



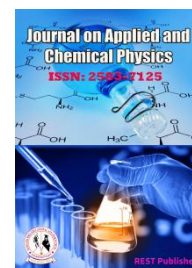
## Journal on Applied and Chemical Physics

Vol: 2(2), June 2023

REST Publisher; ISSN: 2583-7125

Website: <https://restpublisher.com/journals/jacp/>

DOI: <https://doi.org/10.46632/jacp/2/2/5>



# Solid Waste Management from a systems perspective using GRA methodology

\*Chandrasekar Raja, M. Ramachandran, Kurinjimalar Ramu, Chinnasami Sivaji

REST Labs, Kaveripattinam, Krishnagiri, Tamil Nadu, India.

\*Corresponding Author Email: [chandrasekarrajarsri@gmail.com](mailto:chandrasekarrajarsri@gmail.com)

**Abstract.** *most cases. The waste management procedure involves collecting the rubbish from different sources and disposing of it. This process includes the collection, transport, cleaning, analysis, final disposal of waste. This circumstance inspired Hand in Hand India (Hang India), a griddle non-profit organization that supports sustainable development, to work with the inhabitants of Karakul to change mindsets and behavior in their approach to trash management. The necessary infrastructure is lacking in small cities like Karakul to treat its solid waste. It resulted in a significant environmental problem and a lack of understanding among locals, according to Achieved Shekharan from HIHI. By assessing how closely each option resembles the ideal answer, grey relation analysis provides a potent instrument that may environments. A complex decision-making process, design idea evaluation involves a number of elements, including design requirements and limitations including client needs, product prices, and development time. Sanitary landfill (%), Incineration (%), and Open dumps (%), Others (%). Africa, Asia, Europe, North America, Latin America. from the result it is seen that Latin America and is got the first rank whereas is the Asia got is having the lowest rank. The value of the dataset for Sentiment analysis technique in GRA (Gray-related analysis) method shows that it results in Latin America and top ranking.*

**Key words:** Asia, Europe, North America.

## 1. INTRODUCTION

The secondary treatment technology, standards, relationship building with customers, and expansion of alternative markets for side and by-products should all be improved in the waste from municipalities recycling industry. For instance, the majority of solid waste management companies in industrialized nations offer management as well as environmental solutions for household waste in addition to business and industrial wastes. These businesses manage landfills, organic processing areas, waste-to-energy plants, and collection activities. They provide the clients the up-to-date information on trash collection schedule, garbage drop-off locations, garbage pickup, and container delivery, making them a great example of such modern municipal waste disposal facility [1] The book was written by more than 35 solid waste specialists, many of whom are connected through the CWG (Collaborative Working Party on Managing Solid Waste in Medium and high and Bottom Second Countries), an international organization of practice. These experts are from emerging prosperous, transitional, and developed countries. The project was managed by WASTE, a nonprofit organization (NGO) with a Dutch institute-like structure that focuses on global research and development efforts. [2] The PFD is a particularly useful tool for illustrating accurate estimation waste systems which are characterized by concurrent service provision by competing wireless carriers, or by a substantial amount of melding between the formal and informal sectors, and also among private as well as public service providers. A PFD, for example, allows for accurate representation of instances that are common in some of the comparison cities, like if waste is 's official intended for or arrives at a dumpsite but is instead selected there by regional impromptu waste pickers, returning the biodegradable wastes to the industrial lifetime; or when maw is illegally dumped, likely chosen over to isolate cans and bottles, eaten up out by animals, or the residue would then be removed by humans..[3] Also, data was gathered through exercises that were given to participants during workshops, including inquiries about the participants and the state of the city's waste management system in connection to the components, features, and issues related to them. On-site inspections of homes, hospitals, offices, schools, building sites, health care facilities, agricultural areas, and commercial locations were conducted to monitor waste management techniques. Collection and delivery systems, waste management practices, the identification of resources for reuse and recycling, and final disposal facilities were observed. The results were discussed, examined, and verified with pertinent city stakeholders. [4] In terms of economics, the handling of solid waste is a merit good, which is a good or service that the law mandates be provided for the good of all culture, regardless of the market's desire to supply it or the ability (or willingness) of the users to pay for it. In this case, the importance of the service is due

to its impact on public health. As a result, the city's role must continue to be important, if not in the supply of services, then in their regulation. However, it is virtually impossible to keep out non-payers because of the service's propensity for "freeride" behavior. [5] All of the components of the structure of waste management must be treated in an integrated manner in order to successfully integrate a system for handling solid waste into a societal context. The system must be a system which is focused on the market, enjoys the advantages of scale economies, and is acceptable in society. While some components of such a system would be profitable while others would be loss-making, some cross-subsidization would be necessary when building it, so the whole must be thought of holistically. All resources (and not only those that could be used right away) and all sources (home, commercial, industrial, institutional, construction, and agricultural) would need to be catered to. [6] George Waring organized the handling of solid waste in New York City using an engineering unit that included street cleaning, garbage pickup, conveyance, resource recovery, and disposal. The entire nation employed this tactic. and was controlled by city sanitation departments. In the decades that followed, developments included the development of trucks, motorized street cleaners, incineration, and hygienic landfills. [7] Waste management (SWM) rose to the top of local governments' list of essential public services. Solid waste from municipalities (MSW) was the primary focus of SWM services at the time, making MSWM a widely used term with a variety of definitions around the world. According to Hester and Harrison, the definition of MSW varies by nation and may include some or all home trash, as well as hazardous wastes, bulky wastes, street sweepings and litter, garbage from parks and gardens, as well as waste from institutions, businesses, and offices. Both national governments and garbage producers (industries) are now responsible for managing industrial trash. The regulation and oversight of industrial waste management fell within the purview of local governments in nations with greater decentralization, such as China and Japan. [8] It has also been established the cost of various projects, the expected rates of pollution control by various projects, and the split of the overall number of waste pollution produced by the operations of various hospitals. The results show that hospital organic waste disposal challenges in the county of Khuzestan are mostly caused by improper solid waste storing, packing, and transportation as opposed to a lack of facilities. The results of putting the recommended framework into practice in the Khuzestan district show that this methodology is workable for developing a big plan for such management of healthcare solid waste pollution. [9] Once solely a municipal and private sector concern, waste management today incorporates regional, state, and federal agencies. The main industrial nations (OECD) have recently implemented a number of legislative initiatives and processes. The two main justifications for regional solid waste management as opposed to local town and city-level solid waste management, which is the existing practice, are economics as well as technological and political viability. [10] The Component is a sustainable method for integrated solid waste management that includes garbage sorting and subsequent composting of the organic part. The Material Recycling Initiative works to supply by focusing on this biodegradable organic waste. The endeavor, which relies on a low-cost, low-tech, and low-risk approach, aims to improve the local situation while also serving as a template for duplication in developing countries. The project was beginning with a tiny pilot plant on the a 400 m<sup>2</sup> surface area in 2004 by the Boys and girls club of Bali Bud and Ayaan Bali Focus, an actually non organization (NGO). Before expanding to a greater material recovery facility, it examined and verified the operational parameters. [11] The literature that is currently accessible on landfill management in the food and beverage sector was studied for this study. Generally speaking, this field of study has few scientific publications, and the majority of references are from practical reports that various organizations have released. This study concentrated on the hospitality industry's for-profit sector, which is mostly made up of hotels and restaurants. Food waste, which accounts for about 40% of the waste from hotels and 60% of the waste from restaurants, is clearly the most major element of hospitality waste, according to the research mentioned in the debate about the depiction and measurement of trash in the hospitality industry. Several international organizations, programmers, and laws have been created as a result to lessen food waste in the hotel industry. [12]

## 2. MATERIAL AND METHOD

By assessing how closely each option resembles the ideal answer, grey relation analysis provides a potent instrument that may environments. A complex decision-making process, design idea evaluation involves a number of elements, including design requirements and limitations including client needs, product prices, and development time. These criteria are used to compare the design concepts produced during the concept generation process and determine which is the best. The examination of "grey relations" examines ambiguous relationships between one major element and all other variables in a particular system. According to the relationships between a specific day and the daily load patterns, the historical load set's load patterns are divided into a number of groups for the purposes of grey relation analysis, which is based on clustering. [1] The target cluster is the one whose load patterns most closely resemble the configuration for the study day. The hydro timetables for the types in the based on the particular are averaged to produce a preliminary schedule. Because the preliminary schedule produced by the aforementioned clustering grey connection analysis may violate some practical limitations, a heuristic rule-based search technique is created to find a feasible substandard schedule that fulfils all practical criteria. As was already noted, evaluating an airline's CSR involves making difficult decisions based on a wide range of factors, such as design restrictions and requirements. [2] These criteria are used to compare CSR performances in order to determine which is the best. The evaluation's goal is to determine the CSR performance that will maximize stakeholder satisfaction based on criteria employed. The seven methods listed above can each be used on their own to

assess performance. [3]None of them, though, is ideal. Just the performance evaluation method with the fewest downsides in the context of that study can be chosen by researchers. As a result, a workable technique for evaluating performance effectively aims to address problems with many variables and targets. [4] Financial data used to investigate the trust firms that were reformed into commercial banks are sometimes ambiguous or incomplete, so this research is constrained by reasonable boundaries, limiting itself to a scenario in which the amount of data is little and its importance is indeterminate. Given these factors, Grey Relation Analysis (GRA), which will be used to obtain the ratios most frequently employed in financial analysis to address sample size issues, may be the optimal strategy for this study. [5] The method was changed in light of the important evolutionary developments. In order to further support the validity of the findings, sensitivity and balancing tests—which are not frequently covered in maximal grey touch analyses—had been completed. Five had more consistent results that were generally of high quality. To enhance the overall performance qualities of the EDM approach, Lin and Lin applied the grey relation theory. Chakra Dhār and Venue used grey contact assessment to study the impact and parameter augmentation of system components for the EN-31 metallic electrochemical system. MRR is connected with many mechanical characteristics, including floor softness and electrode wear rate. The technique settings under consideration were enhanced taking into account the feed price, application voltage, and electrolyte attention, as well as various performance characteristics including MRR, overcut, roller mistakes, and floor roughness. The feed ratio was the variation that was most critically examined as a technique parameter impacting the ECM energy. [6] It was mentioned that many reactions might be used to improve the way parameters of the electric discharge device for metal matrix compounds employing orthogonal sequence. Moreover, the dark analysis version no longer necessitates knowledge of the diversity and distribution scheme of material data. based on the transportation device's grey-correlation evaluation The creation of a transport system should theoretically lower the cost of passenger and cargo drift and produce a "room integration" effect. [7]This will accelerate the exploitation of resources and population concentration, the development of new towns and city interiors. Costs like wages, bond yields, governmental action, regulations, policies, income taxes, and unemployment are examples of economic factors. All of these elements are independent of the company or investment, yet they have a significant impact on the investment's future value. Technological considerations are the effects that new procedures and tools may have on businesses. [8]Those who include automation and ICT study and development. Sociopolitical refers to something that combines social and political elements. For marketing reasons, a sector of the market is a collection of individuals who have one or more things in common. A topic or area of study within a certain major is referred to as a concentration. regulatory agency, autonomous governmental body created by legislative act to establish and then enforce standards in a particular field of operations in the economy's private sector. [9]The contribution margin displays the total amount of revenue that remains after overhead expenses to pay for fixed costs and make a profit for the business. [10]

### 3. RESULT AND DISCUSSION

TABLE 1. Solid Waste Management in data set

	DATA SET			
	Sanitary landfill (%)	Incineration (%)	Open dumps (%)	Others (%)
Africa	31.08	139.5	29.15	22.05
Asia	29.12	143	33.69	27.3
Europe	24.08	122.6	29.18	23.1
North America	23.17	128.3	24.6	17.59
Latin America	33.33	186.4	27.96	18.89

This table 1 shows that the value of dataset for Solid Waste Management in GRA (Gray-related analysis) method Alternative: Sanitary landfill(%), Incineration(%), and Open dumps(%), Others(%). Evaluation Preference: Africa, Asia, Europe, Naïve Latin America.

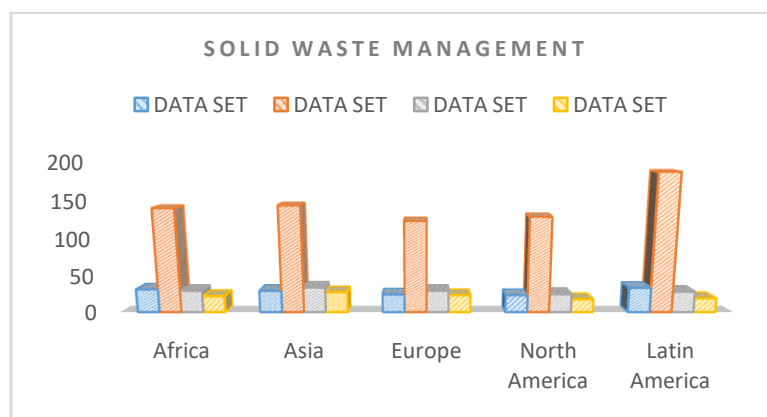


FIGURE 1. Solid Waste Management

This figure 1 shows that the value of dataset for Solid Waste Management in GRA (Gray-related analysis) method Alternative: Sanitary landfill(%), Incineration(%), and Open dumps(%), Others(%). Evaluation Preference: Africa, Asia, Europe, Naïve Latin America.

**TABLE 2.** Solid Waste Management in Normalized Data

Normalized Data			
Sanitary landfill (%)	Incineration (%)	Open dumps (%)	Others (%)
0.77854	0.2655	0.49945	0.5407
0.58563	0.3194	0	0
0.08957	0	0.49615	0.4325
0	0.0893	1	1
1	1	0.630363	0.8661

This table 2 shows that the values of Solid Waste Management in Normalized Data from using gray relation analysis Africa, Asia, Europe, Naïve Latin America.

**TABLE 3.** Solid Waste Management in Deviation sequence

Deviation sequence			
Sanitary landfill (%)	Incineration (%)	Open dumps (%)	Others (%)
0.22146	0.7345	0.50055	0.4593
0.41437	0.6806	1	1
0.91043	1	0.50385	0.5675
1	0.9107	0	0
0	0	0.369637	0.1339

This Table 3 shows that the values of sentiment analysis techniques in Deviation sequence from using gray relation analysis Find the for Africa, Asia, Europe, Naïve Latin America.

**TABLE 4.** Solid Waste Management in Grey relation coefficient

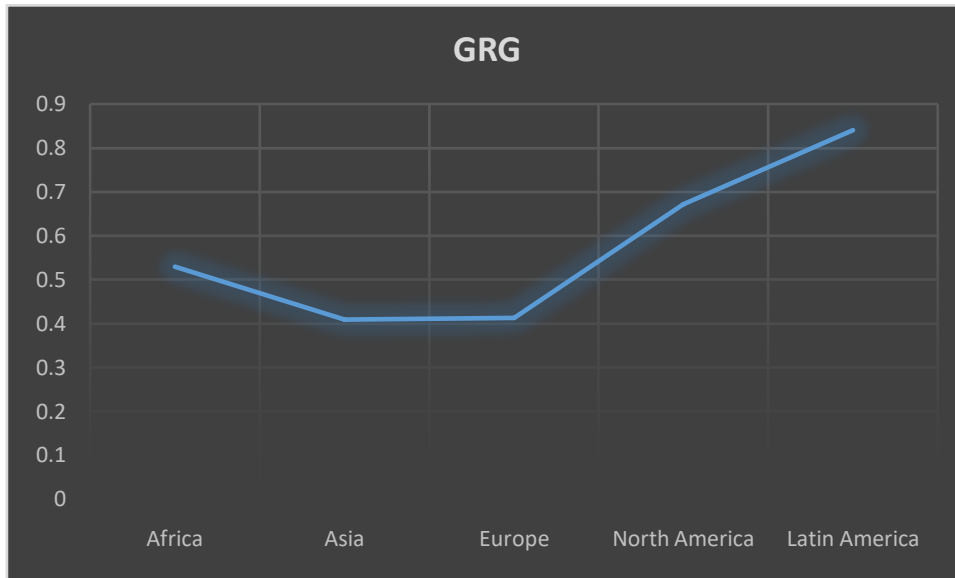
Grey relation coefficient			
Sanitary landfill (%)	Incineration (%)	Open dumps (%)	Others (%)
0.693	0.405038	0.4997	0.521
0.5468	0.423529	0.3333	0.333
0.3545	0.333333	0.4981	0.468
0.3333	0.354434	1	1
1	1	0.575	0.789

This Table 4 shows the values of Solid Waste Management in Grey relation coefficient from using gray relation analysis Find the for Africa, Asia, Europe, Naïve Latin America.

**TABLE 5.** Solid Waste Management in GRG

	GRG
Africa	0.5298
Asia	0.4093
Europe	0.4136
North America	0.6719
Latin America	0.8409

This table 5 shows that from the result Range of Africa, Asia, Europe, Naïve Latin America.



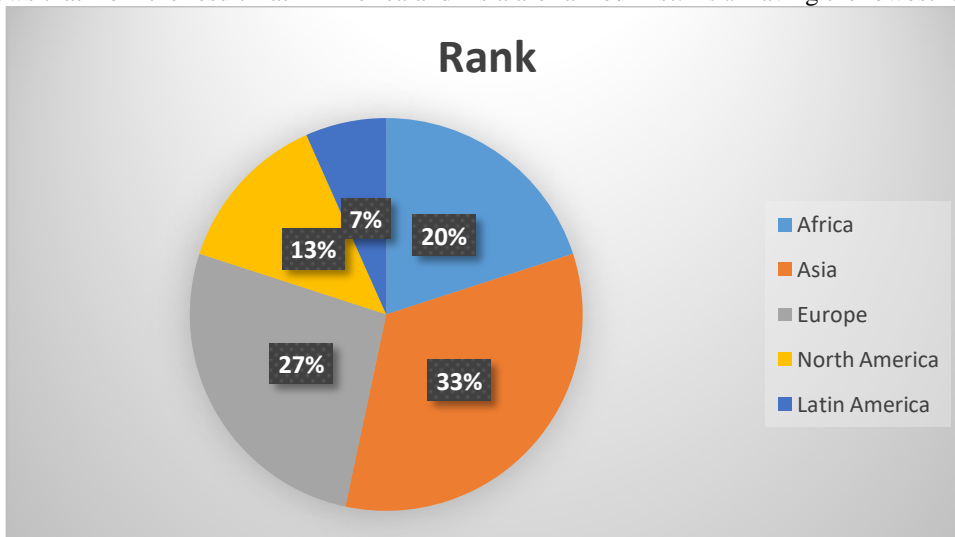
**FIGURE 2.**Solid Waste Management in GRG

Figure 2 shows the form the GRG Range of Africa, Asia, Europe, Naïve Latin America

**TABLE 6.** Solid Waste Management in Rank

	Rank
Africa	3
Asia	5
Europe	4
North America	2
Latin America	1

This table 6 shows that from the result Latin America and Asia are ranked first. Asia Having the lowest rank



**FIGURE 3.**Solid Waste Management in Rank

This figure 3 shows that from the result Latin America and found first rank whereas is the Asia got is having the lowest rank.

#### 4. CONCLUSION

All of the components of the structure of waste management must be treated in an integrated manner in order to successfully integrate a system for handling solid waste into a societal context. The system must be a system which is focused on the market, enjoys the advantages of scale economies, and is acceptable in society. While some components of such a system would be profitable while others would be loss-making, some cross-subsidization would be necessary

when building it, so the whole must be thought of holistically. All resources (and not only those that could be used right away) and all sources (home, commercial, industrial, institutional, construction, and agricultural) would need to be catered to. Financial data used to investigate the trust firms that were reformed into commercial banks are sometimes ambiguous or incomplete, so this research is constrained by reasonable boundaries, limiting itself to a scenario in which the amount of data is little and its importance is indeterminate. Given these factors, Grey Relation Analysis (GRA), which will be used to obtain the ratios most frequently employed in financial analysis to address sample size issues, may be the optimal strategy for this study. The method was changed in light of the important evolutionary developments. In order to further support the validity of the findings, sensitivity and balancing tests which are not frequently covered in maximal grey touch analyses had been completed. Five had more consistent results that were generally of high quality. To enhance the overall performance qualities of the EDM approach, Lin and Lin applied the grey relation theory. Chakra Dhār and Venue used grey contact assessment to study the impact and parameter augmentation of system components for the EN-31 metallic electrochemical system. MRR is connected with many mechanical characteristics, including floor softness and electrode wear rate. From the result it is seen that Latin America and is got the first rank whereas is the Asia got is having the lowest rank.

## REFERENCES

- [1]. Nanda, Sonil, and Franco Berruti. "Municipal solid waste management and landfilling technologies: a review." *Environmental Chemistry Letters* 19, no. 2 (2021): 1433-1456
- [2]. Sakai, S., S. E. Sawell, A. J. Chandler, T. T. Eighmy, D. S. Kosson, J. Vehlow, H. A. Van der Sloot, J. Hartlen, and O. Hjelmar. "World trends in municipal solid waste management." *Waste management* 16, no. 5-6 (1996): 341-350.
- [3]. Wilson, David C., Ljiljana Rodic, Anne Scheinberg, Costas A. Velis, and Graham Alabaster. "Comparative analysis of solid waste management in 20 cities." *Waste management & research* 30, no. 3 (2012): 237-254.
- [4]. Guerrero, Lilliana Abarca, Ger Maas, and William Hogland. "Solid waste management challenges for cities in developing countries." *Waste management* 33, no. 1 (2013): 220-232.
- [5]. Sharholly, Mufeed, Kafeel Ahmad, Gauhar Mahmood, and R. C. Trivedi. "Municipal solid waste management in Indian cities—A review." *Waste management* 28, no. 2 (2008): 459-467.
- [6]. Eriksson, Ola, M. Carlsson Reich, Björn Frostell, Anna Björklund, Getachew Assefa, J-O. Sundqvist, J. Granath, Andras Baky, and Lennart Thyselius. "Municipal solid waste management from a systems perspective." *Journal of cleaner production* 13, no. 3 (2005): 241-252.
- [7]. Krishna Kumar TP, D R Pallavi, M. Ramachandran, Chandrasekar Raja, "Evaluation of Techno-economic Using Decision Making Trial and
- [8]. Evaluation Laboratory (DEMATEL) Method", *Recent Trends in Management and Commerce*, 3(2), 2022, 101-110.
- [9]. Seadon, J. K. "Integrated waste management—Looking beyond the solid waste horizon." *Waste management* 26, no. 12 (2006): 1327-1336.
- [10]. Louis, Garrick E. "A historical context of municipal solid waste management in the United States." *Waste management & research* 22, no. 4 (2004): 306-322.
- [11]. Penugonda Rohit, M. Sudha, M. Ramachandran, Manjula Selvam, "A Study on Contemporary Issues of Business", *Recent trends in Management and Commerce* 4(2), 2023: 1-9.
- [12]. Memon, Mushtaq Ahmed. "Integrated solid waste management based on the 3R approach." *Journal of Material Cycles and Waste Management* 12, no. 1 (2010): 30-40.
- [13]. Karamouz, Mohammad, Banafsheh Zahraie, Reza Kerachian, Nemat Jaafarzadeh, and Najmeh Mahjouri. "Developing a master plan for hospital solid waste management: A case study." *Waste Management* 27, no. 5 (2007): 626-638.
- [14]. Kinnaman, Thomas C. "The economics of municipal solid waste management." *Waste Management* (2009): 2615.
- [15]. Hossain, Md Sohrab, Amutha Santhanam, NA Nik Norulaini, and AK Mohd Omar. "Clinical solid waste management practices and its impact on human health and environment—A review." *Waste management* 31, no. 4 (2011): 754-766.
- [16]. Gottinger, Hans W. "A computational model for solid waste management with application." *European Journal of Operational Research* 35, no. 3 (1988): 350-364.
- [17]. Zurbrugg, Christian, Margareth Gfrerer, Henki Ashadi, Werner Brenner, and David Küper. "Determinants of sustainability in solid waste management—The Gianyar Waste Recovery Project in Indonesia." *Waste management* 32, no. 11 (2012): 2126-2133.
- [18]. Manjunath, C. R., Ketan Rathor, Nandini Kulkarni, Prashant Pandurang Patil, Manoj S. Patil, and Jasdeep Singh. "Cloud Based DDOS Attack Detection Using Machine Learning Architectures: Understanding the Potential for Scientific Applications." *International Journal of Intelligent Systems and Applications in Engineering* 10, no. 2s (2022): 268-271.
- [19]. P.V. Saketh, Harshitha. T. N, Vimala Saravanan, M. Ramachandran, "The Impact of International Financial Reporting Standards (IFRS): A Qualitative Study", *Recent trends in Management and Commerce* 4(2), 2023: 10-16.
- [20]. Pirani, Sanaa I., and Hassan A. Arafat. "Solid waste management in the hospitality industry: A review." *Journal of environmental management* 146 (2014): 320-336.
- [21]. Sharma, Hari Bhakta, Kumar Raja Vanapalli, VR Shankar Cheela, Ved Prakash Ranjan, Amit Kumar Jaglan, Brajesh Dubey, Sudha Goel, and Jayanta Bhattacharya. "Challenges, opportunities, and innovations for effective solid waste management during and post COVID-19 pandemic." *Resources, conservation and recycling* 162 (2020): 105052.

- [22]. Pearce, David William, and R. Kerry Turner. "Market-based approaches to solid waste management." *Resources, Conservation and Recycling* 8, no. 1-2 (1993): 63-90.
- [23]. K. Yeshwanth, Abrar Hussain, M. Ramachandran, Kurinjimalar Ramu, "Computer Mediated Interaction in Business", *Recent trends in Management and Commerce* 4(2), 2023: 17-25.
- [24]. Kumar, Ashish, Ketan Rathor, Snehit Vaddi, Devanshi Patel, Preethi Vanjarapu, and Manichandra Maddi. "ECG Based Early Heart Attack Prediction Using Neural Networks." In *2022 3rd International Conference on Electronics and Sustainable Communication Systems (ICESC)*, pp. 1080-1083. IEEE, 2022.
- [25]. Vasanthi, P., S. Kaliappan, and R. Srinivasaraghavan. "Impact of poor solid waste management on ground water." *Environmental monitoring and assessment* 143, no. 1 (2008): 227-238.
- [26]. Aswini, S., S. Tharaniya, R. J. Joey Persul, B. Avinash Lingam, and P. Kogila. "Assessment of Knowledge, Attitude and Practice on Immunization among Primi Mothers of Children." *Indian Journal of Public Health Research & Development* 11, no. 3 (2020).
- [27]. Rathor, Ketan, Anshul Mandawat, Kartik A. Pandya, Bhanu Teja, Falak Khan, and Zoheib Tufail Khan. "Management of Shipment Content using Novel Practices of Supply Chain Management and Big Data Analytics." In *2022 International Conference on Augmented Intelligence and Sustainable Systems (ICAISS)*, pp. 884-887. IEEE, 2022.
- [28]. Desa, Asmawati, Nor Ba'yahAbdKadir, and Fatimah Yusooif. "A study on the knowledge, attitudes, awareness status and behaviour concerning solid waste management." *Procedia-Social and Behavioral Sciences* 18 (2011): 643-648.
- [29]. Al Ansari, Mohammed Saleh. "Improving solid waste management in gulf co-operation council states: Developing integrated plans to achieve reduction in greenhouse gases." *Modern Applied Science* 6, no. 2 (2012): 60.
- [30]. Coulter, Andre' C. "Graybox software testing methodology: embedded software testing technique." In *Gateway to the New Millennium. 18th Digital Avionics Systems Conference. Proceedings (Cat. No. 99CH37033)*, vol. 2, pp. 10-A. IEEE, 1999.
- [31]. Coulter, Andre' C. "Graybox software testing methodology: embedded software testing technique." In *Gateway to the New Millennium. 18th Digital Avionics Systems Conference. Proceedings (Cat. No. 99CH37033)*, vol. 2, pp. 10-A. IEEE, 1999.
- [32]. DeMillo, Richard A., Dany S. Guindi, W. M. McCracken, A. Jefferson Offutt, and Kim N. King. "An extended overview of the Mothra software testing environment." In *Workshop on Software Testing, Verification, and Analysis*, pp. 142-143. IEEE Computer Society, 1988.
- [33]. Palanimuthu, Kogila. "Birhanu Gutu, Leta Tesfaye, BuliYohannis Tasisa, Yoseph Shiferaw Belayneh, Melkamu Tamiru, and Desalegn Shiferaw." Assessment of Awareness on COVID-19 among Adults by Using an Online Platform: 26 Countries View." *Medico-legal Update* 21.
- [34]. Gutu, Birhanu, Genene Legese, Nigussie Fikadu, Birhanu Kumela, Firafan Shuma, Wakgari Mosisa, Zelalem Regassa et al. "Assessment of preventive behavior and associated factors towards COVID-19 in Qellam Wallaga Zone, Oromia, Ethiopia: A community-based cross-sectional study." *PloS one* 16, no. 4 (2021): e0251062.
- [35]. Rathor, Ketan, Sushant Lenka, Kartik A. Pandya, B. S. Gokulakrishna, Susheel Sriram Ananthan, and Zoheib Tufail Khan. "A Detailed View on industrial Safety and Health Analytics using Machine Learning Hybrid Ensemble Techniques." In *2022 International Conference on Edge Computing and Applications (ICECAA)*, pp. 1166-1169. IEEE, 2022.
- [36]. Sinoj Sajjan, 1Harshitha. T. N, M. Ramachandran, Chandrasekar Raja, "The influence of e-banking service quality on Commercial Bank", *Recent trends in Management and Commerce* 4(2), 2023: 26-34.
- [37]. Khan, Mohd. "Different approaches to black box testing technique for finding errors." *International Journal of Software Engineering & Applications (IJSEA)* 2, no. 4 (2011).
- [38]. Vegas, Sira, and Victor Basili. "A characterisation schema for software testing techniques." *Empirical Software Engineering* 10, no. 4 (2005): 437-466.
- [39]. Tasisa, Yirgalem Bekele, and Kogila Palanimuthu. "Psychosocial Impacts of Imprisonment among Youth Offenders in Correctional Administration Center, Kellem Wollega Zone, Ethiopia." *Medico-legal Update* 21, no. 2 (2021).
- [40]. Basili, Victor R., and Richard W. Selby. "Comparing the effectiveness of software testing strategies." *IEEE transactions on software engineering* 12 (1987): 1278-1296.
- [41]. V. Vineel Vijay, T. N. Harshitha, M. Ramachandran, Vimala Saravanan, "The Efficiency of Small Financial Institutions", *Recent trends in Management and Commerce* 4(2), 2023: 35-43.
- [42]. Palanimuthu, Kogila, Eshetu Fikadu Hamba Yigazu, Gemechu Gelalcha, Yirgalem Bekele, Getachew Birhanu, and Birhanu Gutu. "Assessment of Stress, Fear, Anxiety and Depression on COVID-19 Outbreak among Adults in South-Western Ethiopia." *Prof.(Dr) RK Sharma* 21, no. 1 (2021): 440.
- [43]. Rathor, Ketan, Keyur Patil, Mandiga Sahasra Sai Tarun, Shashwat Nikam, Devanshi Patel, and Sasanapuri Ranjit. "A Novel and Efficient Method to Detect the Face Coverings to Ensure the Safety using Comparison Analysis." In *2022 International Conference on Edge Computing and Applications (ICECAA)*, pp. 1664-1667. IEEE, 2022.