{23}, x_{31}, x_{32}, x_{34}, x_{41}, x_{42}, x_{43}$

For the rest of Working Area, the same steps as above are conducted, and it is summarized into Table 1.

Table 1. Before and After Applying Preprocessing Technique

Working Area	Before Applying Preprocessing Technique[7]		After Applying Preprocessing Technique		Optimal Solution (km)
	Variable	Constraint	Variable	Constraint	
1	25	46	18	39	55,31
2	36	66	27	58	53,717

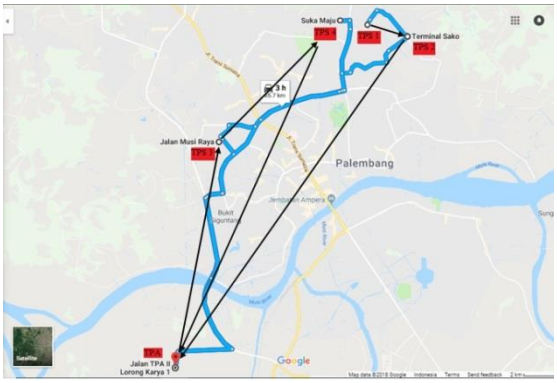
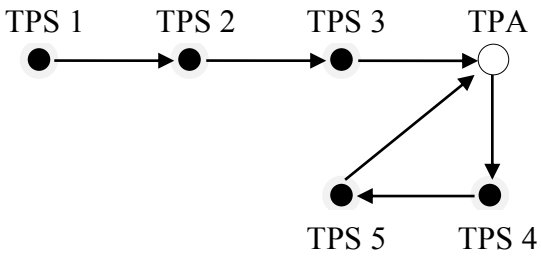


Fig. 1. Shows an image of the route with the optimal distance of Working Area 1 and Working Area 2 with optimal distance details on Table 1.

(a)



(b)

Fig. 2. Route of Working Area 1 (a) and Working Area 2 (b)

According to Figure.1(a), the optimal route of WK 1 of Sematang Borang District, will be TPS Simpang Dogan – TPS Terminal Sako – TPA Karya Jaya – TPS Sepanjang Jl. Musi Raya – TPS Sukamaju – TPA Karya Jaya. For WK 2, the optimal routes will be TPS Kecamatan Sematang Borang – TPS Terminal – TPS Perumnas Lama – TPA Karya Jaya – TPS Pasar Multi Wahana – TPS Giant Mall – TPA Karya Jaya. By applying the method, the route of transporting the waste remains the same, but a simpler formulation is

generated. If it is dealing with computational results, it means saving more time to solve the calculations.

4 Conclusions

It can be concluded that after the use of preprocessing techniques can results in a simpler and faster DRC-OCVRP model in the model completion process compared to the DRC-OCVRP model before using preprocessing techniques. The variable number and constraints of 2 WK before the preprocessing technique is 61 variables and 112 constraints. After the preprocessing technique, has the variable number and constraints is reduced to 45 variables and 97 constraints. It can be seen that the DRC-OCVRP model using preprocessing technique has the variable number and fewer number of constraints that can be seen in Table 1.

References

1. A. Mahajan, Presolving Mixed-Linear Programs. in *Wiley Encyclopedia of Operations Research and Management Science* Argonne: John Wiley & Sons, Inc (2010)
2. E. L. Solano-Charris, Optimization *Methods for the Robust Vehicle Routing Problem*. (Ph.D, Universite De Technologie De Troyes, 2015)
3. E. L. Solano-Charris, C. Prins, and A. C. Santos, A robust optimization approach for the vehicle routing problem with uncertain travel cost. *International Conference on Control, Decision and Information Technologies (CoDIT), Metz*, France: IEEE (2014)
4. Y. Hartono, F. M. Puspita, D. I. Permatasari, and B. Arisha, "LINGO-Based on Robust Counterpart Open Capacitated Vehicle Routing Problem (RCOCVRP) Model of Waste Transportation in Palembang," in *2018 International Conference on Information and Communications Technology (ICOIACT* (2018)
5. F. M. Puspita. Hartono, N. Z. Syaputri, and W. D. Pratiwi, *Journal of Electrical and Computer Engineering (IJECE) (*2018)
6. D. I. Permatasari, *Model Demand Robust Counterpart Open Capacitated Vehicle Routing Problem (DRC-OCVRP) Berbasis Lingo 13.0 Pada Pengoptimalan Rute Pengangkutan Sampah di Kota Palembang* (*Jurusan Matematika*, Indralay, Universitas Sriwijaya, 2017)
7. N. Z. Syaputri, Masalah *Pengangkutan Sampah di Kota Palembang dengan Model Deman Robust Counterpart Open Capacitated Vehicle Routing Problem (DRC-OCVRP)* (Indralaya, Skripsi S1, Universitas Sriwijaya, 2017)
8. Y. Hartono, F. M. Puspita, N. Z. Syaputri, and W. D. Pratiwi, "Model Robust Counterpart Open Capacitated Vehicle Routing Problem (RC-OCVRP) dalam Pengoptimalan Pengangkutan Sampah di Kecamatan Ilir Timur II Dan Kecamatan Alang-Alang Lebar Kota Palembang," *Seminar Nasional Kependudukan & Kebijakan Publik, Universitas Sriwijaya, Palembang,* **1** (2017)
9. M. W. P. Savelsbergh. J. on Computing **6** (1994)

046/UN9.2/LL/Sricoenv.Pps.Unsri/2018

GRADUATE SCHOOL
UNIVERSITAS SRIWIJAYA

This

CERTIFICATE OF PARTICIPATION

is hereby given to

FITRI MAYA PUSPITA

For having actively participated as ORAL PRESENTER during

THE 1st SRIWIJAYA INTERNATIONAL CONFERENCE ON ENVIRONMENTAL ISSUES

held on 26-27 September 2018 at Horison Ultima Hotel, Palembang, Indonesia.

HERMANSYAH
Conference Chairman

PROF. AMIN REJO
Director