



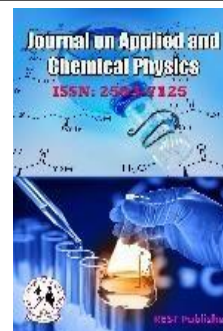
Journal on Applied and Chemical Physics

Vol: 2(1), March 2023

REST Publisher; ISSN: 2583-7125

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

DOI: <https://doi.org/10.46632/jacp/2/1/1>



Developments In Membrane Technology for Water Treatment Using the ELECTRE Method

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Abstract: *Water technology Water Carbon Aerogel, Solar Powered Groundwater Refineries and Electrochlorination Capacitive deionization using Technology (CDI) including rural areas for safe, Technologies for Drinking Water 'Rural Drinking Water and Innovative technologies in healthcare are described in the booklet 'Collection'. Nanotechnology is at the atomic or molecular level Many to use items Includes approaches and processes. Water technology development is very growth ELECTRE (Elimination Et Choice Translating Reality) analysis using the ELECTRE methods, performance comparisons combining an water pollution, pollution control, technology development, prospect of future technology development Alternative value and Onghuajiang river, Liaohe river, Haihe river, Yellow river, Yangtse river, Huaihe river Evaluation Parameters in value. Prospect of future technology development is got the first rank whereas is the water pollution is having the Lowest rank.*

Keywords: *MCDM, water pollution, pollution control, technology development and prospect of future technology development*

1. INTRODUCTION

Water technologies for safe, drinking water in rural areas, carbon aerogel, solar-powered ground water treatment plants and capacitive deionization technology (CDI) using Innovative for rural drinking water and sanitation In the booklet 'Collection of Techniques' Electro chlorination is described. Nanotechnology encompasses many approaches and techniques for manipulating substances on the atomic or molecular degree. Nanotechnology-based totally water treatment techniques are considered to be greater green and price-powerful as compared to conventional water treatment methods. These Includes: (eight) savings; (Nine) and distribution at the end. RO purification, generally called opposite osmosis, purification. This manner entails the usage of membrane era, which lets in the elimination of dissolved salts and other impurities from the water. This membrane has very first-rate pores that allow best water to pass thru Boiling. Simple way to purify water the trick is to boil it longer. Water purification. Reverse osmosis. Water chlorination distillation Addition of iodine solar purification Clay pot filtration. Aerators can help your faucet be more efficient. The aerator is attached to your kitchen faucet and reduces the amount of water that comes out without affecting the effect of washing or rinsing. They reduce splashing and help save 40 liters of water per day. MCDM models have so-called 'outranking relations'. Elimination and selective translational realism (ELECTRE) and its derivatives play an important role in this group. Multi-criteria decision-making (MCTM) Appl the theory is used calculation methods that include multiple criteria. The main parts are: First, it aims to create one or more advanced relationships, a set of detailed actions for each pair of way comparison; Second, an exploratory process describes to be solved: selection, ranking or ranking.

2. WATER TECHNOLOGY

Various strategies for water treatment and recycling have been advanced and used12-23. The most essential are reverse osmosis, ion alternate, electrolysis, electrolysis and adsorption. Among those, opposite osmosis, ion trade, electrolysis, and electrolysis are steeply-priced technologies, costing 10–450 US\$ in line with million liters of treated water [1]. Membrane technology is broadly well-known from ground water, systemic water, brackish water and sea water as a way of producing many aspects of water. Membrane technology business practices and business also used in sewage treatment, and more recently membrane Technology Secondary and Tertiary Municipalities

Produced waste water and oil discipline moved to water treatment area. In many cases, a Along with the help of membrane process another with the aim of manufacturing water of increasing purity and best for various functions. One kind of membrane can beautify the imagination of another to acquire desires ranging from wastewater disposal to the manufacturing of potable water from surprising resources. Opportunity to control overall water assets [2]. Test water for Pilot-plant studies Cincinnati tap water; Ohio River Water; Glendale, Ohio, well water; and low turbulence from the Cincinnati area Gravel pit water. Except for Cincinnati tap water all test water was trucked to the plant on call [3]. Water great and water pollutants have come to be massive problems throughout China's speedy economic growth, with each floor and groundwater supplies experiencing intense tiers of damage. Cannot be effectively degraded by natural means from point and non-point sources Large-scale pollution, water ways by being expelled into us, many Increase the self-purification capacity of water [4]. Domestic sewage includes many tributaries originating from various human activities. Two streams are distinguished in supply-separated sanitation ideas: (1) [5]. The principle of water infiltration Capillary pore diffusion version and Hagan-Byesville is defined by Eq. In this manner Average Pore Radius Calculated as a feature of membrane strain it is a simple and effective method in a roundabout way estimate the pore length, specifically for controlling spinning conditions when preparing hollow-fibre membranes [6]. The feed water used in CDI experiments may have very unique compositions – from analytical grade water with specific quantities of ions to complicated combos If so, it's miles first-class to make certain that the oxygen and CO₂-contents are known, kept regular and reported. Oxygen and CO₂-loose water may be received by using a nitrogen blanket in a water garage (recycling) vessel or by means of bubbling nitrogen gasoline through this tank. In well-known, we are able to distinguish the subsequent varieties of feed water [7]. The salinity of feed water to desalination facilities degrees from about a thousand water is commonly categorized as one in every Two types: sea water or brackish water TDS in most seawater sources is 30,000–45,000 Although mg/L, seawater reverse osmosis Membranes within the TDS range of 10,000 - 90,000 m/l Used to deal with water. Within the range of 1,000-10,000 m/l thats (Miley, 2001). Water sources (mainly ground water sources) opposite osmotic membranes to deal with Brackish water is used. The desalination approach, pre-Treatment measures, waste disposal approach and product reorientation (the influence of product change area of excess water) for a settling plant Feed water type may dictate design choices [8]. They can be used directly for water and wastewater remedy and water reuse or as part of a conventional treatment gadget. A form of membrane tactics is used in the field, including microfiltration, ultra filtration, nanofiltration, and opposite osmosis. Membrane filtration produces high exceptional water [9]. High stages have a look at affords a few sensible and ecological nomenclature methods for eliminating. Experimental water excellent the borehole (about four hundred–six hundred- ft [122–183-m]) of Taiwan Location of black leg-disease there is water around zero.6–2. Zero mg/l as, i.E., 12–forty-fold. Range defined by WHO. 2 This is excess oxygen and contains chlorine requirements it has no dissolved oxygen [10]. Many of the troubles round the arena associated with the shortage of clean, clean water are widely recognized: and thousands and thousands of human beings die annually, which includes three,900 children from risky water-borne illnesses. or human waste1 Countless human beings are stricken by ailment and pollution. Intestinal parasitic infections and diarrheal illnesses due to water-borne microorganism and enteric viruses have turn out to be fundamental reasons of malnutrition, as the meals eaten by using water-ill human beings is not well digested. Water elements from human interest: including heavy metals and lactates with traditional compounds first endocrine to increasing micro pollutants disruptors and nitrosamines [11].

In reaction China's government is the latest in a water crisis to conserve water in agriculture over the years for research on techniques money began to be spent. Zone, despite the fact that there may be Success of adoption by farmers Discussion of size. Excellent coverage producers publicly billion They have said that they can allocate Rs in investment in the event that They knew it would save water Unfortunately, regarding the economics of the water conservation era there are remarkably few studies in China, And the extent to which technologies are adopted, If they hold water, and communities There is no formal data on properties. They are being adopted. Beyond trends Water conservation in North China to raise awareness our aim is to paint a picture of the nation of the generation. Present day popularity [12]. Increasing demand and absence of easy water assets because of the rapid improvement of industrialization, populace boom and lengthy-term droughts have end up a difficulty worldwide. With this developing demand, various sensible strategies and solutions were followed to yield extra feasible water assets. The garage of rainwater for daily sports and increasing the catchment ability for storm water are just a few examples that could solve the troubles in short-time period. Water industries and governments in a few arid regions with plentiful of daylight, much less rainfall and lengthy-time period drought have a assignment to are searching for viable water assets. It is anticipated that round 4 billion people global enjoy to have no or little right of entry to smooth and sanitized water [13]. Water rules in preference to a small change. They trust that the water supply on this use is normally underpriced and overbuilt. They think that normally a far too low hobby fee is used in estimates worried with mission assessment studies, and the cutting-edge criminal trend in the direction of abolition of private belongings rights in want of centralized, deliberate use and manage of water is unwell-advised. There is seldom a concept of attempting to make better use of existing components as an

opportunity to new production. Frequently, elevating the rate of water to the customer a small amount could eliminate a number of the troubles cutting-edge in procurement and deliver of water [14]. The inclusion of a real historical past to the water-law troubles is a manifestation of the author's conviction that felony troubles in water sources troubles cannot be remote from monetary, technical, and political conditions. Therefore, excerpts are inserted from papers in fields along with economics, political technology, geography, and hydrogeology [15].

2.1. Water pollution

Water pollution means drinking water sources, for cooking, cleaning and swimming and use for other activities as well Contaminated by impossible substances. Contaminants are chemicals, debris, bacteria And include parasites. All kinds Pollutants also eventually enter the water.

2.2. Pollution control

Pollution control in environmental engineering, the various methods used to control damage to the environment through the discharge of harmful substances and energies.

2.3. Technology development

Invented in 1960, lasers were so ahead of their time that scientists didn't even know exactly where they might be used. Since then, lasers have found their way into almost every field, from medicine to consumer electronics to manufacturing

2.4. Prospect of future technology development

AI and machine learning are many technologies A built foundation. For example, AI Without, Internet of Things, Virtual Reality, Chat bots, facial recognition, robotics, automation or the amazing advances in self-driving cars We would not have reached. Onghuajiang River, Liohe River, Haihe River, Yellow River, Yangtze River, Huai River

3. ELECTRE METHOD

ELECTRE is a multi-level exam rating is a family with techniques alternatives to the underlying hassle by means of making the set of actions as accurate and applicable as viable or by way of casting off options that outperform others. Team selection is real- Very suitable for global selection-product Is an effective process for delivering the solution situations industrial manipulate alternatives towards Release of a chemical contaminant surroundings. In this have a look at, four consultant manufacturing plants in France High environment for EOL product solution in a mechanism for selecting, the final The module used ELECTRE III. An illustrative example is given, in which the product is a phone. At the final degree of the process of verifying the on environmental and social impact Indicators used exams, the signs must be taken care of into classes. In one case have a look at related to 4 indicators, 3 MCDA strategies have been in comparison to deal with the final stage [16]. Electricity (Elimination at Choice Trade Realistic to assist multi-scale choice making (MCDA) on many actual global choice-making issues, Environment from agriculture and up to water management, plans Create funds. Selection, team of worker's recruitment first delivery and so forth. Theoretical studies on the basics of ELECTRE methods are likewise energetic right now. We accept as true with its far excessive time to expand the comprehensive traits of ELECTRE strategies via emphasizing their state-of-the-art extensions [17]. Attracting users with the simplest version the goal is to upgrade to a previous version. Guide styles for both versions Based on (Start Page, Select Size, Weight systems, door settings and ranking view) algorithm was used has the same user interface both versions and the required values are different [18]. To overcome this shortcoming, ELECTRE easily captures the choice maker's subjective evaluation of the dealer choice standards. Accurate and consistent supplier choice consequences. Second, drawing an actual case, this observes as compared and outstanding among the traditional crisp and ELECTRE strategies. Of the three opportunity providers in our case, dealer C was discovered to be the maximum beneficial dealer under the ambiguous ELECTRE technique, whereas dealer A become identified because the most suitable provider whilst using the soft ELECTRE method [19]. The ELECTRE method was used as a transcendental relationship theory to analyse data related to the results matrix. Concordance and Discordance Indexes in Engineering Four Mathematical troubles can be taken into consideration as a degree of the dissatisfaction a choice maker makes use of in choosing an alternative. We take into account the M opportunity and n quit standards. Each alternative is rated according for every criterion shape a result matrix [20]. As mentioned above the ELECTRE algorithm there are some drawbacks if it is properly addressed will be very attractive to use the problem in network selection. It's Considers the application and top-ranked candidate networks of all alternatives required to be identified does not provide absolute ranking. In this paper, the ELECTRE algorithm an alternative to using the approach is developed [21]. The ELECTRE approach starts with the intuitively attractive prototype that can only make approximate comparisons of a DM's performance. Of alternatives this system allows programs that are not equal in number to be considered equal. Outreach does not have a print basis, but rather parameters and decision-making algorithm. It is still necessary to give the DM Analyst scores for alternatives against the criteria, but the priority system is 'designed' by an approach that sets limits that reflect the DM's preferences for inaccurate comparisons of these performances. [22]. To support the selection process, properly coordinated We are the ELECTRE TRI assistant We propose It guesses priority from

assignment examples given by DM Model parameters. The paper follows Organized: The next section is ELECTRE TRI A brief methodological description of the method Gives and chooses section 3 how processes Explains supporting [23]. ELECTRE is a first aid method that first applies the concept of a decision-making relationship; It should only be used if all criteria are encoded in numerical measurements with identical limits. The end Repair with four criteria Model for contract problem and sample with ELECTRE method Includes applied theory ELECTRE is from the best of alternatives from worst to worst is a system. The ELECTRE method was used for the actual selection Solid Waste Management Organization process [24]. Electre method of the previous methods has played a key role in the team. transcendental relationships. Outreach methods help to use incomplete value information, for example priority of judgments at the ordinal level [25]. There can be three types: mutual reinforcement effect (synergy), mutual weakening effect (redundancy) and hostile effect. For example, when rating sport cars, maximum speed and acceleration may be considered unnecessary because, in general, fast cars also have good acceleration. Therefore, although these two criteria are very important for DM-preferred sports cars, their overall significance is the importance of being considered individually of two criteria is smaller than the sum [26]. ELECTRE methods are required to accurately measure performance. The alternatives in each criterion and the corresponding stock for the mass of a criterion is its voting power Reflects, which is in favour of an over-relationship Contributes to the majority. Weights should not be dependent encryption of limits or scales and cannot be interpreted as conversion ratios like the compensating MCDA methods. Of ELECTRE methods Key Limit (All family systems of MCDA methods) may depend [27].

4. ANALYSIS AND DISCUSSION

TABLE 1. Water technology & ELECTRE method

	Onghuajiang river	Liaohe river	Haihe river	Yellow river	Yangtse river	Huaihe river
water pollution	550	350	99	120	63	55
pollution control	780	250	88	152	55	78
technology development	660	190	76	140	48	95
prospect of future technology development	570	350	98	166	78	82

Table 1 Shows the Water technology for analysis using the ELECTRE Method. water pollution, pollution control, technology development, prospect of future technology development and Onghuajiang river, Liaohe river, Haihe river, Yellow river, Yangtse river, Huaihe river it seen also for Data set of the value.

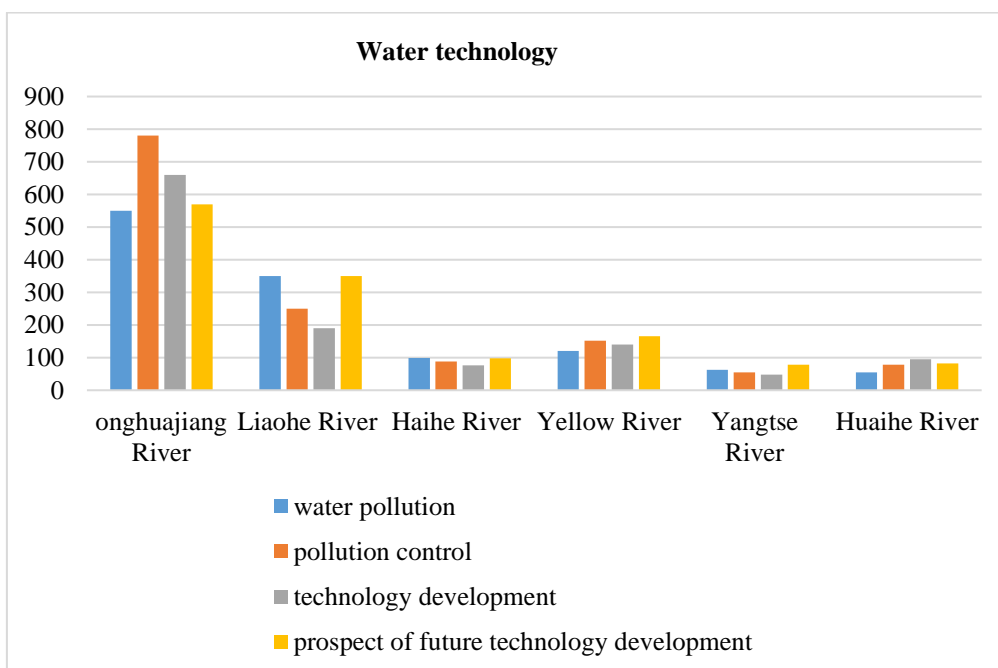


FIGURE 1. Water technology

Figure 1 Shows the Water technology for analysis using the ELECTRE Method. water pollution, pollution control, technology development, prospect of future technology development and Unguiding river, Liaohe river, Haihe river, yellow river, Yangtse river, Huaihe river it seen also for Data set of the value.

TABLE 2. Water technology SUM & SQRT

	Onghuajiang river	Liaohe river	Haihe river	Yellow river	Yangtse river	Huaihe river
water pollution	302500	122500	9801	14400	3969	3025
pollution control	608400	62500	7744	23104	3025	6084
technology development	435600	36100	5776	19600	2304	9025
prospect of future technology development	324900	122500	9604	27556	6084	6724
	1671400	343600	32925	84660	15382	24858
	1292.826	586.174	181.4525	290.9639	124.0242	157.6642

Table 2 shows the Operating system SUM & SQRT value of Alternative water pollution, pollution control, technology development, prospect of future technology development and Onghuajiang river, Liaohe river, Haihe river, Yellow river, Yangtse river, Huaihe river. This table mention the SUM & SQRT value in Onghuajiang river is showing the highest value for Yangtse river is showing the lowest value.

TABLE 3. Normalized Data Matrix

Normalized DM						
	Onghuajiang river	Liaohe river	Haihe river	Yellow river	Yangtse river	Huaihe river
water pollution	0.425424	0.597092	0.545597	0.412422	0.507965	0.348843
pollution control	0.603329	0.426494	0.484975	0.522402	0.443462	0.494722
technology development	0.510509	0.324136	0.418842	0.481159	0.387021	0.602546
prospect of future technology development	0.440894	0.597092	0.540086	0.570517	0.62891	0.520093

Table 3.Shows the Normalized Data Matrix of Alternative water pollution, pollution control, technology development, prospect of future technology development and Onghuajiang river, Liaohe river, Haihe river, Yellow river, Yangtse river, Huaihe river is Normalized Data Matrix value.

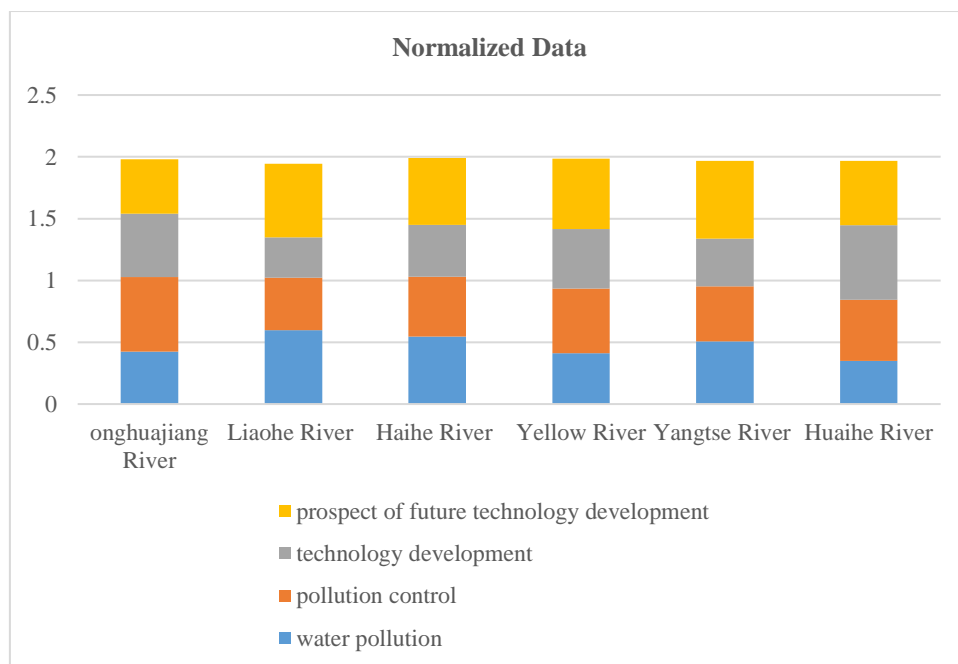


FIGURE 2. Normalized Data Matrix

Figure 2 Shows the Normalized Data Matrix of Alternative water pollution, pollution control, technology development, prospect of future technology development and Onghuajiang river, Liaohe river, Haihe river, yellow river, Yangtse river, Huaihe river is Normalized Data Matrix value.

TABLE 4. Weighted Normalized matrix

	0.2336	0.1652	0.3355	0.1021	0.0424	0.1212
	Onghuajiang river	Liaohse river	Haihe river	Yellow river	Yangtse river	Huaihe river
Water pollution	0.099379	0.09864	0.183048	0.042108	0.021538	0.04228
Pollution control	0.140938	0.070457	0.162709	0.053337	0.018803	0.05996
Technology development	0.119255	0.053547	0.140522	0.049126	0.01641	0.073029
Prospect of future technology development	0.102993	0.09864	0.181199	0.05825	0.026666	0.063035

Table 4 Shows the Weighted Normalized matrix value of the water pollution, pollution control, technology development, prospect of future technology development and Onghuajiang river, Liaohse river, Haihe river, Yellow river, Yangtse river, Huaihe river in Normalized Data Matrix multiplication criterion Weights this will be going to multiply again will be constant Weighted Normalized matrix value.

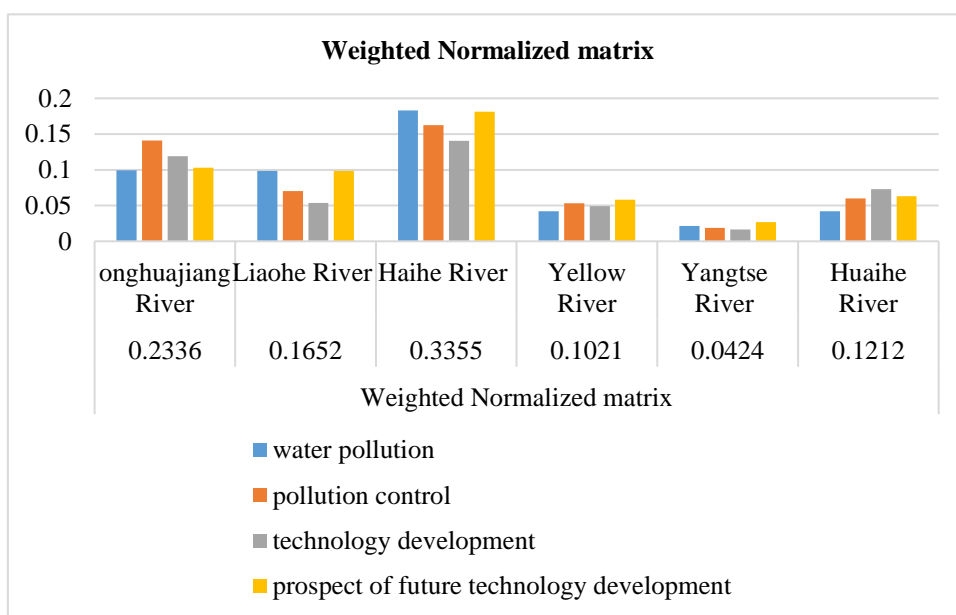


FIGURE 3. Weighted Normalized matrix

Figure 3Shows the Weighted Normalized matrix value of the water pollution, pollution control, technology development, prospect of future technology development and Onghuajiang river, Liaohse river, Haihe river, yellow river, Yangtse river, Huaihe river in Normalized Data Matrix multiplication criterion Weightsthis will be going to multiply again will be constant Weighted Normalized matrix value.

TABLE 5. Concordance Interval Matrix & Discordance Interval Matrix

C12 = {2}	D12 = {1,3,4,5,6}
C13 = {3,5}	D13 = {1,2,4,6}
C14 = {2}	D14 = {1,3,4,5,6}
C21 = {1,3,4,5,6}	D21 = {2}
C23 = {1,3,5}	D23 = {2,4,6}
C24 = {1,4}	D24 = {2,3,5,6}
C31 = {1,2,4,6}	D31 = {3,5}
C32 = {2,4,6}	D32 = {1,3,5}
C34 = {1,2,4,6}	D34 = {3,5}
C41 = {1,3,4,5,6}	D41 = {2}
C42 = {2,3,5,6}	D42 = {1,4}
C43 = {3,5}	D43 = {1,2,4,6}

Table 5 shows the Concordance Interval Matrix & Discordance Interval Matrix is showing the Common Value.

TABLE 6. Concordance Value

0	1	1	0	1	0
0	1	1	0	1	0
0	1	1	0	0	0
1	0	0	1	0	1
1	1	1	1	1	0
1	0	0	0	0	0
1	0	0	1	0	1
0	0	0	0	0	1
1	0	0	0	0	0

Table 6 Shows the Concordance Value for Water technology using the ELECTRE Method =IF(I12>=I13,1,0) to =IF(N14>=N15,1,0) is the Common Value.

TABLE 7. Concordance Interval Matrix

Concordance Interval Matrix						
	M1	M2	M3	M4		
M1	0	0.1652	0.3779	0.1652	0.7083	
M2	0.8348	0	0.6115	0.3357	1.782	
M3	0.6221	0.3885	0	0.6221	1.6327	
M4	0.8348	0.6643	0.3779	0	1.877	
	2.2917	1.218	1.3673	1.123	6	0.5

Table 7 Shows the Concordance Interval Matrix in shown the value Table 4 addition of I10 to N10.

TABLE 8. Concordance Index Matrix

Concordance Index Matrix				
	M1	M2	M3	M4
M1	0	0	0	0
M2	1	0	1	0
M3	1	0	0	1
M4	1	1	0	0

Table 8 Shows the Concordance Interval Matrix in shown the value of Water technology using the ELECTRE Method =IF(J29>=0.5,1,0) to =IF(M32>=0.5,1,0) is the Concordance Interval Matrix.

TABLE 9. Discordance value

	C1	C2	C3	C4	C5	C6
D12	0.041559	0.028183	0.020339	0.011229	0.002735	0.017681
	1					
D13	0.019876	0.045092	0.042526	0.007018	0.005128	0.030749
	1					
D14	0.003614	0	0.001849	0.016142	0.005128	0.020756
	1					
D21	0.041559	0.028183	0.020339	0.011229	0.002735	0.017681
	0.678146					
D23	0.021683	0.01691	0.022188	0.004211	0.002393	0.013068
	0.762121					
D24	0.037945	0.028183	0.01849	0.004913	0.007863	0.003075
	0.742731					
D31	0.019876	0.045092	0.042526	0.007018	0.005128	0.030749
	0.943092					
D32	0.021683	0.01691	0.022188	0.004211	0.002393	0.013068
	1					
D34	0.016262	0.045092	0.040677	0.009123	0.010256	0.009993
	0.902088					
D41	0.003614	0	0.001849	0.016142	0.005128	0.020756
	0					
D42	0.037945	0.028183	0.01849	0.004913	0.007863	0.003075
	1					
D43	0.016262	0.045092	0.040677	0.009123	0.010256	0.009993

Table 9 Shows the Discordance value of Water technology Table 4 Weighted Normalized matrix and table 5 Concordance Interval Matrix & Discordance Interval Matrix or using the Formula =ABS(B43-B44) and Maximum is shown the Manufacturing Companies Value.

TABLE 10. Discordance Index matrix

Discordance Interval Matrix					
	M1	M2	M3	M4	
M1	0	1	1	1	3
M2	0.678146	0	0.762121	0.742731	2.182997
M3	0.943092	1	0	0.902088	2.84518
M4	0	1	1	0	2
	1.621238	3	2.762121	2.644819	10.02818
				d bar	0.835681

Table 10 show the Discordance Index matrix for Water technology is using the Table 9 Discordance value.

TABLE 11. Discordance Index matrix

Discordance Index matrix				
	M1	M2	M3	M4
M1	1	0	0	0
M2	1	1	0	0
M3	0	0	1	0
M4	1	0	0	1

Table 11 show the Discordance Index matrix for Water technology is using the Table 8 Discordance value.

TABLE 12. Final Result of Net superior value & Net Inferior Value

	Rank	Net Inferior Value	Rank
M1	-1.5834	4	1.378762
M2	0.564	2	-0.817
M3	0.2654	3	0.083059
M4	0.754	1	-0.64482

Table 12 Shows the Final Result of Net superior value & Rank of the Net Inferior Value (Concordance Interval Matrix) water pollution, pollution control, technology development, prospect of future technology development and Onghuajiang river, Liaohe river, Haihe river, Yellow river, Yangtse river, Huaihe river is Net superior value and Net Inferior Value for water pollution 4th Rank, pollution control 2^{sd} Rank, technology development 3rd Rank, prospect of future technology development 1st Rank.

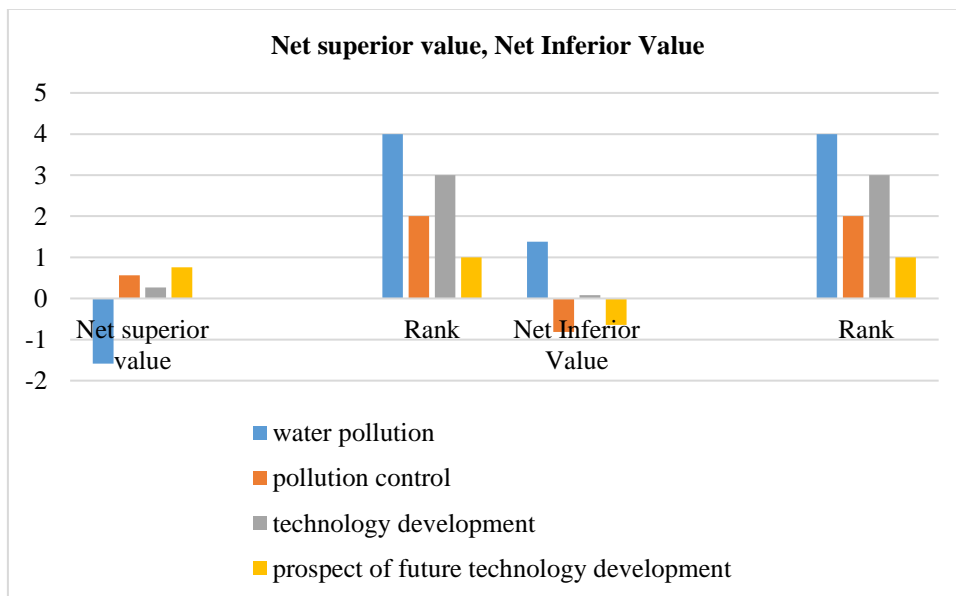


FIGURE 4. Shown the Rank

Figure 4 Final Result of Net superior value & Net Inferior Value Ranking of Water technology for analysis using the ELECTRE Method. Prospect of future technology development is got the first rank whereas is the water pollution is having the Lowest rank.

5. CONCLUSION

Various strategies for water treatment and recycling were evolved and used [12-23]. The maximum essential are reverse osmosis, ion trade, electrolysis, electrolysis and adsorption. Among those, opposite osmosis, ion trade, electrolysis, and electrolysis are costly technology, costing 10–450 US\$ in line with million liters of treated water [7]. of water from surface water, well water, brackish water and sea water Membrane as a way to produce various features Technology is widespread. Membrane technology Industrial processes and industrial wastewater treatment used in, and more recently membrane the formation is secondary and tertiary municipal wastewater and oil field produced water treatment moved to the area. In many cases, growing purity and produce excellent water for many purposes each membrane method is followed with purpose. In one type of membrane wastewater disposal starting from and achieving dreams some can be decorated with creativity to the production of potable water from unexpected sources. the final The module used ELECTRE (Elimination Et Choice Translating Reality) analysis using the ELECTRE methods, performance comparisons combining an ELECTRE (Elimination Et Choice Translating Reality) analysis using the ELECTRE methods, performance comparisons combining an water pollution, pollution control, technology development, prospect of future technology development Alternative value and Onghuajiang river, Liaohe river, Haihe river, Yellow river, Yangtse river, Huaihe river Evaluation Parameters in value. Prospect of future technology development is got the first rank whereas is the water pollution is having the Lowest rank.

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