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Influence of Environmental Elements on Involvement of Individuals with Intellectual Disabilities in the Community through Weighted Aggregated Sum Product Assessment (WASPAS) Method

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Abstract. *Community participation is crucial for individuals with intellectual disabilities (ID) to lead fulfilling lives and integrate into society. The degree of involvement in community activities and the level of support provided by the environment significantly influence their overall well-being and quality of life. This study aims to explore the impact of environmental factors on the community participation of persons with an intellectual disability, utilizing the Weighted Aggregated Sum Product Assessment (WASPAS) method as a decision-making tool. The research employed a mixed-methods approach, combining quantitative surveys and qualitative interviews to comprehensively examine the influence of environmental factors on community integration for individuals with ID. A carefully designed questionnaire was administered to a diverse sample of persons with intellectual disabilities, covering aspects related to their participation, perception of the environment, and support received. Additionally, in-depth interviews were conducted with selected participants and their caregivers to gain deeper insights into their experiences and challenges faced in engaging with their communities. The WASPAS method was employed to analyze and prioritize the significance of various environmental factors in affecting community participation outcomes. This multi-criterion decision-making approach facilitated the identification of key barriers and facilitators, enabling a nuanced understanding of the interplay between the environment and community involvement. The findings revealed that environmental factors significantly impact community participation for persons with an intellectual disability. Factors such as accessibility of public spaces, social inclusivity, availability of support services, and societal attitudes were identified as key determinants affecting their level of involvement. Moreover, the study highlighted the importance of promoting a more inclusive and supportive environment to enhance the overall well-being and social integration of individuals with ID. The alternatives are Availability of Accessible Public Transportation (A1), Accessibility of Public Spaces (A2), Community Awareness and Acceptance (A3), Employment Opportunities and Support (A4), Educational Accessibility (A5) and Healthcare Services and Support (A6). The evaluation parameters are Increase in Community Participation (C1), Enhanced Quality of Life (C2), Social Inclusion and Integration (C3), Cost of Implementation (C4), Technological Feasibility (C5) and Environmental Impact (C6). The result is Accessibility of Public Spaces (A2) is got first rank and Community Awareness and Acceptance (A3) is got lowest rank.*

1. INTRODUCTION

The notion of environment is frequently employed in medical literature in a comprehensive manner, encompassing all non-genetic elements such as dietary habits, way of life, and disease-causing agents. In this expansive context, environmental factors play a significant role in the development of the majority of human cancers. However, within a more precise context, environmental elements encompass solely the (natural or human-made) substances encountered by individuals in their daily routines, over which they possess little to no personal influence. Among the most noteworthy 'environmental' exposures, as defined within this stringent framework, are pollution of outdoor and indoor air, as well as contamination of soil and drinking water. In this assessment of the available evidence linking exposure to specific (precisely defined) environmental factors and the likelihood of developing cancer, we examine the subsequent sources of potential contact with carcinogens present in the environment: asbestos, outdoor air pollution which includes proximity to significant industrial emission origins, second-hand tobacco smoke (environmental tobacco smoke), indoor radon, other origins of indoor air pollution, arsenic found in drinking water, by-products of chlorination in drinking water, and additional pollutants within drinking water. The rise in occurrence within a brief timeframe implies that external elements, alongside genetic factors, might play a role in the emergence of these conditions. Instances of these factors include Epstein-Barr virus infection, cigarette smoking, insufficient vitamin D, limited sun exposure, and adolescent obesity, all recognized as potential risks for multiple sclerosis. Additionally, interactions with the microbiome are deemed significant in autoimmune disease development, like multiple sclerosis, potentially through molecular mimicry or bystander immune activation. Nonetheless, these mechanisms have yet to be definitively proven in human autoimmune disorders. Strachan's "hygiene hypothesis" proposes a connection between the reduced prevalence of infectious diseases and the surge in chronic inflammatory conditions in developed nations. The variations in genetic susceptibility among different populations might partially account for the noticeable differences in occurrence rates across various ethnic groups. Conversely, multiple observations also suggest the significance of environmental influences. For instance, the rise in incidence rates among migrant populations, findings from twin studies, and instances of "epidemics" of type 1 diabetes all underscore the role of environmental factors. The global incidence of type 1 diabetes is on the rise, affecting both low and high prevalence populations, with an overall increase of 3.0% per year from 1960 to 1996. This escalating trend indirectly points to the pivotal contribution of environmental elements. Identifying these factors holds significance for designing intervention studies aimed at preventive measures. In this review, we briefly delve into the current theories regarding the disease's origins and explore key potential environmental influences, including viral infections, dietary aspects, growth patterns, toxins, risks during ante- and perinatal periods, as well as stress-related life events. The initial contribution of this study builds upon prior research related to conditional measures, demonstrating that a meticulous examination of both complete and partial conditional measures enables us to untangle the influence of environmental elements on the production process in its dual components: their impact on the attainable range within the input-output space, and/or their influence on the distribution of efficiency levels. This approach is unprecedented in existing literature. Additionally, novel inference techniques are introduced by modifying appropriate bootstrap methodologies. Secondly, this study introduces a groundbreaking two-stage method to assess the impact of environmental factors on the production process, employing conditional efficiency measures. This approach diverges from the limitations of the conventional two-stage analysis. Notably, our method also yields an inefficiency measure adjusted for the primary effects of environmental factors. Consequently, it becomes possible to rank firms based on their managerial efficiency, even in the presence of varying environmental conditions. We assess the method's effectiveness through three distinct strategies for producing simulated data. The initial approach employs the identical statistical model as embraced by our method. This grants us the opportunity to scrutinize how variations in sample quality and diverse biological scenarios impact the precision of the resulting estimates. The remaining two strategies provide a means to examine the method's performance within scenarios that diverge from the underlying assumptions of the inference model.

2. MATERIAL AND METHOD

Alternatives: The availability of accessible public transportation (A1) is crucial for promoting inclusivity and independence for individuals with disabilities. Accessible transportation options, such as wheelchair ramps on buses and trains, ensure that people with mobility challenges can travel with ease and participate in social and economic activities. By investing in A1, society can break down barriers and create a more inclusive environment. Accessibility of public spaces (A2) is another important aspect of creating an inclusive society. This involves designing and adapting public spaces, such as parks, sidewalks, and buildings, to accommodate people with disabilities. Implementing features like ramps, elevators, and braille signage ensures that everyone can access and enjoy public spaces, fostering a sense of belonging and equality. Community awareness and acceptance (A3) play a pivotal role in shaping attitudes towards individuals with disabilities. By promoting education and awareness campaigns, society can reduce stigma and misconceptions. Encouraging inclusivity and empathy within communities fosters a supportive environment for individuals with disabilities, leading to enhanced social integration and overall well-being. Employment opportunities and support (A4) are essential for empowering individuals with disabilities to participate in the workforce. Removing barriers to employment, providing reasonable accommodations, and promoting inclusive hiring practices can lead to a more diverse and talented workforce. It also ensures that people with disabilities can contribute their skills and talents to the economy and society. Educational accessibility (A5) is critical for promoting equal opportunities in learning. Implementing inclusive educational practices and providing necessary resources and support enable students with disabilities to fully participate in academic activities. By embracing diverse learning styles and needs, educational institutions can create an environment that fosters the growth and development of all students. Healthcare services and support (A6) are vital to ensuring the well-being of individuals with disabilities. Access to quality healthcare, specialized therapies, and assistive devices can significantly improve their overall quality of life. By focusing on A6, society can ensure that healthcare services are tailored to meet the unique needs of individuals with disabilities, promoting their physical and mental health.

Increase in Community Participation (C1): This parameter gauges the extent to which the project engages and involves the local community. It assesses factors such as the number of participants, their level of engagement, and the diversity of representation. A higher score suggests a project's success in fostering active community involvement, which can lead to better decision-making, ownership, and long-term sustainability.

Enhanced Quality of Life (C2): This parameter measures the positive changes in individuals' well-being and overall living conditions resulting from the project. It considers factors like improved access to basic services, healthcare, education, and employment opportunities. A successful initiative should lead to quantifiable enhancements in the quality of life for community members, reflecting its meaningful impact.

Social Inclusion and Integration (C3): This parameter evaluates the project's contribution to reducing social disparities and promoting inclusivity. It examines whether marginalized or vulnerable groups have benefited and whether the project has fostered social cohesion and integration. A higher score indicates a project's effectiveness in creating a more equitable and harmonious community.

Cost of Implementation (C4): This parameter assesses the financial resources required to execute the project. It includes both direct expenses and indirect costs, such as infrastructure development, personnel, and administrative expenses. An efficient project should achieve its goals while maintaining cost-effectiveness and budget adherence.

Technological Feasibility (C5): This parameter examines the practicality of the project's technological components. It considers factors like the availability of necessary infrastructure, technological expertise, and the compatibility of solutions with existing systems. A feasible project should leverage appropriate technologies to ensure smooth implementation and long-term functionality.

Environmental Impact (C6): This parameter evaluates the project's influence on the environment and natural resources. It assesses potential harm, such as pollution, resource depletion, and habitat disruption, as well as positive outcomes like sustainability practices and reduced ecological footprint. A favourable score indicates a project's commitment to environmental responsibility and a balanced approach to development.

Method: The WASPAS technique, a highly efficient approach for Multiple Criteria Decision Making (MCDM), has found practical application in various real-world engineering and managerial scenarios. This method seamlessly combines two fundamental MCDM models: the Weighted Product Model (WPM) and the Weighted Sum Model (WSM). The fusion of WPM and WSM involves employing a blending parameter, typically set at 0.5, resulting in more robust rankings when addressing MCDM challenges. Numerous investigations have been conducted utilizing this approach due to its notable benefits. Furthermore, the WASPAS approach has been expanded to encompass diverse uncertain and fuzzy contexts, such as hesitant fuzzy, intuitionistic fuzzy, spherical fuzzy, interval type-2 fuzzy, Pythagorean fuzzy, and single-valued neuromorphic environments. These advancements underline the versatility of the WASPAS method, making it applicable to a wide array of environments and problems. To clarify, we opted for this approach in our present study because its efficacy has been validated through extensive prior research endeavours. Various studies across different fields have employed the WASPAS technique. The use of both the Analytical Hierarchy Process (AHP) and WASPAS methods together is not uncommon, and several scholarly works have utilized AHP to establish criterion weight values and WASPAS for alternative selection. For instance, Madić et al. assessed machining processes through the amalgamation of AHP and WASPAS, while Turskis et al. employed the fuzzy variants of these methodologies for choosing construction sites. Classic versions of these techniques were applied to laser cutting in one instance. Another study employed the Step-wise Weight Assessment Ratio Analysis (SWARA) in conjunction with WASPAS to select solar power plant sites. Similarly, the combination of SWARA and Quality Function Deployment (QFD) methods was suggested to address supplier selection in a different context. SWARA was additionally utilized to determine criteria significance. This combined approach was also employed for staff selection within the tourism sector. These integrated methodologies have found application in a multitude of decision-making scenarios and environments. However, the main distinction lies in utilizing multiplication as the operative process instead of addition. Both WSM and WPM are frequently denoted as scoring techniques. The newer generation of MCDM methods introduces the Weighted Aggregated Sum Product Assessment (WASPAS), which has been proposed by [author's name]. This method represents a unique fusion of the well-established Weighted Sum Model (WSM) and

Weighted Product Model (WPM) approaches. The underlying mathematical principles of WASPAS are relatively straightforward, enabling it to yield more precise outcomes compared to conventional WSM and WPM methodologies. Thanks to its uncomplicated computational process and result accuracy, WASPAS has garnered notable attention from decision makers across various domains and is progressively gaining recognition as an effective decision-making instrument. Remarkably, despite its wide adoption, the application of WASPAS in the realm of cloud computing decision making remains unexplored. This study pioneers the utilization of the WASPAS model to evaluate cloud computing services, marking the inaugural effort in this direction.

3. RESULT AND DISCUSSION

TABLE 1. Environmental Factors

	C1	C2	C3	C4	C5	C6
A1	44.65000	54.76000	45.87000	56.98000	43.43000	34.76000
A2	77.75000	65.87000	55.86000	75.97000	55.75000	36.86000
A3	54.99000	53.87000	51.75000	56.99000	85.65000	66.74000
A4	65.87000	44.76000	76.77000	66.98000	53.03200	52.63000
A5	56.88000	53.87000	66.87000	64.87000	64.21000	53.67000
A6	57.87000	62.87000	64.87000	54.86000	42.64000	73.54000

Shows the table 1 Environmental factor dataset for using WASPAS method. The alternatives are Availability of Accessible Public Transportation (A1), Accessibility of Public Spaces (A2), Community Awareness and Acceptance (A3), Employment Opportunities and Support (A4), Educational Accessibility (A5) and Healthcare Services and Support (A6). The evaluation parameters are Increase in Community Participation (C1), Enhanced Quality of Life (C2), Social Inclusion and Integration (C3), Cost of Implementation (C4), Technological Feasibility (C5) and Environmental Impact (C6).

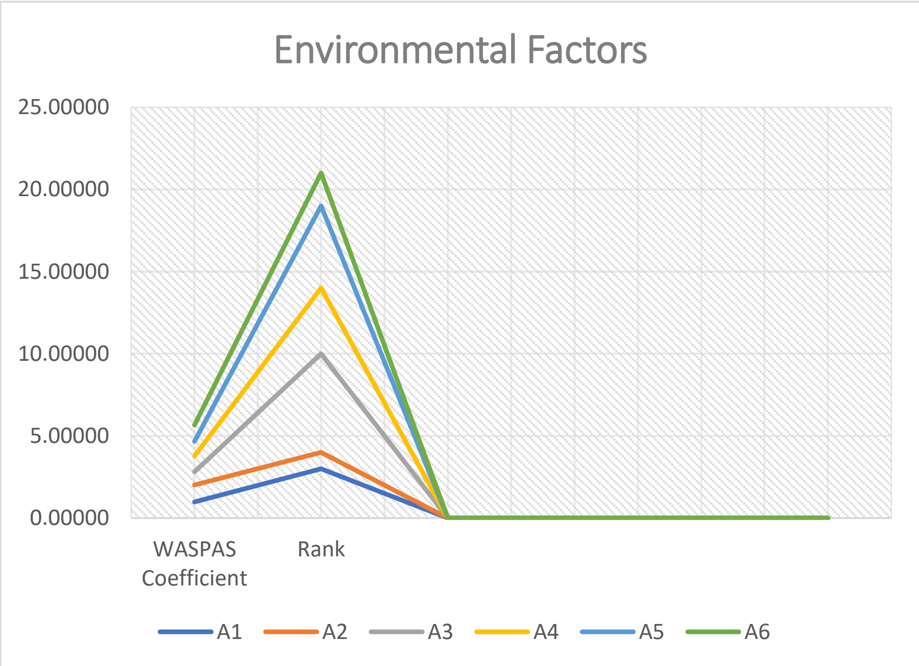


FIGURE 1. Environmental Factors

Shows the Figure 1 Environmental factor dataset for using WASPAS method. The alternatives are Availability of Accessible Public Transportation (A1), Accessibility of Public Spaces (A2), Community Awareness and Acceptance (A3), Employment Opportunities and Support (A4), Educational Accessibility (A5) and Healthcare Services and Support (A6). The evaluation parameters are Increase in Community Participation (C1), Enhanced Quality of Life (C2), Social Inclusion and Integration (C3), Cost of Implementation (C4), Technological Feasibility (C5) and Environmental Impact (C6).

TABLE 2. Performance value

A1	0.57428	0.83133	0.59750	0.96279	0.98181	1.00000
A2	1.00000	1.00000	0.72763	0.72213	0.76484	0.94303
A3	0.70727	0.81782	0.67409	0.96263	0.49784	0.52083
A4	0.84720	0.67952	1.00000	0.81905	0.80404	0.66046
A5	0.73158	0.81782	0.87104	0.84569	0.66407	0.64766
A6	0.74431	0.95446	0.84499	1.00000	1.00000	0.47267

Shows the Table 2 Performance value of environmental factor. alternatives are Availability of Accessible Public Transportation (A1), Accessibility of Public Spaces (A2), Community Awareness and Acceptance (A3), Employment Opportunities and Support (A4), Educational Accessibility (A5) and Healthcare Services and Support (A6). The evaluation parameters are Increase in Community Participation (C1), Enhanced Quality of Life (C2), Social Inclusion and Integration (C3), Cost of Implementation (C4), Technological Feasibility (C5) and Environmental Impact (C6).

TABLE 3. Weight

	Weight					
A1	0.25	0.25	0.25	0.25	0.25	0.25
A2	0.25	0.25	0.25	0.25	0.25	0.25
A3	0.25	0.25	0.25	0.25	0.25	0.25
A4	0.25	0.25	0.25	0.25	0.25	0.25
A5	0.25	0.25	0.25	0.25	0.25	0.25
A6	0.25	0.25	0.25	0.25	0.25	0.25

Shows the Table 3. Environmental Factors weights are almost same value 0.25

TABLE 4. Weighted normalized decision matrix (WSM)

	Weighted normalized decision matrix (WSM)					
A1	0.14357	0.20783	0.14937	0.24070	0.24545	0.25000
A2	0.25000	0.25000	0.18191	0.18053	0.19121	0.23576
A3	0.17682	0.20446	0.16852	0.24066	0.12446	0.13021
A4	0.21180	0.16988	0.25000	0.20476	0.20101	0.16511
A5	0.18289	0.20446	0.21776	0.21142	0.16602	0.16192
A6	0.18608	0.23861	0.21125	0.25000	0.25000	0.11817

Shows the table 4 "The weighted normalized decision matrix for WSM for the cotton Environmental Factors using the WASPAS method is shown in Table 2, which is computed by dividing the value in the dataset by the highest value of a given value in the dataset."

TABLE 5. Weighted normalized decision matrix (WPM)

	Weighted normalized decision matrix (WPM)					
A1	0.87052	0.95487	0.87919	0.99057	0.99542	1.00000
A2	1.00000	1.00000	0.92359	0.92184	0.93518	0.98544
A3	0.91706	0.95097	0.90611	0.99052	0.83999	0.84952
A4	0.95939	0.90793	1.00000	0.95132	0.94693	0.90149
A5	0.92484	0.95097	0.96607	0.95897	0.90272	0.89709
A6	0.92883	0.98841	0.95877	1.00000	1.00000	0.82916

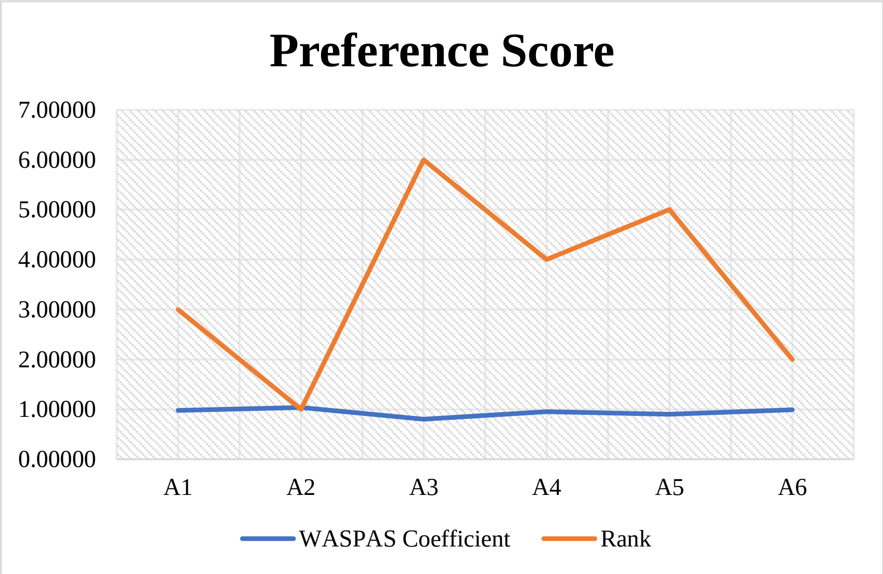
Shows the table 5 "The weighted normalized decision matrix for WPM for the cotton Environmental Factors using the WASPAS method is shown in Table 2, which is computed by dividing the value in the dataset by the highest value of a given value in the dataset."

TABLE 6. Preference Score for (WSM & WPM)

	Preference Score (WSM	Preference Score (WPM)
A1	1.23693	0.72061
A2	1.28941	0.78461
A3	1.04512	0.55854
A4	1.20257	0.70739
A5	1.14447	0.65983
A6	1.25411	0.72984

Shows the table 6 preference score for WSM method. A2 has the highest preference score of 1.28941, which means it is the most preferred environmental factor among the listed ones. On the other hand, A3 has the lowest preference score of 1.04512, indicating that it is the least preferred or considered less important compared to the other factors. Preference score for WPM method. Based on these scores, we can infer that option A2 has the highest preference score (0.78461) for its positive impact on the environment, making it the most environmentally favorable option among the presented choices. On the other hand, option A3 has the lowest preference score (0.55854) in terms of its environmental impact, making it the least preferred choice among the options.

FIGURE 2. Preference score for (WSM & WPM)



Shows the figure 2 preference score for WSM method. A2 has the highest preference score of 1.28941, which means it is the most preferred environmental factor among the listed ones. On the other hand, A3 has the lowest preference score of 1.04512, indicating that it is the least preferred or considered less important compared to the other factors. Preference score for WPM method. Based on these scores, we can infer that option A2 has the highest preference score (0.78461) for its positive impact on the environment, making it the most environmentally favorable option among the presented choices. On the other hand, option A3 has the lowest preference score (0.55854) in terms of its environmental impact, making it the least preferred choice among the options.

TABLE 7. WASPAS Coefficient & rank

	lambda	WASPAS Coefficient	Rank
A1		0.97877	3
A2		1.03701	1
A3		0.80183	6
A4		0.95498	4
A5		0.90215	5
A6	0.5	0.99197	2

Shows the table 7 Environmental Factors for WASPAS Coefficient & Rank. The lambda value is 0.5. Availability of Accessible Public Transportation (A1) has a WASPAS Coefficient of 0.97877, which ranks it as the third-best option among the given alternatives. It performs well, but there are two other alternatives with higher coefficients. Accessibility of Public Spaces (A2) has the highest WASPAS Coefficient of 1.03701, making it the top-ranked alternative. This means A2 is the most favorable choice in terms of meeting the environmental criteria. Community Awareness and Acceptance (A3) has the lowest WASPAS Coefficient of 0.80183, ranking it as the sixth and last option among the alternatives. It performs relatively poorly compared to the other alternatives. Employment Opportunities and Support (A4) has a WASPAS Coefficient of 0.95498, which ranks it as the fourth-best alternative. While it performs better than A3, it is still behind the top three alternatives. Educational Accessibility (A5) has a WASPAS Coefficient of 0.90215, placing it fifth in the ranking. It performs better than A3 but is outranked by the top four alternatives. Healthcare Services and Support (A6) has a WASPAS Coefficient of 0.99197, making it the second-best option among the alternatives. It performs well but falls just short of the top-ranked alternative (A2).

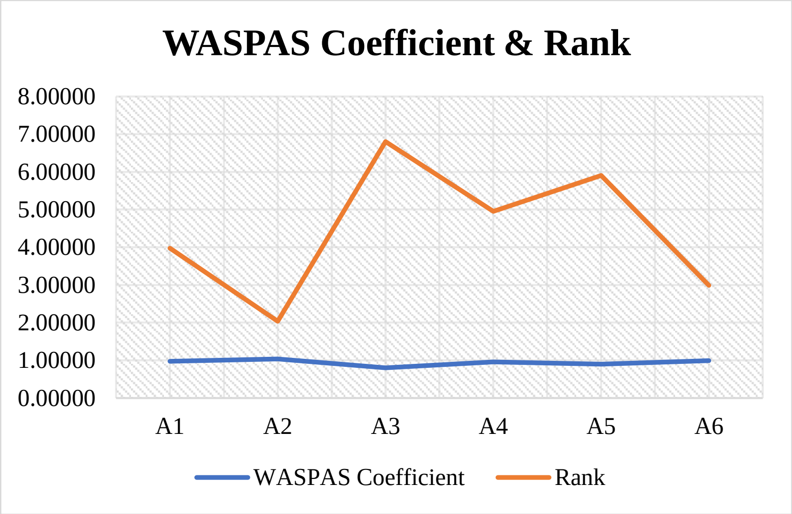


FIGURE 3. WASPAS coefficient & Rank

Shows the figure 3 Environmental Factors for WASPAS Coefficient & Rank. Availability of Accessible Public Transportation (A1) has a WASPAS Coefficient of 0.97877, which ranks it as the third-best option among the given alternatives. It performs well, but there are two other alternatives with higher coefficients. Accessibility of Public Spaces (A2) has the highest WASPAS Coefficient of 1.03701, making it the top-ranked alternative. This means A2 is the most favorable choice in terms of meeting the environmental criteria. Community Awareness and Acceptance (A3) has the lowest WASPAS Coefficient of 0.80183, ranking it as the sixth and last option among the alternatives. It performs relatively poorly compared to the other alternatives. Employment Opportunities and Support (A4) has a WASPAS Coefficient of 0.95498, which ranks it as the fourth-best alternative. While it performs better than A3, it is still behind the top three alternatives. Educational Accessibility (A5) has a WASPAS Coefficient of 0.90215, placing it fifth in the ranking. It performs better than A3 but is outranked by the top four alternatives. Healthcare Services and Support (A6) has a WASPAS Coefficient of 0.99197, making it the second-best option among the alternatives. It performs well but falls just short of the top-ranked alternative (A2).

4. CONCLUSION

The impact of environmental factors on community participation has been thoroughly assessed using the WASPAS (Weighted Aggregated Sum Product Assessment) method, providing valuable insights into the relationship between the two. The study aimed to explore how various environmental elements influence community engagement and how these factors can be prioritized to enhance participation and sustainable development. Throughout the analysis, it became evident that environmental factors play a crucial role in shaping community participation. The WASPAS method allowed us to quantify the significance of each factor and determine their relative weights in influencing community engagement. This information is essential for policymakers, community leaders, and stakeholders as it offers a solid foundation for targeted interventions and resource allocation. The findings demonstrate that certain environmental factors have a more substantial impact on community participation than others. For instance, factors like access to essential services (such as healthcare, education, and clean water) and the presence of social infrastructure (community centers, parks, and recreational spaces) were identified as significant contributors to fostering community involvement. These factors serve as vital facilitators, promoting inclusivity and accessibility, thereby enhancing community cohesion and engagement. Moreover, the study highlights the interconnectivity between environmental factors and their combined effect on community participation. It was observed that the positive correlation between multiple factors leads to a synergistic effect, which further amplifies community engagement levels. This emphasizes the need for a holistic approach to community development that addresses the various aspects of the environment comprehensively. On the other hand, the study also identified certain environmental factors that hinder community participation, such as environmental pollution, lack of green spaces, and limited access to transportation. By understanding these barriers, policymakers and community leaders can devise strategies to mitigate their negative impact and create a more conducive environment for active community involvement. The WASPAS method proved to be a valuable tool for evaluating the relative significance of environmental factors in community participation. Its systematic and quantitative approach provided an objective assessment, guiding decision-makers in setting priorities and making informed choices. Nonetheless, it is crucial to acknowledge the limitations of the study, such as the potential omission of certain factors or the inherent subjectivity in assigning weights. this study sheds light on the intricate relationship between environmental factors and community participation. By recognizing the pivotal role played by the environment, stakeholders can work towards creating sustainable communities that thrive on active engagement and collaboration. Moving forward, further research and continuous monitoring of environmental impacts on community participation will be imperative to refine strategies and ensure the well-being and development of communities worldwide. With concerted efforts, we can foster an environment where every individual feels empowered to contribute to their community's growth and prosperity. Accessibility of Public Spaces (A2) has obtained the first rank, while Community Awareness and Acceptance (A3) has received the lowest rank.

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