Data Analytics and Artificial Intelligence
Vol: 1(2), 2021
REST Publisher
ISBN: 978-81-948459-4-2
Website: http://restpublisher.com/book-series/data-analytics-and-artificial-intelligence

Selection of E-Waste Mitigation Strategies using Weighted Aggregated Sum Product Assessment (WASPAS) method

Mishra Reena Amit
SSt College of Arts and Commerce, Maharashtra, India.
Email: reenamishra@sstcollege.edu.in

Abstract

The problem of e-waste is the original equipment of environmental agencies, government, developing countries like India Eco-friendly for manufacturers and to develop e-waste mitigation strategies Innovate and e-waste push the threat Manage and control. E-waste or E-waste includes obsolete, unwanted or broken electrical and electronic equipment. That means everything from smart phones to end-of-life refrigerators. Basically, anything that runs on electricity that you decide to remove. When e-waste is exposed to heat, A toxin in the air that damages the atmosphere Chemicals are released; By electronic waste It causes one of the biggest environmental impacts. That Toxins seep into groundwater and affect land and marine life. Electronic waste is also air contribute to pollution. When an electronic item is disposed of after its useful life When e-waste is exposed to heat, are formed. Rapid expansion Technology and consumer driven society generates enormous amounts of e-waste. Like Extended Producer Responsibility (EPR) attempts; Designing for the environment, reducing, Reuse, recycle (3Rs), a circular economy A technology platform that connects markets to facilitate; increased With reuse and recycling rates, consumers They aim to promote Proper disposal of e-waste. E-waste recycling is essential but A safe and standardized one manner. For hazardous, secondary e-waste products the limits of acceptable risk grew and developed Countries should not be different. The WASPAS method is a weighted sum model (WSM) and the weighted product is Benefits Modeling (WPM) Integrates uses. WSM and integration WPM is WASPAS an alternative Increases ranking accuracy. Over time, the WASPAS has an optimal mixing parameter, which is then will be described Alternative: Extended producer responsibility (EPR), commercial Process Management, Customer Relationship Management and sustainable supply chain. Evaluation Option: No effect (N), very low effect (VL), low effect (L), medium effect (M), high effect (H). from the result it is seen that High effect (H) and is got the first rank whereas is the Low effect (L) got is having the lowest rank. The value of the dataset for E-Waste Mitigation Strategies in WASPAS method shows that it results in High effect (H) and top ranking.

Keywords: E-Waste, Extended Producer Responsibility (EPR), WASPAS method

Introduction

Waste management plan, waste type, quantity and including assessments of management practices, Large amounts of waste generated by business How it will be managed and handled describes. As mentioned, e-The waste contains Organisms are dangerous to human health. Human brain, heart, liver, kidney and bone the system is damaged negative health effects of these toxins. E-waste accumulates pollutants in our body and damages DNA and lead to cancer. Children are especially vulnerable as they are still growing and pregnant women are exposed to e-waste. unborn babies. A waste management system is an organization to remove, reduce, reuse and prevent waste The strategy used is Possible waste disposal methods include recycling, composting, incineration, and landfill These include land filling, biological remediation, waste-to-energy and waste minimization. Waste Management Life Cycle | Safety culture. Specialized waste disposal companies recycle discarded electrical products from recycling centers As they do, it is transported For a processing plant, it is broken into smaller pieces and shredded. Once shredded, Strong magnets repel ferrous metals such as iron, and non-ferrous metals are electronic are collected using electric currents. Weighted Aggregate its ability It is currently an effective method to provide more Multi- Decision Making Criteria (MCTM) is functional (OR) is a frequently discussed area of research. This is To handle problems involving multiple criteria can, and make meaningful and quality decisions Creates, especially in selecting the best alternative.

E-Waste Mitigation Strategies

An integrated Interdependence between proposed work Concept and the WASPASS technique based framework. Electronic waste management and control 'Management initiation and return This study revealed that 'Commitment to Management' is essential and drive strategy. It affects other existing strategies as well. E-Waste Policy, Directives and Ext Producer responsibility, advance recycling payment technology and green innovation recycling Focusing on effective implementation of network and supply chain strategic alliances, This also proves that e-waste mitigation is effective Work exemplifies.

Stakeholders in the Indian scenario E-waste in managing e-waste issues This work deals with recyclers [1]. with electronic Significant current e-waste for successful application of waste management systems Attempts to identify and analyze mitigation strategies. Appropriate literature with inputs recommended by industry experts on e-waste mitigation strategies identified through analysis. These approved MSs are gray DEMATEL approach are evaluated based on When considering several independent criteria, the decision is made The gray concept is very supportive in the analysis, and there is uncertainty in such assessment. and involves gray theory [2]. Apart from the mandatory product recall, there is Voluntary withdrawal strategies are common In developing countries like China, India. Here, harmony There are no compelling laws, hence the EPR No penalty for not meeting targets. By e-waste Public awareness about the problems that arise and The government focuses on certain manufacturers developing countries in their company Specific as part of social responsibility and green appearance It prompted the establishment of individual take-back programs for products. [3]. We present Subsequently, three are titled Research and Development Key perspectives. Evolution of e-waste An integrated model of is governments, policy makers and provides promising implications for other stakeholders. [4]. The popular story of a vast An e-waste site where e-waste waste accumulates is an important claim. Hundreds in Korle Lagoon Shacks and structures were demolished, resulting in thousands of community residents were forced out. The disposal exercise includes some e-waste processing sites, but A series of lively and occasional locals AMA saved most of the e-waste processing center after violent protests. [5]. EPR is as per EPR External costs associated with life expectancy minus their products [6]. Current Scenes of unabated e-waste generation have reached dangerous levels for humanity. from future destruction Public and private sectors, civil society, voluntary work in conservation of nature and natural resources It requires immediate attention of companies, industrialists and business community. administrative, technical, environmental, regulation, legislation, education, stakeholder engagement and global cooperation Multi-pronged strategies should be adopted for inclusive e-waste management. [7]. product import origin, Notable in terms of volume of imports and various losses The authors identified data gaps. Such flows are placed in the market, collected and treated. [8] Regardless of other parameters, supervision is not required. therefore We get right to the root causes of recycling We get – principle, design for separation and Minimizing recycling costs - our sample scam Provides an opportunity to study ways to reduce be symptomatic of these deeper problems [10]. The TRPN considers the severity of the event, probability and likelihood of detecting hazards in electrical waste. Recycling and recovery process. The procedure calls for individual risk to the study participants' weight. Participants were asked to rate the risks. These risks are further taken as criteria to assess/measure their impacts on the economy, environment and society [11].

WASPAS method

We are the app Cloud Service Score and We An Integrated Fuzzy AHP-WASPAS Model for Representative Selection. Before ratings, make a list of alternatives and compare those alternatives It is likewise mandatory to become aware of the set of criteria used. After the initial screening, six public IaaS offerings with worldwide presence in global areas had been selected for evaluation. In effect A systematic review of assessment trends is a large Identified scale evaluation criteria. This Criteria should be provided directly means of companies who want to receive the cloud provider or If the choice maker isn't sure approximately the applicable standards, it have to be acquired thru a formal procedure. Based on the effects of the Fuzzy Delphi screening technique, a holistic and multidimensional hierarchical structure (Table III See.) changed to structured. Determine AHP-WASPAS technique applied. Subjective estimates had been provided via the equal selection -making agencies and ranked common coordination were converted into corresponding crisp numbers the use of the method. Objective carrier evaluation facts acquired via 1/3-celebration benchmarking services. US-Eastern location to preserve balance and gain overall performance appraisal effects Selected. Based on these estimates an included evaluation crew changed into shaped. Of six IaaS offerings against 30 rating factors WASPAS is used to evaluate scores. The end result is a listing of ranked offerings Obtained with great performance service. We are looking for to broaden a mechanism for destiny High technology industries in Iran Planning. The Swara-Vaspas technique will choose Used for technique and future making plans. Nano generation in Iran is the quality progress as discovered, the case under examine is the Department of Nanotechnology. For this purpose, nanotechnology in various scientific fields in Iran All applications are identified and based on literary study and past research were evaluated using determined criteria. SWARA and WASPAS Criteria and alternatives are used to evaluate. Priority to be explored Its purpose is to identify nanotechnology applications. The problem with choosing a car-sharing location is its price and ridership Among the most important strategic decisions due to implications is one. The objective of this study is for CAB type-2 is , which is used for MCDM problems Choosing the best possible car-sharing stations is , which is used for MCDM problems A new integrated with fuzzy sets provides an approach, WASPAS-based Topsis. The Uncertainty According to the calculations of the The determined alternative provides better building zoning options look. The high-bridge construction technique is the same as that obtained by the recommended cubic intuition WASPASS technique. The remaining alternative was found to be changed for all. This is because during these current choices, the path they take only initially takes into account alternative options WSM, WPM, Weighted Aggregate Product Appraisal (WASPAS) method, method (MULTIMOORA) Objective optimization is considered to investigate their robustness. Two real-time robot exams On changing the weights of most important and least important criteria while solving problems. Using one-dimensional and high-dimensional weight sensitivity analysis, these six MCDM methods are very robust and very Sensitivity is determined to identify MCDM methods.

TABLE 1. E-Waste Mitigation Strategies in Data Set

	DATA SET			
	Extended producer responsibility (EPR),	business process management	customer relationship management	sustainable supply chain
(N)	41.08000	239.53000	39.15000	29.05000
(VL)	39.12000	242.97000	23.69000	37.30000
(L)	34.08000	222.58000	39.18000	33.10000
(M)	33.17000	228.28000	34.60000	27.59000
(H)	43.33000	286.41000	37.96000	28.89000

This table 1 shows that the value of dataset for E-Waste Mitigation Strategies in EDAS method Alternative: Extended producer responsibility (EPR), commercial Process Management, Customer Relationship Management and sustainable supply chain. Evaluation Option: No effect (N), very low effect (VL), low effect (L), medium effect (M), high effect (H).

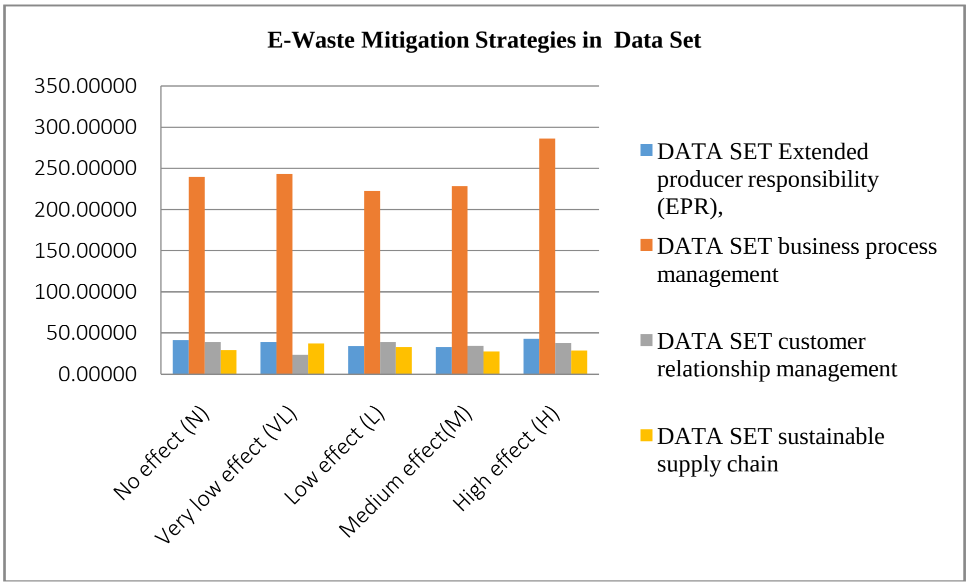

FIGURE 1. E-Waste Mitigation Strategies in Data Set

This figure 1 shows that the value of dataset for E-Waste Mitigation Strategies in EDAS method Alternative: Extended producer responsibility (EPR), commercial Process Management, Customer Relationship Management and sustainable supply chain. Evaluation Option: No effect (N), very low effect (VL), low effect (L), medium effect (M), high effect (H).

TABLE 2. E-Waste Mitigation Strategies in Performance value

	Performance value			
(N)	0.948073	0.836319	0.605109	0.949742
(VL)	0.902839	0.848329	1	0.739678
(L)	0.786522	0.777138	0.604645	0.833535
(M)	0.76552	0.797039	0.684682	1
(H)	1	1	0.624078	0.955002

This table 2 shows that the values of E-Waste Mitigation Strategies for Performance value using WASPAS. Find the pair wise comparison value for No effect (N), very low effect (VL), low effect (L), medium effect (M), high effect (H).

TABLE 3. E-Waste Mitigation Strategies in Weightage

Weight			
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25
0.25	0.25	0.25	0.25

Table 3 Product recommendation on weight in all weight ages same weight

TABLE 4. E-Waste Mitigation Strategies in Weighted normalized decision matrix 1

	Weighted normalized decision matrix 1			
(N)	0.23702	0.20908	0.151277	0.237435
(VL)	0.22571	0.212082	0.25	0.18492
(L)	0.196631	0.194284	0.151161	0.208384
(M)	0.19138	0.19926	0.171171	0.25
(H)	0.25	0.25	0.156019	0.23875

This table 4 shows that the values of E-Waste Mitigation Strategies in For product recommendation using WASPAS Weighted normalized outcome matrix 1. No effect (N), very low effect (VL), low effect (L), medium effect (M), high effect (H).

TABLE 5. E-Waste Mitigation Strategies in Weighted normalized decision matrix 2

	Weighted normalized decision matrix 2			
(N)	0.986758	0.956297	0.881979	0.987191
(VL)	0.974771	0.959712	1	0.927386
(L)	0.941733	0.938911	0.88181	0.955501
(M)	0.935382	0.944865	0.909646	1
(H)	1	1	0.888812	0.988555

This table 5 shows that the values of E-Waste Mitigation Strategies in For product recommendation using WASPAS Weighted normalized outcome matrix 2 . No effect (N), very low effect (VL), low effect (L), medium effect (M), high effect (H).

TABLE 6. E-Waste Mitigation Strategies in Preference Score 1, Preference Score 2 and WASPASS coefficient and rank

	Preference Score 1	Preference Score 2	WASPAS Coefficient	RANK
(N)	0.83481	0.821605	0.828208	3
(VL)	0.872712	0.86757	0.870141	2
(L)	0.75046	0.745003	0.747732	5
(M)	0.81181	0.803954	0.807882	4
(H)	0.89477	0.87864	0.886705	1

This table 6 shows that the values of E-Waste Mitigation Strategies in Preference Score 1, Preference Score 2, WASPAS Coefficient, RANK For Product recommendation using WASPAS. Find the pair wise comparison value for No effect (N), very low effect (VL), low effect (L), medium effect (M), high effect (H).

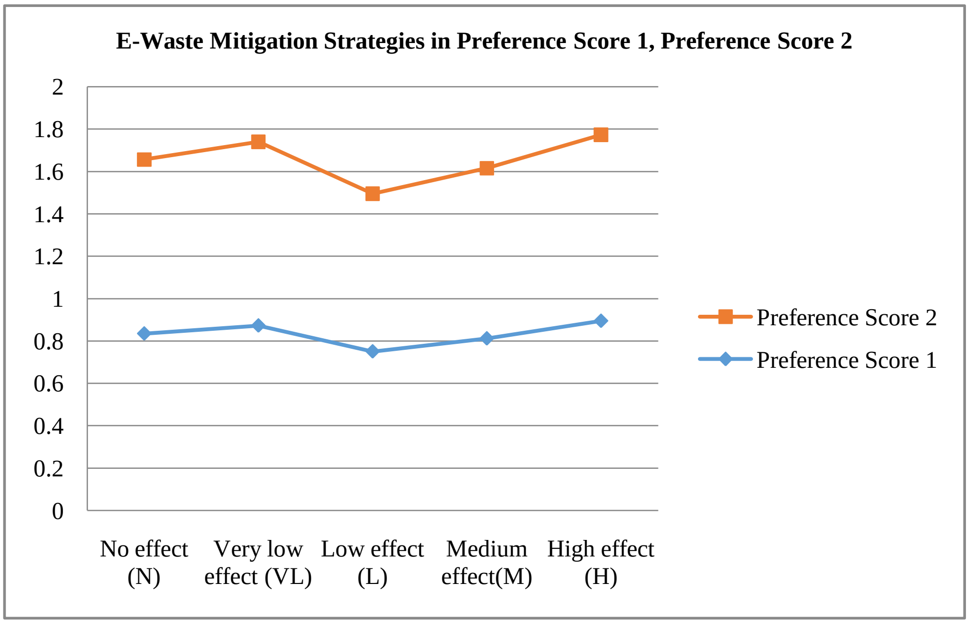

FIGURE 2. E-Waste Mitigation Strategies in Preference Score 1, Preference Score 2

This figure 2 shows that from the-Waste Mitigation Strategies in Preference Score 1 result it is seen that High effect (H) = 0.89477 and is got the first value whereas is the Low effect (L) = 0.75046 got is having the lowest value.

This figure 2 shows that from the-Waste Mitigation Strategies in Preference Score 2 result it is seen that High effect (H) = 0.87864 and is got the first value whereas is the Low effect (L) = 0.745003 got is having the lowest value.

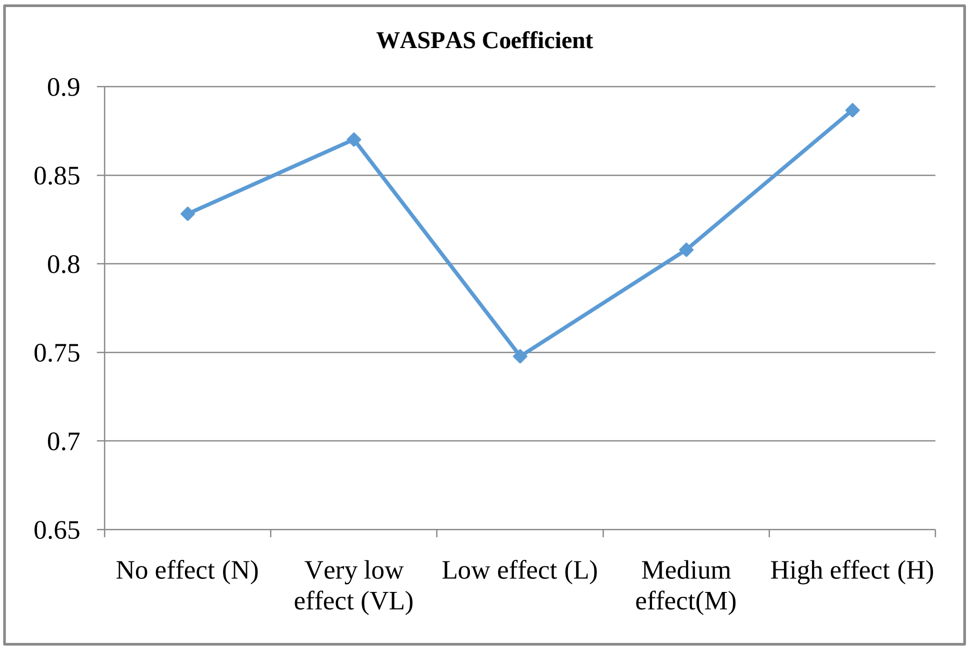

FIGURE 3. E-Waste Mitigation Strategies in WASPASS coefficient

This figure 3 shows that from the result it is seen that High effect (H) = 0.886705 and is got the first value whereas is the Low effect (L) = 0.747732got is having the lowest value.

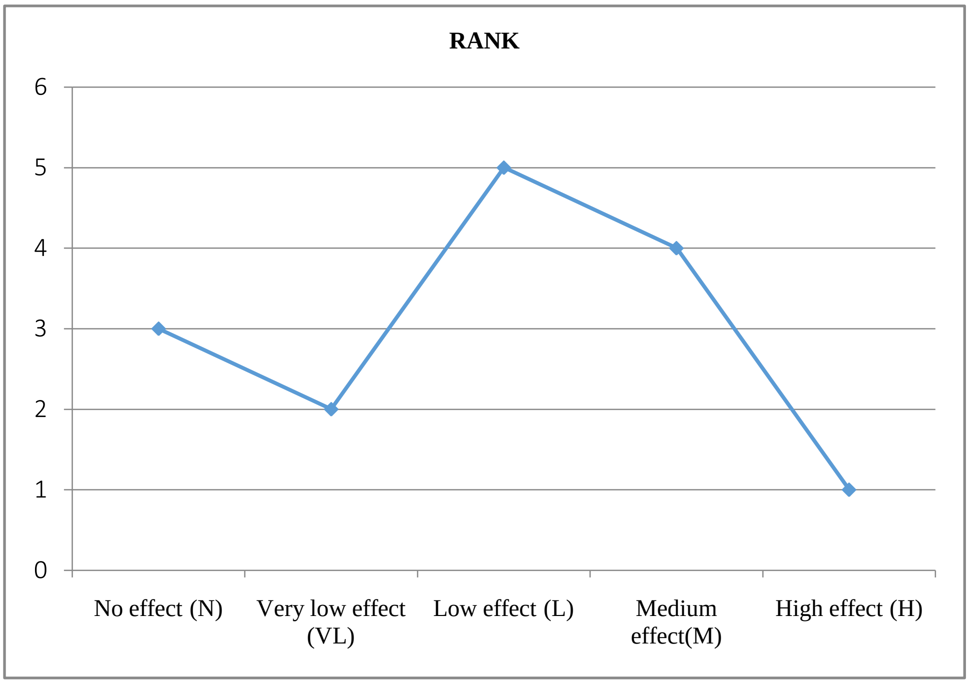

FIGURE 4. E-Waste Mitigation Strategies in rank

This figure 4 shows that from the result it is seen that High effect (H) and is got the first rank whereas is the Low effect (L) got is having the lowest rank.

Conclusion

Current Scenes of unabated e-waste generation have reached dangerous levels for humanity. from future destruction Public and private sectors, civil society, voluntary work in conservation of nature and natural resources It requires immediate attention of companies, industrialists and business community. Multi-pronged strategies should be adopted for e-waste management that includes Administrative, technical, environmental, regulatory, legislative, educational, stakeholder involvement and The authors concluded that global cooperation has accumulated more EEE shares during the Provides information. SWARA and WASPAS Criteria and alternatives are used to evaluate. Priority to be explored its purpose is to identify nanotechnology applications. The problem with choosing a car-sharing location is its price and ridership among the most important strategic decisions due to implications is one. vaspass- Based on a new integrated TOPSIS MCDM with fuzzy sets provides an approach For interval type-2 used for problems Selecting potential car-sharing stations. The Uncertainty Value intuition is ambiguous, performance of the WASPAS method implemented with information and Demonstrates reliability. Comparative analysis and sensitivity with existing methods to validate the result Analysis is presented in an interval-valued intuitive fuzzy environment. From the result it is seen that High effect (H) and is got the first rank whereas is the Low effect (L) got is having the lowest rank

Reference

1. Garg, Chandra Prakash. "Modeling the e-waste mitigation strategies using Grey-theory and DEMATEL framework." Journal of Cleaner Production 281 (2021): 124035.
2. Thakur, P., and S. Kumar. "Evaluation of e-waste status, management strategies, and legislations." International Journal of Environmental Science and Technology (2021): 1-10.
3. Dwivedy, Maheshwar, Pratik Suchde, and R. K. Mittal. "Modeling and assessment of e-waste take-back strategies in India." Resources, Conservation and Recycling 96 (2015): 11-18.
4. Amankwah-Amoah, Joseph. "Global business and emerging economies: Towards a new perspective on the effects of e-waste." Technological Forecasting and Social Change 105 (2016): 20-26.
5. Daum, Kurt, Justin Stoler, and Richard J. Grant. "Toward a more sustainable trajectory for e-waste policy: a review of a decade of e-waste research in Accra, Ghana." International journal of environmental research and public health 14, no. 2 (2017): 135.
6. Turaga, Rama Mohana R., Kalyan Bhaskar, Satish Sinha, Daniel Hinchliffe, Morton Hemkhaus, Rachna Arora, Sandip Chatterjee et al. "E-waste management in India: Issues and strategies." Vikalpa 44, no. 3 (2019): 127-162.
7. Hussain, Mumtaz, and Saniea Mumtaz. "E-waste: impacts, issues and management strategies." Reviews on environmental health 29, no. 1-2 (2014): 53-58.
8. Islam, Md Tasbirul, and Nazmul Huda. "Material flow analysis (MFA) as a strategic tool in E-waste management: Applications, trends and future directions." Journal of Environmental Management 244 (2019): 344-361.
9. Arya, Shashi, and Sunil Kumar. "E-waste in India at a glance: Current trends, regulations, challenges and management strategies." Journal of Cleaner Production 271 (2020): 122707.
10. Salmon, Daniel, Callie W. Babbitt, Gregory A. Babbitt, and Christopher E. Wilmer. "A framework for modeling fraud in E-waste management." Resources, Conservation and Recycling 171 (2021): 105613.
11. Hameed, Hameem Bin, Yousaf Ali, and Antonella Petrillo. "Environmental risk assessment of E-waste in developing countries by using the modified-SIRA method." Science of The Total Environment 733 (2020): 138525.
12. Lukowiak, Anna, Lidia Zur, Robert Tomala, Thi Ngoc LamTran, Adel Bouajaj, Wieslaw Strek, Giancarlo C. Righini, Mathias Wickleder, and Maurizio Ferrari. "Rare earth elements and urban mines: Critical strategies for sustainable development." Ceramics International 46, no. 16 (2020): 26247-26250.
13. Andeobu, Lynda, Santoso Wibowo, and Srimannarayana Grandhi. "An assessment of e-waste generation and environmental management of selected countries in Africa, Europe and North America: A systematic review." Science of The Total Environment 792 (2021): 148078.
14. Pathapalli, Venkateshwar Reddy, Veerabhadra Reddy Basam, Suresh Kumar Gudimetta, and Madhava Reddy Koppula. "Optimization of machining parameters using WASPAS and MOORA." World Journal of Engineering (2020).
15. Alam, Khubaib Amjad, Rodina Ahmed, Faisal Shafique Butt, Soon-Gohn Kim, and Kwang-Man Ko. "An uncertainty-aware integrated fuzzy AHP-WASPAS model to evaluate public cloud computing services." Procedia computer science 130 (2018): 504-509.
16. Wang, Chia-Nan, Yih-Tzoo Chen, and Chun-Chun Tung. "Evaluation of wave energy location by using an integrated MCDM approach." Energies 14, no. 7 (2021): 1840.
17. Stojčić, Mirko, Edmundas Kazimieras Zavadskas, Dragan Pamučar, Željko Stević, and Abbas Mardani. "Application of MCDM methods in sustainability engineering: A literature review 2008–2018." Symmetry 11, no. 3 (2019): 350.
18. Ghorshi Nezhad, Mohammad Reza, Sarfaraz Hashemkhani Zolfani, Fathollah Moztarzadeh, Edmundas Kazimieras Zavadskas, and Mohsen Bahrami. "Planning the priority of high tech industries based on SWARA-WASPAS methodology: The case of the nanotechnology industry in Iran." Economic research-Ekonomska istraživanja 28, no. 1 (2015): 1111-1137.
19. Rani, Pratibha, Arunodaya Raj Mishra, and Kamal Raj Pardasani. "A novel WASPAS approach for multi-criteria physician selection problem with intuitionistic fuzzy type-2 sets." Soft Computing 24, no. 3 (2020): 2355-2367.

20. Rani, Pratibha, Arunodaya Raj Mishra, and Kamal Raj Pardasani. "A novel WASPAS approach for multi-criteria physician selection problem with intuitionistic fuzzy type-2 sets." Soft Computing 24, no. 3 (2020): 2355-2367.
21. Kazimieras Zavadskas, Edmundas, Romualdas Baušys, and Marius Lazauskas. "Sustainable assessment of alternative sites for the construction of a waste incineration plant by applying WASPAS method with single-valued neutrosophic set." Sustainability 7, no. 12 (2015): 15923-15936.
22. Deveci, Muhammet, Fatih Canıtez, and Ilgın Gökaşar. "WASPAS and TOPSIS based interval type-2 fuzzy MCDM method for a selection of a car sharing station." Sustainable Cities and Society 41 (2018): 777-791.
23. Mardani, Abbas, Mehrbakhsh Nilashi, Norhayati Zakuan, Nanthakumar Loganathan, Somayeh Soheilirad, Muhamad Zameri Mat Saman, and Othman Ibrahim. "A systematic review and meta-Analysis of SWARA and WASPAS methods: Theory and applications with recent fuzzy developments." Applied Soft Computing 57 (2017): 265-292.
24. Mishra, Arunodaya Raj, and Pratibha Rani. "Interval-valued intuitionistic fuzzy WASPAS method: application in reservoir flood control management policy." Group Decision and Negotiation 27, no. 6 (2018): 1047-1078.
25. Bausys, Romualdas, Giruta Kazakeviciute-Januskeviciene, Fausto Cavallaro, and Ana Usovaite. "Algorithm selection for edge detection in satellite images by neutrosophic WASPAS method." Sustainability 12, no. 2 (2020): 548.