REST Journal on Emerging Trends in Modelling and Manufacturing
Vol: 3(4), 2017
REST Publisher;
ISSN: 2455-4537
Website: www.restpublisher.com/journals/jemm

Incorporating Economies of Scale into Facility Location Problems in Carpet Recycling Using TOPSIS Methods

Singh Namrata Rajesh Singh
SST College of Arts and commerce, Maharashtra, India.
namratasingh@sstcollege.edu.in

Abstract

The biggest limitation of Recycle means recycling all materials can't, so go through the process each time A certain number of times due to distortion Only materials can be recycled. This degradation is also referred to as down cycling. Why recycle? Doesn't Work in America Many recyclables are in the wrong bin when stored or soiled food containers they become contaminated when they end up in the recycling bin. Contamination can prevent large volumes from being recycled. Some facilities cannot process other materials. Recycling mixed material products is difficult because the materials must be separated for effective processing and reuse. Often, the Different types of plastics for body and cap Use water bottles recycle one Doable and the other unused Products such as goods are overlooked by consumers mixing materials. Sorting is expensive; Careful sorting and cleaning of plastics containing food scraps, labels and other debris is even more costly to obtain the quality of plastic required for recycling into pellets. As the price of recycled plastic products falls, recycling is becoming a less profitable industry. This often leads to confusion and difficulty. How to recycle, what can be recycled or People don't know what to do with it. Americans It's convenient to say that you don't usually recycle Lack of access is the main reason. This is true that things that are placed in the recycling bin are not always recycled. Alternative: Supply Chain Director, Financial Advisor, Marketing & Recycling Manager. Evaluation Preference: CLSC expenses, coverage, volume flexibility. As a result, CLSC costs ranked first at the same time, volume flexibility is low has ranking. The value of the dataset The Recycling Facility Problems in TOPSIS Method (Similar for the best solution). By option order technique shows its results in CLSC costs and top ranking.

Keywords: Supply Chain Director, Financial Advisor, CLSC costs, volume flexibility.

1. Introduction

The recycling process is of vital the environment of ELV management in this mega city and the Importance of economic sustainability. Therefore, Opening an additional ELV recycling facility in Istanbul There is a strong motivation. ELV recycling facility locations Selection is a multi-criteria decision-making (MCDM) problem considered, [1] As a measure to prevent Food waste is garbage, the Korean government says Invest in money and food waste recycling systems Strong efforts have been made to establish These In systems, food waste is used as animal feed Recycling, composting, and soil amendment and Producing biogas in anaerobic digesters. [2] It is the virgin raw material for the textile industry To reduce dependency and reduce the cost of production, It also helps reduce its impact on the environment. Many rugs Manufacturers are developing new recycling techniques that are coming two or three more centres are possible in the future. [3] Finally, our technical contribution is twofold: (i) Recycling facility location planning Limited Adaptive Distributed Robustness Formed the model, which is mixed integer second-order Cone can be converted to a program where integer variables are binary Location results can be manipulated. Off-the- By off-the-shelf MIP solutions. [4] Therefore, According to the recycling uncertainty theory, in an uncertain environment with a limited number of smart recycling facilities to meet peak demand for government decision-makers to organize rationally to help, consider service cost as an uncertain variable is taken. [5] Incinerators or recycling plants rather than landfills in decisions on the location of waste treatment facilities such as Widely used. In Literature, MSW, Min and e-waste and C&DW recycling facilities various used to find out MCA's to identify recycling facilities; including methods Different examples of usage have been detected. [6] Hazardous waste recycling (HWR) facilities are hazardous to treat, store or dispose of the waste are installed. Improper disposal of hazardous waste Handling in the manner of site personnel and the public pose a serious threat. Health and Anticipate potential security risks by taking action, working at HWR facilities with minimal risk to workers and the public Lets continue. [7] In this case, hybrid facilities are both "regional aggregates Vendors" that will ful fill the customer demand for Retail of new batteries and "collection centers". From dealers or service, stations Collect spent batteries and keep them for several days Collect and send them to licensed recycling facilities. [8] Motivated by An RL network for recycling in Turkey Optimum number of recycling facilities should be designed, Multi-period facility to determine location and performance a location-assignment model should be established. Facilities and Discarded materials from their source Transport to facilities is reduced. [9] From an energy savings and emissions perspective, producing one tons than producing steel from iron ore less energy and times fewer CO2 emissions than steel needed. Thus the vessel is fully recycled an important part of resource recycling if carried out meets the sustainability requirement. [10] The first part of the paper is primarily the global steel industry Production trends,

scrap consumption, and recycling rates and focuses on environmental resource stocks pays and CO2 in different recycling scenarios of different models used to predict emissions includes a review. [11] Electronics to invest in proper recycling facilities Promoting manufacturers is a promising Practice suggests that the approach would be. End-of-life treatment of their products under EPR Producers is responsible for those costs can reduce building their own proper recycling facilities, [12] Companies need to find Efficient to recycle their products and a profitable way. of third-party recycling centers Due to the high cost, many cartridge makers have their They choose to set up their own recycling plants. Hence the location of collection centers and recycling plants and there should be provision optimized. [13] Despite its potential as a water resource, water Recycling often involves water recycling Water quality degradation and associated health are Hindered by hazards. Water Quality Guidelines and Global agreement on health-related standards this situation is not helped by the absence. Proposed or actually published standards a vary widely from country to country [14] it found that a percentage of plastic manufacturing companies would choose Cheap and on recycled plastic pellets High-quality virgin resins. Plastic is very versatile and can be produced in various forms and this Causes problem with recycling. [15] Collection of recyclables is usually done through on-site collection or through drop-off systems. The collection policy depends on the area of service and is generally local at the municipal level and Determined by governments. [16]

2. Materials and method

Conclusion normalizing the matrix; a positive ideal solution and matrix normalization; Positive ideal solution and negative ideal solution Calculation of separations. An alternative to PIS and NIS. Proximity in descending order to receive replacement [1] The TOPSIS method was originally developed by HWANG and YOON Introduced by Introduced; it proposed several for solving criterion decision problems. This According to the technique, The best alternative is positive for the best solution Intimate is presence and negativity Far from ideal solutions are far away. [2] Order by similarity of best solution (TOPSIS) approach multiple answers using optional technique an attempt was made to improve. This method is of any kind Ability to improve problem and any number they concluded that it had answers. [3] The aim of the present work is Thermal of CFWCT and MCDM-TOPSIS Performance in optimal operating conditions to investigate cooling tower; Installed in a specific location using the method is operated. Heat and mass in CFWCT Exchange equations were presented and CFWCT's Thermal efficiency was evaluated with fill height. [4] The application of those MCDM techniques is often conservative and for approximate or sub-optimal solutions lead to Therefore, in this thesis, the experiments Formatting and headings methods Calculated TOPSIS Along with the marks, two NTM as EDM and WEDM processes Build regression meta-models to search for optimal parameter combinations for processes. [5] The Calculated TOPSIS Along with the marks, two NTM as EDM and WEDM processes Build regression meta-models to search for optimal parameter combinations for processes. [6] Two Probability Using Relative Entropy A comprehensive weight between distributions is calculated. Calculated detailed weights basically, air quality measurement is based on the TOPSIS system is evaluated using [7] has wide Applications and better In One of the multi-attribute decision-making models. In this manner, m replaces n evaluated by attributes, And each is a problem an n-dimensional space with m points is a geometric system. [8] Applied fuzzy TOPICS and network optimization techniques to solve Choice of stem location in deep multiple or body deposits problem Based on TOPSIS system, highway Superstructure selection in the conceptual design of the bridge They are an optimization-based method for solving presented. [9] Quantifying impacts Water level using TOPSIS methodology and quality and weighting value objective and combined with sets of subjective values. [10] SCR is estimated using the Fuzzy TOPSIS technique. A general TOPSIS method of SCR estimation is ambiguity or inaccuracy of estimation to overcome this limit Linguistic Limitation in Handling, Fuzzy-TOPSIS Method followed. of risk factors Linguistics to estimate ratings and weights Words are used and criteria. [11] Time, scales, with unknown weights Extended TOPSIS under neutrosophic synthesis an optimization method for determining weight information model method proposed. [12] Available to achieve the required criteria Identify the optimal alternative from various alternatives TOPSIS method is used to see. In this manner, the compromise ranking basically the optimal solution is selected and selected the solution is positive and The shorter the distance from the ideal solution is negative, the better must also have a very large distance from the solution. [13] Spatial and temporal characteristics of floods CV-TOPSIS method for disaster risk assessment done In the first part, every year Considered a watchdog for the economy, too Flood risk using CVTOPSIS method 263 observations were examined to obtain scores. [14]. It aims at the performance evaluation of the distance using the DEA method in the academic year of the academic Departments of Public Universities in Turkey TOPSIS method. This result in efficient decision making this study also compares and ranks units aims to a measure of competence in themselves [15] Software AHP method and For selected criteria Based on weights determines. Final ranking of technologies and hierarchy. [16] One of the known classical MCDM methods for optimal solution (TOPSIS) is a technique of order efficiency through similarity. TOPSIS is the chosen alternative positive ideal a negative ideal is also the idea is a short distance from the solution is far from the solution based on the other hand. [17] According to the TOPSIS method, the observed selected hybrid the ranking of different methods in models is usually very high Given Highest ranking. On the other hand, the M5T Hybrid LSSVM, ANFIS, MLP, RBF and GEP models surpasses [18] A due to alternative drugs should be given will be selected [19] A company's head of supply chain management may be a Small business owner, all logistics operations Run them yourself or have a small staff of them or to other contracted logistics companies Outsourcing. The CFP designation is the highest in the financial planning field Professional quality. Strict educational requirements and as there is a long certification exam to get the certification, A financial planner has extensive training and knowledge CFP specifies. Reusing materials ensures that unused materials are used and it also reduces the purchase of raw materials. Recycling provides huge revenue for e-waste recycling business as the huge market of recycled materials favors the recycling business.

3. Analysis and dissection

TABLE 1. TOPSIS Recycling Facility Problems

	DATA SET		
	Supply Chain Director	Financial Advisor	Marketing & Recycling Manager
CLSC costs	51.08	339.53	19.15
coverage	69.12	162.97	13.69
volume flexibility	74.08	222.58	19.18

This Table 1 TOPSIS of the Era of Industry 4.0 Alternative: Supply Chain Director, Financial Advisor, Marketing & Recycling Manager. Evaluation Preference: CLSC expenses, coverage, volume flexibility. Supply Chain Director the volume flexibility it is seen that is showing the highest value for CLSC costs is showing the lowest value. Financial Advisor it is seen that CLSC costs is showing the highest value for coverage is showing the lowest value. Marketing & Recycling Manager it is seen that volume flexibility is showing the highest value for coverage is showing the lowest value.

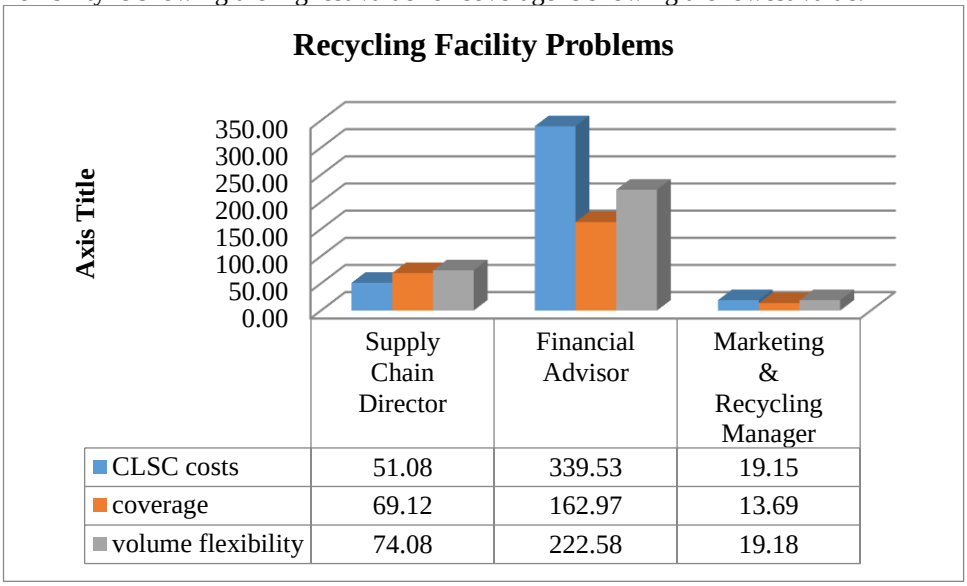

FIGURE 1. TOPSIS of the Recycling Facility Problems

This Figure 1 TOPSIS of the Era of Industry 4.0 Alternative: Supply Chain Director, Financial Advisor, Marketing & Recycling Manager. Evaluation Preference: CLSC expenses, coverage, volume flexibility.

TABLE 2. Squire Rote of matrix

2609.166	115280.621	366.7225
4777.574	26559.2209	187.4161
5487.846	49541.8564	367.8724

Table 2 shows the Squire Rote of matrix value.

TABLE 3. Recycling Facility Problems in Normalized Data

Normalized Data		
Supply Chain Director	Financial Advisor	Marketing & Recycling Manager
0.45	2.992	0.631
0.609	1.436	0.451
0.653	1.962	0.632

Table 3 Normalized Data shows the informational set for the Innovation, Technological, Social factors, Flexibility. The Normalized data is from the dataset value Calculated; it is the square root of the column value divided by the sum.

TABLE 4. Weight

Weight		
0.25	0.25	0.25
0.25	0.25	0.25
0.25	0.25	0.25

Table 4 Weight Information for Weight Displays the package 0.25.

TABLE 5. Recycling Facility Problems in Weighted normalized result matrix

Weighted normalized decision matrix		
0.113	0.748	0.158
0.152	0.359	0.113
0.163	0.49	0.158

Table 5 Weighted normalized decision matrixes show the informational Normal we used the formula Set the data multiplication weight.

TABLE 6. Recycling Facility Problems in Positive Matrix

Positive Matrix		
0.163	0.748	0.113
0.163	0.748	0.113
0.163	0.748	0.113

Table 6 Positive Matrix shows the informational set for the value Supply Chain Director 0.163, Financial Advisor 0.748, Marketing & Recycling Manager 0.113.

TABLE 7. Recycling Facility Problems in Negetive matrix

Negetive matrix		
0.113	0.359	0.158
0.113	0.359	0.158
0.113	0.359	0.158

Table 6 Positive Matrix shows the informational set for the value Supply Chain Director 0.113, Financial Advisor 0.359, Marketing & Recycling Manager 0.158.

TABLE 8. Recycling Facility Problems in Si Positive & Si Negative & Ci

SI Plus	Si Negative	Ci
0.067741	0.3890145	0.851691
0.389168	0.060191	0.133949
0.26161	0.140776	0.349853

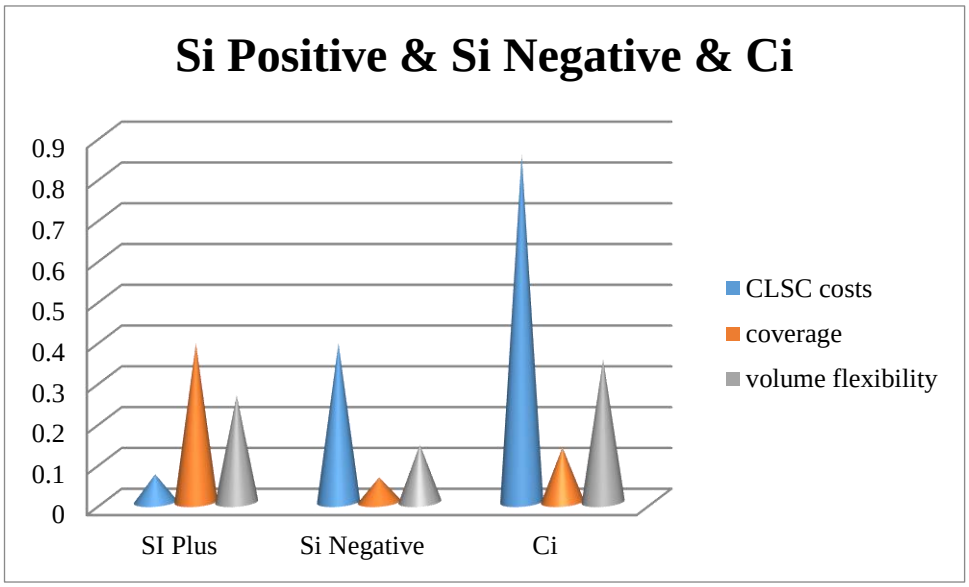

FIGURE 2. Recycling Facility Problems in Si Positive & Si Negative & Ci

Figure 2 Si positive & Si negative & Ci graphical Shows representation

TABLE 9. Recycling Facility Problems in Rank

	Rank
CLSC costs	1
coverage	3
volume flexibility	2

Table 9 Rank shows the informational set for the CLSC costs is in 1st rank, coverage is in 3rd rank, volume flexibility is in 2nd rank,

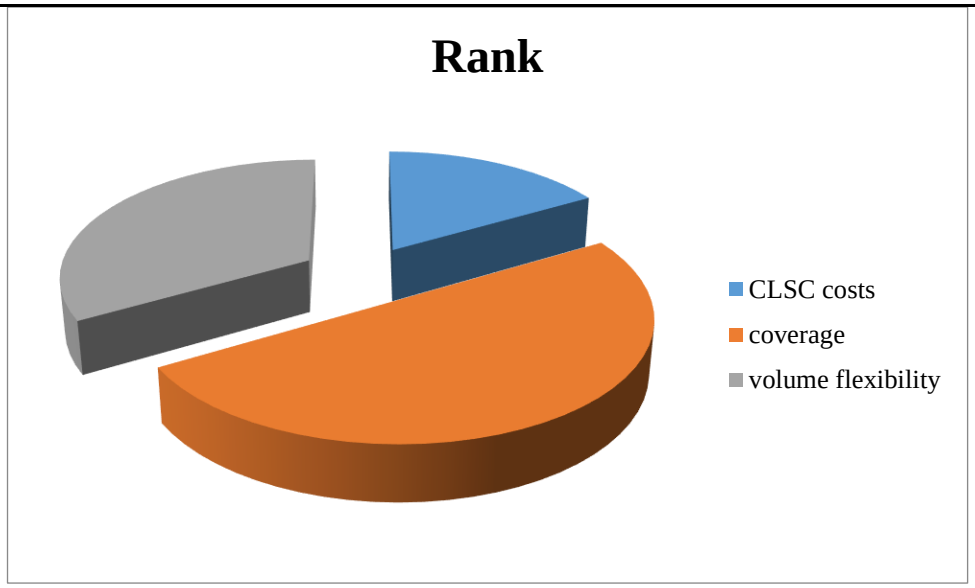

FIGURE 3. Recycling Facility Problems in Rank

Figure 3 shows that As a result, CLSC costs ranked first obtained, where volume flexibility is limited to have ranking.

4. Conclusion

That As a result, CLSC costs ranked first obtained, where volume flexibility is limited to have ranking. Quantifying impacts Water level using TOPSIS methodology and quality and weighting value objective and combined with sets of subjective values. SCR is estimated using the Fuzzy TOPSIS technique. A general TOPSIS method of SCR estimation is ambiguity or inaccuracy of estimation to overcome this limit Linguistic Limitation in Handling, Fuzzy-TOPSIS Method followed. Of risk factors Linguistics to estimate ratings and weights Words are used and criteria. Motivated by An RL network for recycling in Turkey Optimum number of recycling facilities should be designed, Multi-period facility to determine location and performance a location-assignment model should be established. Facilities and Discarded materials from their source Transport to facilities are reduced. From an energy savings and emissions perspective, producing one tons than producing steel from iron ore less energy and times fewer CO2 emissions than steel needed. Thus the vessel is fully recycled an important part of resource recycling if carried out meets the sustainability requirement. it found that a percentage of plastic manufacturing companies would choose Cheap and on recycled plastic pellets High-quality virgin resins. Plastic is very versatile and can be produced in various forms and this Causes problem with recycling.

Reference

[1]. Karagöz, Selman, Muhammet Deveci, Vladimir Simic, and Nezir Aydin. "Interval type-2 Fuzzy ARAS method for recycling facility location problems." Applied Soft Computing 102 (2021): 107107.

[2]. Lee, Dae Hee, Shishir Kumar Behera, Ji Won Kim, and Hung-Suck Park. "Methane production potential of leachate generated from Korean food waste recycling facilities: a lab-scale study." Waste Management 29, no. 2 (2009): 876-882.

[3]. Bucci, Michael J., Ryan Woolard, Jeffrey Joines, Kristin Thoney, and Russell E. King. "Incorporating economies of scale into facility location problems in carpet recycling." The Journal of The Textile Institute 105, no. 12 (2014): 1300-1311.

[4]. Liu, Tianqi, and Guiyu Li. "Robust recycling facility location with clustering." Computers & Operations Research 136 (2021): 105466.

[5]. Wang, Zhen, Yongrui Duan, and Jiazhen Huo. "Maximal covering location problem of smart recycling infrastructure for recyclable waste in an uncertain environment." Waste Management & Research 39, no. 2 (2021): 396-404.

[6]. Dosal, E., J. R. Viguri, and A. Andrés. "Multi-criteria decision-making methods for the optimal location of construction and demolition waste (C&DW) recycling facilities." In Handbook of recycled concrete and demolition waste, pp. 76-107. Woodhead Publishing, 2013.

[7]. Hatami-Marbini, Adel, Madjid Tavana, Masoumeh Moradi, and Fatemeh Kangi. "A fuzzy group Electre method for safety and health assessment in hazardous waste recycling facilities." Safety science 51, no. 1 (2013): 414-426.

[8]. Subulan, Kemal, A. Serdar Taşan, and Adil Baykasoğlu. "A fuzzy goal programming model to strategic planning problem of a lead/acid battery closed-loop supply chain." Journal of Manufacturing Systems 37 (2015): 243-264.

[9]. Aras, Necati, Aybek Korugan, Gülçin Büyüközkan, Funda Sivrikaya Şerifoğlu, Ismail Erol, and Meltem Nurtanış Velioğlu. "Locating recycling facilities for IT-based electronic waste in Turkey." Journal of Cleaner Production 105 (2015): 324-336.

[10]. Zakaria, NM Golam, Mir Tareque Ali, and Kh Akhter Hossain. "Underlying problems of ship recycling industries in Bangladesh and way forward." Journal of Naval Architecture and Marine Engineering 9, no. 2 (2012): 91-102.

[11]. Yellishetty, Mohan, Gavin M. Mudd, Pathegama Gamage Ranjith, and Ambalavanar Tharumarajah. "Environmental life-cycle comparisons of steel production and recycling: sustainability issues, problems and prospects." Environmental science & policy 14, no. 6 (2011): 650-663.
[12]. Gui, Luyi. "Recycling infrastructure development under extended producer responsibility in developing economies." Production and Operations Management 29, no. 8 (2020): 1858-1877.
[13]. Chen, Y. T., F. T. S. Chan, and Sai Ho Chung. "An integrated closed-loop supply chain model with location allocation problem and product recycling decisions." International Journal of Production Research 53, no. 10 (2015): 3120-3140.
[14]. Birks, Rebecca, Jeni Colbourne, S. Hills, and R. Hobson. "Microbiological water quality in a large in-building, water recycling facility." Water Science and Technology 50, no. 2 (2004): 165-172.
[15]. Chen, Hui Ling, Tapan Kumar Nath, Siewhui Chong, Vernon Foo, Chris Gibbins, and Alex M. Lechner. "The plastic waste problem in Malaysia: management, recycling and disposal of local and global plastic waste." SN Applied Sciences 3, no. 4 (2021): 1-15.
[16]. Cubillos, Maximiliano, and Sanne Wøhlk. "Solution of the maximal covering tour problem for locating recycling drop-off stations." (2021): 1898-1913.
[17]. Abootalebi, S., A. Hadi-Vencheh, and A. Jamshidi. "Ranking the alternatives with a modified TOPSIS method in multiple attribute decision making problems." IEEE transactions on engineering management (2019).
[18]. Rahimdel, Mohammad Javad, and Mohammad Karamoozian. "Fuzzy TOPSIS method to primary crusher selection for Golegohar Iron Mine (Iran)." Journal of Central South University 21, no. 11 (2014): 4352-4359.
[19]. Raj, S. Oliver Nesa, and Sethuramalingam Prabhu. "Analysis of multi objective optimisation using TOPSIS method in EDM process with CNT infused copper electrode." International Journal of Machining and Machinability of Materials 19, no. 1 (2017): 76-94.
[20]. Keshtkar, Mohammad Mehdi. "Performance analysis of a counter flow wet cooling tower and selection of optimum operative condition by MCDM-TOPSIS method." Applied Thermal Engineering 114 (2017): 776-784.
[21]. Chakraborty, Shankar, Prasenjit Chatterjee, and Partha Protim Das. "A DoE–TOPSIS method-based meta-model for parametric optimization of non-traditional machining processes." Journal of Modelling in Management (2019).
[22]. Akram, Muhammad, Sumera Naz, and Florentin Smarandache. "Generalization of maximizing deviation and TOPSIS method for MADM in simplified neutrosophic hesitant fuzzy environment." Symmetry 11, no. 8 (2019): 1058.
[23]. Lin, Hong, Tianhong Pan, and Shan Chen. "Comprehensive evaluation of urban air quality using the relative entropy theory and improved TOPSIS method." Air Quality, Atmosphere & Health 14, no. 2 (2021): 251-258.
[24]. Yari, M., M. Monjezi, and R. Bagherpour. "Selecting the most suitable blasting pattern using AHP-TOPSIS method: Sungun copper mine." Journal of Mining Science 49, no. 6 (2013): 967-975.
[25]. Chen, Ting-Yu. "Signed distanced-based TOPSIS method for multiple criteria decision analysis based on generalized interval-valued fuzzy numbers." International Journal of Information Technology & Decision Making 10, no. 06 (2011): 1131-1159.
[26]. Chung, Eun-Sung, Patricia Jitta Abdulai, Hyesun Park, Yeonjoo Kim, So Ra Ahn, and Seong Joon Kim. "Multi-criteria assessment of spatial robust water resource vulnerability using the TOPSIS method coupled with objective and subjective weights in the Han River basin." Sustainability 9, no. 1 (2016): 29.
[27]. Al Zubayer, Md Abdullah, Syd Mithun Ali, and Golam Kabir. "Analysis of supply chain risk in the ceramic industry using the TOPSIS method under a fuzzy environment." Journal of Modelling in Management (2019).
[28]. Tho Thong, Nguyen, Luong Thi Hong Lan, Shuo-Yan Chou, Le Hoang Son, Do Duc Dong, and Tran Thi Ngan. "An extended TOPSIS method with unknown weight information in dynamic neutrosophic environment." Mathematics 8, no. 3 (2020): 401.
[29]. Muddineni, Vishnu Prasad, Srinivasa Rao Sandepudi, and Anil Kumar Bonala. "Finite control set predictive torque control for induction motor drive with simplified weighting factor selection using TOPSIS method." IET Electric Power Applications 11, no. 5 (2017): 749-760.
[30]. An, Yan, Xianchun Tan, Baihe Gu, and Kaiwei Zhu. "Flood risk assessment using the CV-TOPSIS method for the Belt and Road Initiative: an empirical study of Southeast Asia." Ecosystem Health and Sustainability 6, no. 1 (2020): 1765703.
[31]. Ersoy, Yusuf. "Performance evaluation in distance education by using data envelopment analysis (DEA) and TOPSIS methods." Arabian Journal for Science and Engineering 46, no. 2 (2021): 1803-1817.
[32]. Berdie, A. D., M. Osaci, I. Muscalagiu, and C. Barz. "A combined approach of AHP and TOPSIS methods applied in the field of integrated software systems." In IOP Conference Series: Materials Science and Engineering, vol. 200, no. 1, p. 012041. IOP Publishing, 2017.
[33]. Wang, Dejiang. "Extension of TOPSIS method for R&D personnel selection problem with interval grey number." In 2009 International Conference on Management and Service Science, pp. 1-4. IEEE, 2009.
[34]. Farajpanah, Hiwa, Morteza Lotfirad, Arash Adib, Hassan Esmaeili-Gisavandani, Özgur Kisi, Mohammad Mehdi Riyahi, and Jaber Salehpoor. "Ranking of hybrid wavelet-AI models by TOPSIS method for estimation of daily flow discharge." Water Supply 20, no. 8 (2020): 3156-3171.
[35]. Larasati, Amanda Ayu, Anif Hanifa Setyaningrum, and Luh Kesuma Wardhani. "Development decision support system of choosing medicine using TOPSIS method (Case Study: RSIA Tiara)." In 2016 6th International

Conference on Information and Communication Technology for The Muslim World (ICT4M), pp. 160-165. IEEE, 2016.