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Assessment of regional development needs according to criteria based on the Sustainable Development Goals in the Meta Region (Colombia)

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Abstract

When a regional government considers investing funds for the sustainable development of its region, it must consider the real needs of the population and the fulfillment of the Sustainable Development Goals (SDGs). The identification of needs should be carried out with the support of local stakeholders representing various social groups. This paper seeks to answer the question of how to guide public investment policies at the local level, such as improving education, health, transportation and others, to better meet the SDGs. To answer this question, a multi-criteria decision-making process is followed, whereby, once the needs are classified by investment areas, they are prioritized based on criteria derived from the SDGs. The problem is complex because of the difficulty of the local stakeholder engagement process and also because of the interrelationships and influences that arise between all the elements of the decision problem: criteria and alternatives. To address this complexity, the Analytical Network Process method combined with DEMATEL will be followed. This process is applied to the case study of the distribution of funds allocated by the Government of Colombia to the Meta Region (Colombia) with the participation of 48 stakeholders to identify needs and the support of six experts in sustainability and project management for their prioritization.

KEYWORDS

analytic network process, DEMATEL, environmental policy, multicriteria decision analysis, regional development needs, stakeholder engagement, Sustainable Development Goals

1 | INTRODUCTION

The social and economic progress of humanity depends on its ability to make it compatible with environmental protection. This statement is the foundation of the United Nations 2030 Agenda for Sustainable Development, adopted in 2015 by resolution A/RES/70/1, which establishes a plan of action for people, planet, and prosperity through the implementation of 17 Sustainable Development Goals (SDGs) and 169 targets (United Nations, 2015). The accelerating loss of ecosystems and biodiversity due to human action makes it necessary to promote sustainable and socially responsible investments. The SDGs provide a global framework to respond to this need (Winans

et al., 2021). The achievement of these goals is a major challenge for science, civil society, and governments because of the strong interconnection between the SDGs (Kostetckaia & Hametner, 2021; Nilsson et al., 2018) and the need to prioritize goals, adapt national strategies and policies to align with the SDGs, leverage synergies between goals, and obtain sufficient resources to achieve them (Allen et al., 2021; Aly et al., 2022). This will demand an integrated, holistic, and coherent policy approach involving actors from public and private sectors in the decision-making process (Glass & Newig, 2019). Bowen et al. (2017) argue that much attention is being paid to the scientific challenges, but very little to the governance challenges for the achievement of the SDGs. These challenges can be summarized as: integrating stakeholders in the decision-making processes, making difficult compromises with a focus on fairness, justice, and impartiality and creating transparency and accountability mechanisms for the stakeholders' decisions. Citizen involvement in public policy decision-making processes increases the effectiveness and democratic legitimacy of the policies implemented because they will better meet citizens' demands and needs (Newig et al., 2018; Suebvises, 2018; van Holstein, 2018).

Most of the studies on SDG implementation are conducted at the global or national level, but there are few studies of their practical application at the local level (Benedek et al., 2021; Han et al., 2021; Ningrum et al., 2022). The decision of where to concentrate public investment policies should be conditioned by the achievement of the SDGs and by behavioral and contextual aspects that allow us to understand the specific environment and promote the participation of local stakeholders (Barquet et al., 2021). This paper addresses the problem that a regional government faces when deciding on its regional development investment policies so that they are aligned with the achievement of the SDGs. The research questions posed are: *how to guide public investment policies at the local level to better meet the SDGs, considering the development needs of the local population, and what are the needs of the population of the region under study?* To this end, a decision-support process has been followed to identify local development needs in different areas (education, health, water supply, and others), and to prioritize investment in those areas that best contribute to meeting the SDGs. This process is applied to the case study of the distribution of funds allocated by the Government of Colombia to the Meta Region (Colombia).

To identify needs, 48 stakeholders were contacted and through a semi-structured interview they were asked about the investment needs they considered most relevant for the development of their region. Qualitative analysis of the responses was then carried out using the Atlas.ti program and 13 investment areas were established. In the second phase of the work, the investment areas were prioritized based on their contribution to a series of criteria derived from the SDGs. To support this evaluation process, techniques based on Multicriteria Decision Analysis (MCDA) are useful (Figueira et al., 2005; Ishizaka & Nemery, 2013). Among them, the Analytical Network Process (ANP) combined with Decision-Making Trial and Evaluation Laboratory (DEMATEL) was chosen for this purpose. ANP is a MCDA technique that allows dealing with complex decision-making processes in the real world, where the elements of the problem (criteria and alternatives) have complex influences and interrelationships and simultaneously present quantitative and qualitative criteria (Saaty, 2001). Recent works have highlighted the interactions among the SDGs (Dawes, 2020; Pham-Truffert et al., 2020; Toth et al., 2021; Tremblay et al., 2020), have analyzed and identified the most relevant ones for public policy development (Alcamo et al., 2020; Bandari et al., 2022; Scharlemann et al., 2020), or have studied which of them should be promoted for the development of certain regions (Allen et al., 2019; Swain & Ranganathan, 2021). Furthermore, investments in different areas are also interrelated, since, for example, investing in education benefits other investment policies, such as support to local companies. ANP is currently one of the most widely used techniques to address this type of problem (Kheybari et al., 2020). Sustainability and environmental management, together with supply chain management are the decision areas where ANP is being used most, alone or in combination with other techniques (Chen et al., 2019). For all these reasons, ANP has been chosen in this work. However, the use of ANP in decision-making processes involving numerous interrelated elements implies that the individuals participating in the process (experts or decision-makers) must answer many questions that make the process become even more complex. To make the process of obtaining judgments easier, the use of DEMATEL is proposed, combined with ANP according to (Kadoić et al., 2019).

2 | MATERIAL AND METHODS

2.1 | Overview of ANP and ANP combined with DEMATEL

ANP is a generalization of the well-known Analytic Hierarchy Process (AHP) method, proposed by Professor Th. Saaty at the end of the 1970s (Saaty, 1980). AHP is a Multi-Criteria Decision Analysis (MCDA) technique that models the decision problem by means of a hierarchical structure divided into Goal, Criteria and Alternatives based on the independence in preference among all the elements of the hierarchy. When there are interrelationships and influences between the elements of the decision-making problem, ANP models it as a network composed of elements that are grouped. The fundamental steps of the ANP are: (1) Identify the relevant elements of the decision problem by grouping and relating them according to the flow of influence between them (Saaty & Shih, 2009); (2) An influence matrix is established where each position takes the value 1 if the row element influences the respective column element and 0 if it does not influence; (3) Then, for each of the column elements of the previous matrix, the relative influence exerted on it by the elements of the same group that have been determined to exert influence is calculated. For this purpose, reciprocal matrices of paired comparison between the elements of the same group are generated and the associated main eigenvector is calculated, following the relative preference measurement method established by Saaty (1980). This requires the development of as many comparison matrices as elements of the

different groups influence each column element. The resulting supermatrix is called Unweighted supermatrix; (4) The influence of the elements is conditioned by their belonging to a certain group and the influence that some groups exert on others. To calculate this influence, the Cluster matrix is constructed in which, for each column, paired comparisons are made between the groups that influence it; (5) The Weighted supermatrix is obtained by combining the two matrices, Unweighted and Cluster. By columns, the relative influence of all the elements of the system on each column element whose sum gives the value 1, is calculated; (6) The weighted supermatrix is then raised to successive powers to obtain the limit matrix which is characterized by all columns having the same values. The result assigns to each element of the system a value of its relative influence. All calculations are described in detail (Saaty, 2001; Saaty, 2005; Saaty, 2008).

When the network is complex, because of the high number of elements and influences between them, Steps 2 and 3 require the experts or decision-makers to answer many questions to weigh the influences between elements and groups. This is a very serious limitation for the practical application of the method. For this reason, the literature proposes the combined application of the DEMATEL method together with ANP. DEMATEL is a method proposed by Fontela and Gabus at the Geneva Research Centre of Battelle Memorial Institute. It is used to analyze the interdependence (relationship or influence) between components or variables/attributes of a complex system, identify those that are critical and analyze their cause-effect relationships, using an impact relationship diagram. DEMATEL is mostly used in complex multicriteria decision-making processes (Si et al., 2018), mainly in combination with ANP (Gölcük & Baykasoglu, 2016). The steps to apply DEMATEL can be found in Schulze-Gonzalez et al. (2021) and Li and Tzeng (2009). One of the simplest techniques for combining DEMATEL and ANP is the one proposed by Kadoić et al. (2019) who, once the elements and groups of the decision problem have been identified, propose not to perform all the DEMATEL steps, but only the following ones: (1) Create the influence matrix between network elements where experts or decision makers are asked about which row elements influence each column element and with what intensity on a scale which can have different levels of influence varying from 3-point scale to 10-point scale (Naseri-Rad et al., 2020). If there are several groups, the influence matrix between groups is created in a similar way to the influence matrix between elements. This step includes Steps 1 and 2 of ANP and avoids the need for experts or decision-makers to make pairwise comparison judgments, saving considerable time and effort. (2) Kadoić et al. (2019) propose two procedures to arrive at the Weighted matrix, similar to the one obtained by ANP. The first, and simplest, consists of normalizing each column of the element influence matrix by adding all the values in each column and dividing each by the respective sums. If there are several groups, the values of each column of the influence matrix are normalized by groups and the group matrix is normalized in a similar way. In this way, the equivalent of the Unweighted and Cluster ANP matrices would be obtained to continue the process in ANP Step 4. The second procedure, is operationally more complex, as it uses transition matrices and is described in Kadoić et al. (2019). Once this step is completed, the procedure continues with ANP Step 5. Schulze-Gonzalez et al. (2021) apply the proposal of Kadoić et al. (2019) to 45 cases published in the literature and solved with ANP, concluding that the results between the proposal of Kadoic et al. and ANP are very similar, which compensates for the effort reduction of applying DEMATEL combined with ANP.

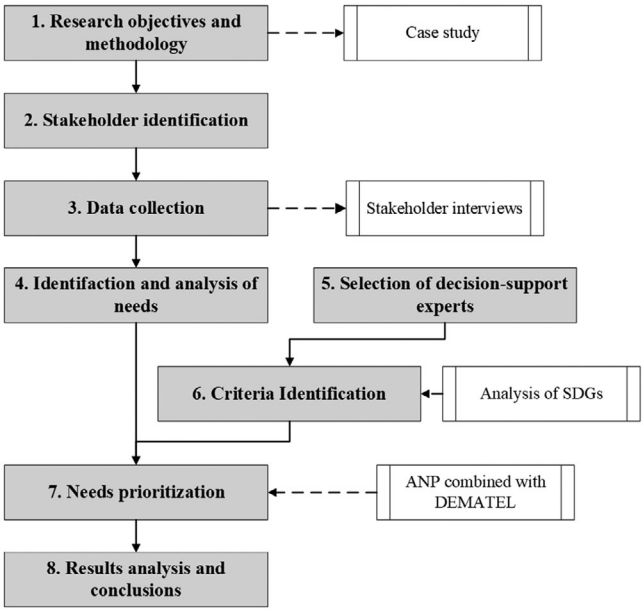

FIGURE 1 Decision-making process

2.2 | Research objectives and methodology: Case study

The objective of the research is *to support regional authorities to identify local development needs in different areas and prioritize investments towards those areas that best meet criteria derived from the SDGs, following a systematic MCDA approach*. The process has been designed for the case study of the Government of the Meta Region (Colombia), but the methodology is applicable to problems in which a local administration must align its investment policies towards compliance with the SDGs.

The Government of Colombia allocates part of the income that the country receives for its oil production, to regional development projects. In each of the country's regions there are collegiate administration and decision-making bodies (OCAD) that are responsible for evaluating and prioritizing investment projects financed with this budget, called "Royalties" (Congreso de Colombia, 2020). Generally, the different administrations with competence in this area have developed the projects following political or technical guidelines. However, Colombian law specifies that the OCAD must consult with technical committees and other relevant actors to identify and prioritize initiatives or projects to be financed. The following sections describe the steps of the multi-criteria decision analysis process (Belton & Stewart, 2002) adapted to the case study (Figure 1). Step 2:

TABLE 1 Stakeholders grouping

Group	Stakeholders	Representation (%)
01 Public Administration	I1, I2, I3, I4, I5, I6, I7, I12, I27, I28, I38, I39, I40, I45	29.17
02 Civil Society	I17, I18, I19, I20, I25, I34, I36, I37, I41, I42, I43, I46	25.00
03 Business and professional associations	I9, I10, I11, I13, I14, I15, I48	14.58
04 Trade Unions	I21, I22, I23, I24, I35	10.42
05 Academic	I8, I16, I26, I32	8.33
06 Companies	I33, I44, I47	6.25
07 Citizens	I29, I30, I31	6.25

Stakeholder identification and Step 3: *data collection* is designed to identify and analyze the needs of the Region (Step 4). Step 5: *Selection of decision support experts* is necessary to perform the following steps: Step 6: decision criteria identification, Step 7: prioritization of needs by applying the ANP method combined with DEMATEL and Step 8: obtain and analyze the results.

2.3 | Stakeholder identification

There is a broad consensus among policy makers and environmental managers on the relevance of involving stakeholders in governance processes to better manage the complexity of modern democratic societies. However, there is a debate on how to achieve this participation (Bidwell & Schweizer, 2021). Although the provision of information by stakeholders is the lowest level among public participation processes, it is considered interesting because it gives citizens the opportunity to comment on plans, discuss problems and develop alternatives to the public participation process (Ruiz-Villaverde & García-Rubio, 2017). This is the participation model proposed in this work to help decision-makers better identify the investment needs of the Meta Region (Colombia). For the selection of stakeholders, it is necessary to consider: their motivation or interest in participating in the process, their knowledge, preferences, concerns and expectations about the problem and the decision-making process (Srdjevic et al., 2018). There are several techniques for identifying stakeholders described in the literature (Bendtsen et al., 2021; Gregory et al., 2020). One is to identify groups according to the recognized roles of stakeholders (customers, investors, contractors, etc.) and the social identities to which they belong (age, gender, different groups or associations) (Crane & Ruebottom, 2011). Another well-known method is the so-called "snowballing" in which a few interested parties are selected and through them new people emerge who can be selected. (Brugha & Varvasovszky, 2000).

In our case study, most of the stakeholders were selected from the public database of people who had already participated in previous consultation processes with the Government of the Meta Region. Two hundred people from that database were contacted by e-mail and telephone, and, of whom 43 expressed availabilities to be interviewed and interest in the problem of government fund sharing. In parallel, five other interested parties were contacted through personal relations of one of the researchers of this work (one of the businessmen of the Region, one of the academics, two officials of the regional administration of Meta with responsibilities in the management of Regalia funds and an official of the Mayor's Office of Villavicencio). A total of 48 stakeholders were consulted. Stakeholders were named with an identifier (I1, I2, ..., I48) and by groups, according to the social group they belong to and represent (Table 1).

All the stakeholders are people residing in the Meta Region and have been grouped according to a functional criterion, that is, thinking about what kind of interests a certain group of individuals may have in common, in relation to the identification of investment needs. The stakeholders from the public administration are people who hold positions in the Regional Administration of Meta and in the Mayor of Villavicencio Office and all of them have knowledge and are involved with the management and administration of Royalties. Stakeholders integrated in the Civil Society group constitute the second most important group and represent a wide range of neighborhood, sports and cultural associations, indigenous communities, and humanitarian foundations. The academic people work in three universities in the Region and in the Superior School of Public Administration. The business and professional associations belong to the agriculture and services sectors, the Chamber of Commerce, and some professional association. The stakeholders from the trade union group belong to different trade union organizations representing various sectors. The group of companies includes three representatives of important companies in the region from the oil, transportation, and agriculture sectors and from the industrialists´ association. In the group of citizens, three people have been contacted who have in depth knowledge of the Region and its needs and who are participating in the study in an individual capacity. Although all the stakeholders have signed an authorisation for publication of the results of this study for scientific purposes, due to confidentiality issues they are no further identified, and no information is given on their affiliation.

2.4 | Data collection

The information gathering process was carried out by means of semi-structured interviews. This qualitative research technique provides researchers with data that allow them to understand the experiences and opinions of the interviewees in relation to the object of the research (Adeoye-Olatunde & Olenik, 2021). The protocol followed in the interviews was as follows (Castillo-Montoya, 2016): prepare a questionnaire aligned with the research objective, prepare the interview script to keep the conversation focused on the objective, agree on the date and conduct the interviews by analyzing the behavior of

TABLE 2 Needs grouped into investment areas

Investment area	Needs identified by stakeholders
01. Education (17,40%)	Infrastructure in education, particularly the construction of educational centers. Construction of an ethnic school to strengthen cultural identity. Construction of self-government training schools. Modernization of education. Implementation of technical, professional, and postgraduate training programs. Education for citizenship. Training to acquire skills for employment.
02. Social assistance (8,41%)	Attention to unsatisfied basic needs. Support to vulnerable communities. Attention to the elderly, children, and adolescents. Investment in opportunities for women victims, mothers that are household heads and child protection. Emotional and financial support to Afro-Colombian communities and women. Promotion of inclusion processes for the population. Development of a food plan for children and canteens for the elderly. Construction of kindergartens for children of sex workers. Construction of rehabilitation centers for the homeless. Establishment of soccer schools for low-income children. Establishment of community halls to treat young people who consume psychoactive substances.
03. Business support (7,82%)	Investment in infrastructure for productive processes. Strengthening of family businesses. Investment in production improvement for export. Generation of innovation processes, competitiveness, and industrial technology parks. Business consolidation in the development of installed capacities. Investment in projects and productive chains. Investment in strengthening small and medium-sized enterprises. Measures to improve business financing. Support for the adoption of ICTs in the productive sector. Promotion of science and technology transfer.
04. Health Service (11,49%)	Strengthening of the health sector in the municipalities and townships. Expansion of hospital equipment.
05. Water supply and sanitation (7,61%)	Construction of a new water collection system for Villavicencio, since the current one is continuously blocked with sediments from the stream that collects the water; Investment in a new wastewater treatment plant in Villavicencio, water purification plant and maintenance of the aqueduct and sewage system.
06. Agri-food (10,53%)	Stimulation of employment in the agricultural sector and irrigation district. Promoting the transformation of agricultural products. Research in agricultural health and production. Agricultural planning and markets. Strengthening of agribusiness and food security. Investment in livestock production in the floodplain flood zone and fish production. Investment in improving family agricultural production and peasant economy. Land titling. Agribusiness financing. Modernization of the production system.
07. Roads/tertiary roads (14,52%)	Construction of the Bogotá-Villavicencio highway and improvement of tertiary roads.
08. Housing (6,85%)	Investment in the construction of decent housing for the low-income population. Integral relocation of indigenous ethnic groups. Investment in rural housing. Updating of land registries.
09. Security (2,94%)	Investment in security. Promotion of peace. Creation of a security corps.
10. Environmental sustainability/ biodiversity protection (5,70%)	Investment in biodiversity protection and climate change mitigation actions. Strengthening environmental sustainability. Conservation of the environmental base and ecosystems. Environmental monitoring.
11. Tourism (3,76%)	Investment in support of sustainable and community-based tourism.
12. Fluvial (0,81%)	Investment in improving river connectivity by improving the navigability of the Meta River.
13. Airport (1,90%)	Investment in improving area connectivity as a means for young people to train in other countries.

the interviewee during the interview, for example, interest and attitude in relation to the problem, their degree of attention in the conversation and body language. In this case, the most complex step to carry out in many of the cases was to agree on the date for the interview. Each stakeholder was asked to state the development needs of the Region where, in his or her opinion, it was most important to allocate investments from the royalties. The interviewer observed that, in general, the stakeholders showed a high level of interest in the problem and a diversity of opinions about the investment allocation process and regional development projects in the Meta region. Most of the stakeholders considered that in many cases the selection process of investment projects is subject to private interests, not always aligned with the general interest, and that authorities should make a greater effort to involve citizens in the decision-making process. The question that was asked to the stakeholders for this research was: *What do you think are the most important needs in which the Royalty funds should be invested?*

In order to describe the type of responses obtained from the stakeholders, we present, as an example, the response given by I01 to the question in the questionnaire: *"Social needs, with investments in infrastructure, health, education, housing, technologies, agri-food. In the following order: agri-food, health, education, housing, technology and infrastructure. In the latter, I would prioritize the Villavicencio-Bogotá highway"*.

2.5 | Identification and analysis of needs

In this step, a qualitative analysis of the responses obtained in the interviews was carried out using a structural coding approach with the

TABLE 3 Distribution of weighted frequencies by group

Investment area	Groups (% representation)							% Total
	G01	G02	G03	G04	G05	G06	G07	
	0.2917	0.25	0.1458	0.1042	0.0833	0.0625	0.0625	
A01	13.00%	13.80%	16.70%	20.00%	17.60%	16.70%	50.00%	17.40%
A02	5.60%	13.80%	5.60%	5.00%	17.60%	8.30%	0.00%	8.41%
A03	7.40%	6.90%	16.70%	0.00%	11.80%	8.30%	0.00%	7.82%
A04	14.80%	6.90%	5.60%	25.00%	11.80%	16.70%	0.00%	11.49%
A05	7.40%	10.30%	5.60%	5.00%	5.90%	16.70%	0.00%	7.61%
A06	13.00%	6.90%	16.70%	5.00%	5.90%	8.30%	16.70%	10,53%
A07	14.80%	17.20%	16.70%	15.00%	16.60%	8.30%	0.00%	14.52%
A08	9.30%	10.30%	0.00%	10.00%	0.00%	8.30%	0.00%	6.85%
A09	3.70%	3.40%	0.00%	5,00%	5.90%	0.00%	0.00%	2.94%
A10	3.70%	6.90%	5.60%	5.00%	0.00%	8.30%	16.70%	5.70%
A11	1.90%	3.40%	5.60%	0.00%	5.90%	0.00%	16.70%	3.76%
A12	1.00%	0.00%	0.00%	5.00%	0.00%	0.00%	0.00%	0.81%
A13	3.70%	0.00%	5.60%	0.00%	0.00%	0.00%	0.00%	1.90%

help of the Atlas.ti program (Paulus et al., 2019). For this purpose, the responses were transcribed into a single document and the concepts that emerged in the text were coded. The codes are the basic unit of analysis that group fragments of the most relevant responses from the 48 stakeholders (belonging to 7 social groups). As a result of the process, 13 areas were identified in which the stakeholders considered that investments should be made to meet the needs described in Table 2. This table also shows the relative frequency by which each area has been mentioned by the 48 stakeholders, considering the percentage of representation of each stakeholder group. In this classification, the needs perceived in the area A01 Education stand out, since the Region has an educational quality below the national average, followed by investment needs in A07 Highways and tertiary roads, A04 Health, especially in strengthening the sector in the municipalities and A06 Agri-food, due to its relation to rural development and food security.

By stakeholder groups the most relevant investment needs are: for *G01 Public Administration*, A04 Health Service and A07 Highways/tertiary roads (14.8%, respectively); for G02 *Civil Society*, A07 Highways/tertiary roads (17.2%); for G03 *Business and professional associations*, equally, A01 Education, A03 Business support, A06 Agri-food and A07 Highways/tertiary roads (16.7%, respectively); for G04 *Trade Unions*, A04 Health Service (25%); for G05 *Academics*, equally, A01 Education, A07 Highways/tertiary roads and A02 Social welfare (17.6%, respectively); for G06 Businesses and professional associations, equally, A01 Education, A04 Health Service and A05 Water supply and sanitation (16.7%, respectively); and for G07 Citizens, A01 Education (50%). Table 3 shows the relative frequency with which each stakeholder group (in columns) has mentioned each of the areas and the final weighting, taking into account the percentage representation of each group.

2.6 | Selection of decision support experts

Once the needs have been identified in the previous step, this paper proposes to prioritize them according to their contribution to the SDGs. Multi-criteria decision analysis techniques make it possible to manage the subjectivity inherent in any decision-making process by establishing procedures to measure the judgments or preferences, always subjective, of the decision-maker (Belton & Stewart, 2002; Saaty & Peniwati, 2008). The fact that judgments are subjective does not mean that they are arbitrary since they are based on the knowledge and experience of the experts or decision-makers who make them. Therefore, in any decision-making process, it is essential to identify the people involved in the process. In addition, this problem is characterized by its complexity, due to the interrelationships that arise between the elements of the problem and the fact that the definition of the SDGs includes several specific concepts that make it difficult to evaluate specific alternatives. For these reasons it was decided to create a multidisciplinary group of researchers, experts in sustainability, economics and project management, formed by two researchers from the Universidad de Los Llanos (Unillanos, Colombia), E1 and E2, and four researchers from the Universitat Politècnica de València (UPV, Spain) of which, three of them, E3, acted by consensus as if they were a single expert, and the fourth, E4, acted independently of the other three. With them, the problem has been analyzed in depth.

2.7 | Criteria identification

This step was carried out by consensus among the six experts. In a first meeting, once it was agreed that the ANP method combined with DEMATEL would be applied, the SDGs and the possibility of using

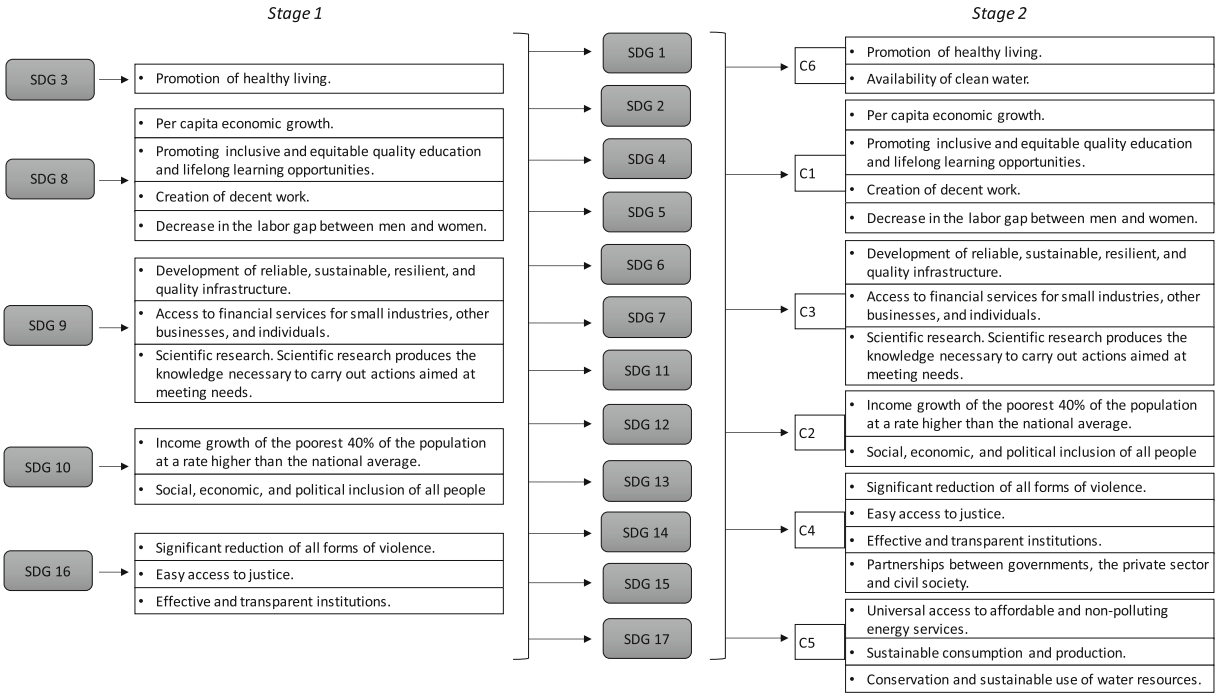

FIGURE 2 Process of obtaining criteria from the SDGs

them as decision criteria in the ANP model were reviewed. Difficulties were observed since the definition of part of the SDGs covers different concepts and made it difficult to evaluate the investment areas. One case that opened the debate was SDG 1 End Poverty. This goal addresses a multidimensional phenomenon that arises when people lack key capabilities, do not have adequate income or education, or lack health, insecurity, and other situations (Haughton & Khandher, 2009). Investment in the different areas as a whole contributes to this SDG, but it is very complex to establish which of them contributes more. In the course of the process, it became clear that, to the best of our knowledge, there is not enough literature that directly addresses the SDGs in their entirety as decision criteria. There are references that specifically use some sustainable development indicators to evaluate investments or projects in specific fields in relation to the fulfillment of some of the SDGs or their Targets, for example, Xue et al. (2022), Sreekumar and Rajmohan (2019), Adshead et al. (2019), and Rickels et al. (2016).

Given the initial difficulties in using the SDGs directly as decision criteria, a Delphi process adapted to the problem was followed (Beiderbeck et al., 2021). It was agreed that one of the experts would act as coordinator and facilitator for the rest of the group. With the ideas gathered at the first meeting of the experts, the coordinator made a first proposal of criteria that was submitted to the analysis of the rest of the experts. In this first proposal the coordinator identified that *SDG3 Good health and well-being*, *SDG8 Decent work and economic growth*, *SDG9 Industry, innovation and infrastructure*, *SDG10 Reduced inequalities and SDG 16 Peace, justice and strong institutions* could be directly considered as first level decision criteria, and also part of the targets derived from the SDGs could be directly identified as sub-criteria. Figure 2 shows on the left side these SDGs and the sub-criteria that would allow a better evaluation of the alternatives. In a second round, each of the experts individually made written observations and suggestions to the proposal sent by the coordinator, in order to study how to cover the remaining SDGs. The main idea that emerged was to group SDG7 *Affordable and clean energy*, SDG12 *Responsible consumption and production*, SDG11 *Sustainable cities and communities* and SDG6 *Clean water and sanitation* under a new criterion called "Sustainable Development". A second proposal was made with this new grouping that was discussed in a new meeting, this time in person. At this final meeting, it was agreed to separate SDG 6 into sub-criterion *Availability of clean water*, which would be integrated into the *Health and welfare* group of decision criteria, and sub-criterion "Conservation and sustainable use of water resources", which would be integrated into the "Sustainable development" group of decision criteria. The *Peace, justice and strong institutions* criterion was also complemented with a subcriterion called *Partnerships between governments, the private sector and civil society*, which is derived from SGD 17. The remaining SDGs were also reviewed and it was agreed not to identify any more subcriteria since the satisfaction of those already established allowed the remaining ones to be covered. Figure 2 summarizes the process.

After this last meeting, the decision criteria were established as follows:

C1 Decent work and economic growth. This group of criteria evaluates the labor welfare of the worker. It includes good labor practices, income that meets the worker's needs, job stability, good treatment and

SDG	Criteria decision																	
	C1.1.	C1.2.	C1.3.	C1.4.	C2.1.	C2.2.	C3.1.	C3.2.	C3.3.	C4.1.	C4.2.	C4.3.	C4.4.	C5.1.	C5.2.	C5.3.	C6.1	C6.2
1. No poverty	◉				◉	◉								◉				
2. Zero hunger	◉	◉	◉	◉	◉		◉	◉	◉						◉	◉		
3. Good health and well-being	◉	◉	◉	◉	◉	◉			◉	◉				◉	◉	◉	◉	◉
4. Quality education		◉				◉	◉		◉	◉							◉	
5. Gender equality		◉		◉		◉				◉	◉							
6. Clean water and sanitation							◉									◉		◉
7. Affordable and clean energy							◉		◉					◉	◉			
8. Decent work and economic growth	◉	◉	◉	◉	◉		◉	◉	◉			◉	◉					
9. Industry, innovation and infraestructure							◉	◉	◉									
10. Reduced inequalities		◉		◉	◉	◉						◉	◉					
11. Sustainable and communities							◉		◉				◉	◉	◉	◉		
12. Responsible consumption and production		◉												◉	◉	◉		
13. Climate action									◉				◉	◉	◉	◉		
14. Life below water														◉	◉	◉		
15. Life on land														◉	◉	◉		
16. Peace, justice and strong institutions										◉	◉	◉	◉					
17. Partnerships for the goals	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉	◉

FIGURE 3 SDG-criteria matching

TABLE 4 DEMATEL scale of intensity of influence between elements or groups

Intensity	Value	Description
None	0	No influence of one element (criterion or alternative) on another. No influence of one group on another.
Very low	1	Very low influence of one element (criterion or alternative) on another. Very low influence of one group on another.
Low	2	Low influence of one element (criterion or alternative) on another. Low influence of one group over another.
Medium	3	Medium level of influence of one element (criterion or alternative) on another. Medium level of influence of one group on another.
High	4	High influence of one element (criterion or alternative) on another. High influence of one group over another.
Very High	5	Very high influence of one element (criterion or alternative) on another. Very High influence of one group over another.

freedom of association to defend rights. Economic growth is necessary to improve the population's income. The subcriteria of this group are:

- C1.1 Per capita economic growth.
- C1.2 Promoting inclusive and equitable quality education and lifelong learning opportunities.
- C1.3 Creation of decent work.
- C1.4 Decrease in the labor gap between men and women.

C2 *Reduced inequalities*. Social inequality discriminates against one group of people to favor other groups. The greater the inequality, the wider the gap between those who have access to health, education, technology, decent income, among others, and those who do not. The sub-criteria of this group are:

- C2.1. Income growth of the poorest 40% of the population at a rate higher than the national average. Increasing the incomes of the poorest reduces social inequality.
- C2.2 Social, economic, and political inclusion of all people.

C3 *Industry, innovation, and infrastructure*. Investment in industry, innovation and infrastructure supports economic growth through demand for labor, tools, machinery, and inputs. Robust industrialization is supported by innovation and infrastructure. The sub-criteria in this group are:

- C3.1 Development of reliable, sustainable, resilient, and quality infrastructure. The strength of transport, energy, water, telecommunications and building infrastructure ensures a favorable environment for sustainable development.
- C3.2 Access to financial services for small industries, other businesses, and individuals.
- C3.3 Scientific research. Scientific research produces the knowledge necessary to carry out actions aimed at meeting needs.

C4 Peace, justice, and strong institutions. In a solid and stable institutional environment, the rule of law is promoted, and all forms of violence and corruption are reduced.

- C4.1 Significant reduction of all forms of violence. Armed violence, insecurity and crime deepen social deprivation.
- C4.2 Easy access to justice. Easy access to justice allows conflicts to be resolved and offers protection and redress for the population.
- C4.3 Effective and transparent institutions.
- C4.4 Partnerships between governments, the private sector and civil society.

C5. Sustainable development. It is defined by the United Nations Brundtland Commission as "meeting the needs of the present generation without compromising the ability of future generations to meet

their own needs". This definition covers various dimensions such as nature conservation, human development, and increased productivity. The sub-criteria of this group are:

- C5.1. Universal access to affordable and non-polluting energy services.
- C5.2. Sustainable consumption and production.
- C5.3. Conservation and sustainable use of water resources.

C6. Health and welfare. Health service is the set of government services to preserve the health of the common inhabitants of the nation, a province, or a municipality. Important aspects of health care are increasing life expectancy and reducing some of the causes of infant and maternal mortality.

- C6.1. Promotion of healthy living.
- C6.2. Availability of clean water.

Figure 3 shows the relationship that experts perceive between the SDGs and the decision criteria described in the model.

2.8 | Needs prioritization

The decision model that emerges from the above steps has six groups of criteria and the group of alternatives, which comprises the investment areas. The steps for applying the ANP method combined with DEMATEL are described below.

2.8.1 | Create the influence matrix between network elements

In this step, the six experts were asked to study the influences they observed between all the elements of the network. This matrix has four zones where the influences between: criteria–criteria, criteria–alternatives, alternatives–criteria, and alternatives–alternatives are analyzed. To elaborate this matrix, the first step of the DEMATEL method is implemented, where experts were asked about which row elements influence each column element and with what intensity on a scale of different levels. After analyzing different scales of influence, the experts agreed by consensus to use a five-level scale, as shown in Table 4.

The experts made their judgments, and four influence matrices were obtained (See Table A1 for Expert E1 in Appendix A). Table 5 shows, as an example, the influence of items C1.1 to C2.2 on items C2.1 to C3.3 for one of the experts.

2.8.2 | Create the influence matrix between network groups

Similar to the previous step, the experts analyzed the influence between groups, generating four matrices (see Table A3 for Expert E1 in Appendix A) as shown in Table 6.

2.8.3 | Calculation of the unweighted matrix

The DEMATEL influence matrix of elements is normalized by adding, in each column, the values of the elements of the same group and dividing each of them by that sum. The matrix thus obtained would be equivalent to the ANP unweighted matrix. In this way, many questions to the experts have been avoided. If the ANP method had been applied, several pairwise comparison matrices would have had to be

TABLE 6 Example of DEMATEL influence matrix between groups, for one of the experts

	C1	C2	C3	C4	C5	C6	A
C1	3	5	1	3	1	3	5
C2	1	5	0	3	2	3	5
C3	4	3	2	0	3	1	4
C4	0	3	0	2	0	1	2
C5	3	3	3	0	4	4	2
C6	0	1	0	0	4	2	3
A	5	4	4	2	5	4	4

TABLE 5 Example of DEMATEL influence matrix between elements, for one of the experts

		–	C2 reduced inequalities		C3 industry, innovation, and infrastructure		
			C2.1	C2.2	C3.1	C3.2	C3.3
C1. Decent Work and Economic Growth	C1.1	–	5	2	4	4	4
	C1.2	–	4	5	2	0	0
	C1.3	–	5	5	0	0	0
	C1.4	–	4	5	0	0	0
C2. Reduced Inequalities	C2.1	–	0	4	0	0	0
	C2.2	–	4	4	0	0	0
–	–	–	–	–	–	–	–

TABLE 7 Example of normalized DEMATEL influence matrix of elements, for one of the experts

		–	C2 reduced inequalities		C3 industry, innovation and infrastructure		
			C2.1	C2.2	C3.1	C3.2	C3.3
C1. Decent Work and Economic Growth	C1.1	–	0.2778	0.1177	0.6667	1.0000	1.0000
	C1.2	–	0.2222	0.2941	0.3333	0.0000	0.0000
	C1.3	–	0.2778	0.2941	0.0000	0.0000	0.0000
	C1.4	–	0.2222	0.2941	0.0000	0.0000	0.0000
C2. Reduced Inequalities	C2.1	–	0.0000	0.5000	0.0000	0.0000	0.0000
	C2.2	–	1.0000	0.5000	0.0000	0.0000	0.0000

generated. As an example, Table 7 shows a part of the standardized influence matrix.

The values of column C2.1 and rows C1.1 to C1.4 have been calculated by adding the values of these positions of the influence matrix in Table 5 between DEMATEL elements and dividing each of them by that sum as shown in Table 8. It is noted that if the ANP method had been used to obtain this vector, a 4×4 pairwise comparison matrix would have had to be constructed, and the expert would have had to answer six additional questions. Table 7 is the equivalent of the ANP unweighted supermatrix.

Similarly, the DEMATEL influence matrix of groups is normalized by adding the values of each column of the matrix and dividing each of them by their sum. Table 9 shows the DEMATEL cluster influence matrix normalized from Table 6. This table is equivalent to the one that would be obtained as a cluster matrix in ANP. Again, numerous questions to the experts have been avoided with respect to the ANP model since, in this case, judgments of seven pairwise comparison matrices would have had to be filled in.

TABLE 8 DEMATEL influence matrix normalization process

	C2.1	C2.1 normalized
C1.1	5	5/18 = 0.2778
C1.2	4	4/18 = 0.2222
C1.3	5	5/18 = 0.2778
C1.4	4	4/18 = 0.2222
SUM	18	

2.8.4 | Calculation of the weighted matrix

The weighted matrix is calculated by multiplying the unweighted DEMATEL influence matrix by the group values obtained in the group DEMATEL influence matrix. As an example, Table 10 shows a part of the weighted matrix. The values of the elements in columns C2.1 and C2.2 and rows C1.1 to C1.4 corresponding to column block C2 and row C1 have been obtained by multiplying the corresponding values of the unweighted DEMATEL influence matrix by 0.20833, which is the value of the influence of group C1 on C2.

This matrix is characterized by being stochastic by columns, that is, the sum of the values in each column adds up to 1. There may be certain cases in which in some columns, this condition is not fulfilled. In this case, it is necessary to renormalize this column to fulfill the condition.

2.8.5 | Calculation of the limit matrix

The limit matrix is obtained by raising the weighted matrix to successive powers. This matrix is characterized by the fact that all the columns have the same values (hereafter referred to as "raw") from which the relative influence of each element (criteria and alternatives) on the network is calculated. Renormalizing the raw values corresponding to the criteria will give the priority that, in this case, the criteria have among them. The priority among alternatives will be obtained by renormalizing the "raw" values corresponding to the alternatives, which is the solution sought.

Tables A1–A6 in Appendix A show the inter-element and inter-group influence matrices, weighted matrix and the priorities corresponding to E1. In the supplementary material, Data S1, the calculations made for all experts and for the group can be seen.

3 | RESULTS AND DISCUSSION

Each expert has provided their influence model, translated into the corresponding influence matrix between network elements, network groups, and limit matrices. The latter have made it possible to obtain the priorities given by each expert to the elements of the system. Table 11 shows the priorities for the criteria and Table 12 the priorities corresponding to the alternatives by expert, presented as percentages for a better visualization of the results. The priorities of criteria and alternatives have been aggregated by calculating the geometric means of the renormalized priorities of each expert (IAP), thus obtaining the group aggregation. Following (Forman & Peniwati, 1998), this is the way to get group aggregation when each decision-maker has a different decision model.

Analyzing the Group column in Table 11, it is observed that, in this case, the five criteria with the most significant influence on the group ranking (which together add up to an influence of 37.94%) are: C2.2 Social, economic and political inclusion of all people and C2.1

Income growth of the poorest 40% of the population at a rate above the national average, which belong to group C2 Reduction of inequalities, C3.3 Scientific research of group C3, Industry, innovation and infrastructure, C1.1 Economic growth per capita, and C5.2. Sustainable consumption and production, belonging to group C5 Sustainable Development.

Analyzing the individual rankings of the experts, it can be seen that there is considerable unanimity among the experts about the influence of C2.2 and C3.3, but less so about the other three criteria. These two criteria are closely related to SDGs 3 Good Health and Well-Being and 4 Quality Education. In the model of expert E2, C1.1 appears in the last position, while in the models of the other experts,

TABLE 9 DEMATEL normalized influence matrix of groups

	C1	C2	C3	C4	C5	C6	A
C1	0.1875	0.2083	0.1000	0.3000	0.0526	0.1667	0.2000
C2	0.0625	0.2083	0.0000	0.3000	0.1053	0.1667	0.2000
C3	0.2500	0.1250	0.2000	0.0000	0.1579	0.0556	0.1600
C4	0.0000	0.1250	0.0000	0.2000	0.0000	0.0556	0.0800
C5	0.1875	0.125	0.3000	0.0000	0.2105	0.2222	0.0800
C6	0.000	0.0417	0.0000	0.0000	0.2105	0.1111	0.1200
A	0.3125	0.1667	0.4000	0.2000	0.2632	0.2222	0.1600

TABLE 10 Weighted matrix

		–	C2 reduced inequalities		C3 industry, innovation, and infrastructure		
			C2.1	C2.2	C3.1	C3.2	C3.3
C1. Decent Work and Economic Growth	C1.1	–	0.0579	0.0245	0.0667	0.1000	0.1000
	C1.2	–	0.0463	0.0613	0.0333	0.0000	0.0000
	C1.3	–	0.0579	0.0613	0.0000	0.0000	0.0000
	C1.4	–	0.0463	0.0613	0.0000	0.0000	0.0000
C2. Reduced Inequalities	C2.1	–	0.0000	0.1042	0.0000	0.0000	0.0000
	C2.2	–	0.2083	0.1042	0.0000	0.0000	0.0000

TABLE 11 Ranking of criteria ordered by the percentage of influence by expert

E1		E2		E3		E4		GRUPO	
C2.1	10.51%	C2.2	9.08%	C1.1	13.80%	C2.2	8.82%	C2.2	9.31%
C2.2	7.92%	C2.1	7.87%	C3.3	10.02%	C3.3	8.24%	C2.1	8.42%
C6.1	7.36%	C3.3	6.30%	C2.2	9.63%	C1.3	7.37%	C3.3	8.09%
C3.3	6.70%	C6.1	6.30%	C3.2	9.52%	C4.3	7.04%	C1.1	6.33%
C1.1	6.12%	C4.3	6.11%	C3.1	7.65%	C5.2	6.95%	C5.2	5.79%
C4.3	6.03%	C4.1	5.85%	C2.1	7.38%	C2.1	6.69%	C6.1	5.73%
C1.3	5.70%	C6.2	5.78%	C5.2	5.99%	C1.1	6.47%	C1.3	5.63%
C5.3	5.59%	C4.4	5.67%	C1.2	5.98%	C1.2	6.08%	C5.1	5.54%
C3.2	5.16%	C4.2	5.66%	C5.1	5.83%	C3.1	5.92%	C1.2	5.50%
C5.1	5.03%	C5.3	5.38%	C4.4	4.26%	C4.4	5.32%	C3.1	5.49%
C1.2	5.02%	C5.1	5.35%	C6.1	4.13%	C5.1	4.90%	C3.2	5.46%
C4.1	4.71%	C1.3	5.06%	C1.3	3.85%	C6.2	4.77%	C4.3	5.16%
C5.2	4.57%	C1.4	4.99%	C5.3	2.95%	C6.1	4.59%	C4.4	4.91%
C4.2	4.39%	C5.2	4.81%	C1.4	2.58%	C4.1	3.94%	C5.3	4.34%
C6.2	4.36%	C3.2	4.69%	C6.2	2.34%	C1.4	3.47%	C6.2	4.31%
C4.4	3.68%	C3.1	4.66%	C4.3	2.23%	C5.3	3.27%	C1.4	3.76%
C1.4	3.64%	C1.2	4.07%	C4.2	1.36%	C3.2	3.14%	C4.2	3.35%
C3.1	3.51%	C1.1	2.38%	C4.1	0.51%	C4.2	3.02%	C4.1	2.87%

it appears among the first five positions. In relation to C2.1, there is also a discrepancy, although not as great.

Looking at the results in Table 12, if a single recommendation had to be given to the authorities of the Meta Region, considering the criteria based on the SDGs and the influences among all the elements of this complex system, the experts consulted would recommend, as a group, to invest as a priority in the areas A01 Education, A03 Business support and A02 Social assistance (32.69% of the total), followed by A06 Agri-food, A10 Environmental sustainability/biodiversity protection, and A05 Water supply and sanitation. It is also noted that there is no obvious consensus between the group's rankings and those of the experts. This issue requires further study, so a correlation and compatibility analysis between the experts' priorities among themselves and with the group is carried out in the following subsection.

A comparison of the recommendation made by the academic experts with Table 2 of the needs most mentioned by the 48 stakeholders shows that both groups agree that investments in A01 Education are the highest priority. However, there is no agreement with the rest of the areas. Interviews with stakeholders revealed that most view Royalties as funds used to execute works. There is no perception that they can be used to better promote development by aligning investments with the fulfillment of the SDGs. The most important perception regarding royalties focuses on their misuse and hoarding by power groups in the Public Administration, which concentrates resources on infrastructure projects, leaving aside other needs. As a result, stakeholders identified in descending order the following areas of need: education, roads/tertiary roads, health, agri-food, social assistance, water supply and sanitation, business support, housing, environmental sustainability/biodiversity protection, security, tourism, airports, and waterways. This ranking must be clarified in relation to two aspects: first, the actual lack of decent living conditions in the Meta region, as evidenced by social indicators; second, the stakeholders' perception, which considers the social context and their interaction with people and the media.

3.1 | Correlation and compatibility analysis

To study the correlation between the ranks of two variables, the best-known correlation measures are Spearman's and Kendall's. The Kendall correlation measure is recommended for small sample sizes. It is also more robust and slightly more efficient than Spearman's rank correlation, making it a preferable estimator, according to Croux and Dehon (2010). For this reason, in this analysis we will show the results obtained using Kendall's Tau-b, which is the recommended statistic in the case of ties in the priorities. To study the compatibility between two priority vectors there are different proposals (Garuti, 2020), but the best known in the field of AHP/ANP application are: Saaty's S-index which applies the Hadamard product (Saaty & Peniwati, 2008) and Garuti's G-index which is based on a physical interpretation of the inner product of two vectors (Garuti, 2016; Garuti & Salomon, 2012). Table 13 shows the results of Kendall's Tau-b correlation, with their respective *p*-value of statistical significance and the values of Saaty's S and Garuti's G compatibility indexes, for all combinations of priorities among experts and for each of them with the group. Table 14 shows the different levels of correlation and compatibility considered. The S index indicates no compatibility at values greater than 1.1.

The analysis of these results shows that there is a low to moderate Kendall correlation between the two Colombian experts E1–E2 and a moderate to high G-compatibility. However, if their priorities are carefully observed, it is concluded that there is a clear discrepancy between the alternatives ranked in the first positions by each of these two experts. The E1 model considers as the highest priority to invest in A05 Water supply and sanitation and A10 Environmental sustainability and biodiversity protection, followed by A09 Security and A01 Education; while in the E3 model, it comes out that A09 Security should be invested first, followed by A01 Education, A07 Roads, and A08 Housing. There are coincidences in the rankings of some of the alternatives ranked below, such as A06, A04 or the last three, which interchange their rankings. Therefore, we can state that the models of

TABLE 12 Ranking of alternatives. [Colour table can be viewed at wileyonlinelibrary.com]

E1		E2		E3		E4		GROUP	
A05	12.28%	A09	9.56%	A03	18.21%	A01	13.62%	A01	12.02%
A10	10.02%	A01	8.93%	A01	14.73%	A02	11.45%	A03	10.99%
A09	9.52%	A07	8.90%	A02	10.12%	A03	8.88%	A02	9.68%
A01	9.46%	A08	8.40%	A06	9.78%	A06	8.52%	A06	8.84%
A08	8.96%	A03	8.37%	A11	9.62%	A11	8.43%	A10	8.38%
A07	8.93%	A02	7.99%	A04	6.88%	A09	8.38%	A05	7.97%
A03	8.72%	A10	7.86%	A10	6.36%	A10	7.97%	A04	7.26%
A06	7.82%	A06	7.59%	A07	5.36%	A05	7.36%	A08	7.20%
A04	7.79%	A04	7.43%	A05	5.17%	A08	6.28%	A07	6.93%
A02	7.69%	A05	7.01%	A08	4.61%	A04	5.67%	A11	6.89%
A12	4.98%	A13	6.89%	A13	3.79%	A12	5.17%	A09	6.31%
A11	3.39%	A11	6.64%	A12	3.69%	A07	4.39%	A12	4.77%
A13	0.46%	A12	4.44%	A09	1.68%	A13	3.88%	A13	2.75%

Note: The criterion has been to assign a color to the different alternatives according to their positions in the group ranking and to assign them the corresponding colors in the experts' rankings.

TABLE 13 Saaty's S-index, Garuti's G-index, and Kendall correlation measure

Comparisons	Kendall		S-Saaty	G-Garuti
	Tau-b	*p*-value		
E1–E2	0.462	0.028	2.064	0.852
E1–E3	−0.051	0.807	2.372	0.579
E1–E4	0.154	0.464	1.710	0.725
E1–GROUP	0.282	0.180	1.406	0.772
E2–E3	0.179	0.393	1.478	0.648
E2–E4	0.282	0.180	1.112	0.788
E2–GROUP	0.308	0.143	1.109	0.817
E3-E4	0.590	0.005	1.324	0.763
E3-GROUP	0.667	0.002	1.235	0.753
E4-GROUP	0.667	0.002	1.050	0.848

Note: The shades highlight the values with a specified correlation.

TABLE 14 Levels of compatibility and correlation

Levels	Compatibility G	Kendall
Very high	≥0.9	0.91 to 1 (−0.91 to −1)
High	0.85–0.899	0.7 to 0.9 (−0.7 to −0.9)
Moderate	0.75–0.849	0.5 to 0.7 (−0.5 to −0.7)
Low	0.65–0.749	0.3 to 0.5 (−0.3 to −0.5)
Very low	0.6–0.649	0.1 to 0.3 (−0.1 to −0.3)
Null	<0.6	0–0.1 (−0.1 to 0)

the two Colombian experts present a quite significant discrepancy of opinions. The first four top-rated alternatives of the group coincide with the four top-rated alternatives in the models of experts E3 and E4, which are the UPV experts, although the ranking among the first three (A01, A02 and A03) is different. Both Kendall's correlation and G compatibility are moderate between these two experts, and if their rankings are observed, a certain level of consensus can be seen between them, except for alternatives A04 and A09, where they differ considerably in priority. The comparison between the E4-Group priorities is the only one that gives a Saaty's S compatibility index within the limit and a G at the high level, although there are clear differences in the rankings. In contrast, Kendall's correlation is moderate and the same as that between E3-group, since in both cases there are only three alternatives that are in the same position between E3-Group and between E4-Group.

It should be noted that the investment in A09 Security occupies a relevant position in the models of the two Colombian experts and the UPV expert E4, while the experts grouped in E3 consider this investment as irrelevant with such a low percentage of priority that this alternative greatly lowers its position in the group aggregation. It seems clear that the researchers closest to the Meta Region have a greater sensitivity to the problems of the Region. When giving their opinions, they have not only thought about the contribution of investment in the different areas to the SDGs in general, but they have also considered the problems that each expert perceives in their Region. It is observed that no comparison shows a very high correlation and compatibilities S and G, so it can be concluded that there is no clear consensus in the ranking of the alternatives among the experts. This circumstance highlights the complexity of the analysis carried out.

4 | CONCLUSIONS

The impact that public investment policy has on society in general is very relevant. Therefore, it is essential that this policy addresses the real needs of the population and not political or other short-term interests. The identification of needs should be carried out with the support of local stakeholders representing various social groups. This paper has presented a decision-support model in which an analysis of local development investments aligned with the SDGs is carried out. This approach is a contribution to the debate on how public investment policy can contribute to meeting the SDGs. It has answered the question of *how to guide public investment policies at the local level to better meet the SDGs, considering the development needs of the local population, and what are the needs of the population of the region under study?* Although the model has been applied to a case study, it can be extended to similar problems, where a regional or local administration must make investments that must be aligned with the SDGs.

The complexity of the decision process has been highlighted. This complexity stems from the definition of the SDGs and their consideration as decision criteria and also from the divergent views of decision support experts who have to analyze the interrelationships observed between all the elements of the decision process. This work has shown that the complexity of the problem can be managed in a systematic and rigorous way, from the identification of stakeholders for the definition of needs, the selection of decision support experts, and the use of a technique such as ANP combined with DEMATEL that allows to analyze all the interrelationships and influences between the elements of the problem. A proposal has been made to define decision criteria based on the SDGs and to better specify the process of evaluating alternatives and the influences between the criteria. The use of the SDGs as they are defined as decision criteria is in some cases complex and requires redefinition.

The ANP method combined with DEMATEL has allowed, on the one hand, to simplify the analysis, reducing the high number of questions that arise with the application of the first steps of ANP to establish the unweighted, cluster, and weighted matrices. On the other hand, it has allowed to capture all the complexity of the problem by focusing the attention of the experts on specific paired questions such as: what is the influence of element i on element j? All this implies that the experts have to perform a very deep analysis of the problem.

This study has some limitations that should be highlighted. The first, common to any participatory process, is the identification of stakeholders. It is not always possible to count on many individuals willing to dedicate the time required for their participation. The second limitation concerns the decision support experts. In this case, it was possible to use six academic researchers, three of whom

(E3) acted by consensus as a single expert. Therefore, the results obtained are based on these experts' opinions, always subjective. However, the fact that the opinions are subjective does not mean that they are arbitrary since they are based on the knowledge and experience of the experts. The third limitation derives from the complexity of the application of the ANP method combined with DEMATEL. As has been justified, this technique makes it possible to manage this complexity, which is both an advantage and a limitation because the practical application of the method requires the investment of sufficient time for reflection, which is not always available to experts and, in addition, sometimes the questions they must answer are not simple.

As future developments, it is proposed to apply this decision support model adapted to evaluating investments in specific projects.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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APPENDIX A

Tables A1–A6.

TABLE A1 E1 DEMATEL influence matrix between network elements

	C.1.1	C.1.2	C.1.3	C.1.4	C.2.1	C.2.2	C.3.1	C.3.2	C.3.3	C.4.1	C.4.2	C.4.3	C.4.4	C.5.1	C.5.2	C.5.3	C.6.1	C.6.2	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13
C.1.1	0	1	3	3	3	3	3	3	3	2	2	2	2	2	2	2	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4
C.1.2	3	0	3	3	3	3	2	2	3	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
C.1.3	3	3	0	0	3	3	2	2	2	3	3	2	3	3	3	3	2	3	3	3	3	3	3	3	2	3	3	2	2	2	2
C.1.4	2	3	3	0	2	3	1	1	2	2	2	2	2	1	1	1	1	0	2	2	1	2	1	1	1	1	1	1	1	1	1
C.2.1	4	3	3	3	0	3	3	3	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
C.2.2	3	3	3	3	3	0	2	2	2	2	2	2	1	2	2	2	0	2	1	2	2	2	2	2	2	2	2	1	0	0	0
C.3.1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
C.3.2	2	2	2	2	2	2	2	0	2	2	2	2	2	2	2	1	0	1	1	1	3	1	1	1	1	1	1	1	1	1	1
C.3.3	2	2	2	2	2	2	2	2	0	2	2	2	2	3	2	2	2	2	3	2	1	1	2	2	3	2	1	2	1	1	1
C.4.1	3	3	3	2	3	3	2	2	2	0	3	3	2	2	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	1
C.4.2	2	3	3	3	3	3	2	2	2	3	0	3	2	2	2	2	1	0	2	2	1	2	2	2	2	1	3	1	1	1	1
C.4.3	3	3	3	3	3	3	3	3	3	3	3	0	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
C.4.4	1	1	2	2	2	2	2	2	2	1	1	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
C.5.1	2	2	2	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
C.5.2	2	1	2	2	2	2	1	1	2	2	1	2	0	2	0	3	2	4	2	2	2	1	2	3	2	1	2	3	1	1	0
C.5.3	2	2	2	2	2	2	2	2	2	2	2	2	2	3	4	0	2	4	2	2	2	2	3	3	2	2	2	4	2	3	2
C.6.1	1	2	1	1	1	1	1	1	1	1	1	1	0	1	2	1	0	2	1	1	1	1	1	2	0	0	0	1	1	0	0
C.6.2	0	0	0	0	0	0	1	0	1	0	1	0	0	2	2	4	3	0	2	1	0	2	5	3	1	2	1	3	2	2	0
A01	3	2	2	2	2	2	2	2	3	2	2	2	2	2	2	2	2	2	0	1	4	2	2	2	2	2	2	2	2	2	2
A02	2	2	2	2	2	2	1	2	1	3	3	2	1	1	1	1	1	2	2	0	2	2	2	2	1	2	2	2	2	2	2
A03	2	2	3	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	3	0	2	2	2	2	2	2	2	2	2	2
A04	2	2	2	2	2	2	1	1	2	2	2	2	2	2	1	1	2	2	2	3	1	0	1	1	1	2	2	1	0	0	0
A05	3	3	3	3	3	3	2	3	3	3	3	3	2	2	3	3	3	3	2	2	2	2	0	2	2	2	2	2	2	3	2
A06	2	2	2	2	2	2	1	2	2	2	1	1	1	1	2	2	2	2	2	2	2	2	2	0	2	2	2	2	0	0	0
A07	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	2	2	2	3	1	1
A08	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	2	2	2	2	2
A09	3	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	0	2	2	3	3
A10	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	4	2	2	2	1	2	1	2	2	1	0	1	2	1
A11	2	2	2	2	2	2	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
A12	2	1	1	1	2	1	1	1	1	0	0	0	0	2	2	2	0	3	1	1	1	1	1	1	1	1	1	3	2	0	0
A13	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0

TABLE A2 E1 normalized DEMATEL influence matrix between network elements

	C.1.1	C.1.2	C.1.3	C.1.4	C.2.1	C.2.2	C.3.1	C.3.2	C.3.3	C.4.1	C.4.2	C.4.3	C.4.4	C.5.1	C.5.2	C.5.3	C.6.1	C.6.2	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13
C.1.1	0.000	0.143	0.333	0.500	0.273	0.250	0.375	0.375	0.300	0.250	0.222	0.250	0.222	0.250	0.250	0.250	0.375	0.375	0.300	0.364	0.400	0.364	0.400	0.400	0.444	0.400	0.400	0.444	0.444	0.444	0.444
C.1.2	0.375	0.000	0.333	0.500	0.273	0.250	0.250	0.250	0.300	0.125	0.222	0.250	0.222	0.250	0.250	0.250	0.250	0.250	0.200	0.182	0.200	0.182	0.200	0.200	0.222	0.200	0.200	0.222	0.222	0.222	0.222
C.1.3	0.375	0.429	0.000	0.000	0.273	0.250	0.250	0.250	0.200	0.375	0.333	0.250	0.333	0.375	0.375	0.375	0.250	0.375	0.300	0.273	0.300	0.273	0.300	0.300	0.222	0.300	0.300	0.222	0.222	0.222	0.222
C.1.4	0.250	0.429	0.333	0.000	0.182	0.250	0.125	0.125	0.200	0.250	0.222	0.250	0.222	0.125	0.125	0.125	0.125	0.000	0.200	0.182	0.100	0.182	0.100	0.100	0.111	0.100	0.100	0.111	0.111	0.111	0.111
C.2.1	0.571	0.500	0.500	0.500	0.000	1000	0.600	0.600	0.500	0.600	0.500	0.500	0.667	0.500	0.500	0.500	1000	0.500	0.667	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.667	1000	1000	1000
C.2.2	0.429	0.500	0.500	0.500	1000	0.000	0.400	0.400	0.500	0.400	0.500	0.500	0.333	0.500	0.500	0.500	0.000	0.500	0.333	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.500	0.333	0.000	0.000	0.000
C.3.1	0.200	0.200	0.200	0.200	0.200	0.200	0.000	0.333	0.333	0.200	0.200	0.200	0.200	0.167	0.200	0.250	0.333	0.250	0.200	0.250	0.200	0.333	0.250	0.250	0.200	0.250	0.333	0.250	0.333	0.333	0.333
C.3.2	0.400	0.400	0.400	0.400	0.400	0.400	0.500	0.000	0.667	0.400	0.400	0.400	0.400	0.333	0.400	0.250	0.000	0.250	0.200	0.250	0.600	0.333	0.250	0.250	0.200	0.250	0.333	0.250	0.333	0.333	0.333
C.3.3	0.400	0.400	0.400	0.400	0.400	0.400	0.500	0.667	0.000	0.400	0.400	0.400	0.400	0.500	0.400	0.500	0.667	0.500	0.600	0.500	0.200	0.333	0.500	0.500	0.600	0.500	0.333	0.500	0.333	0.333	0.333
C.4.1	0.333	0.300	0.273	0.200	0.273	0.273	0.222	0.222	0.222	0.000	0.429	0.375	0.286	0.222	0.222	0.222	0.143	0.286	0.222	0.222	0.250	0.222	0.222	0.222	0.222	0.250	0.200	0.250	0.250	0.250	0.143
C.4.2	0.222	0.300	0.273	0.300	0.273	0.273	0.222	0.222	0.222	0.429	0.000	0.375	0.286	0.222	0.222	0.222	0.143	0.000	0.222	0.222	0.125	0.222	0.222	0.222	0.222	0.125	0.300	0.125	0.125	0.125	0.143
C.4.3	0.333	0.300	0.273	0.300	0.273	0.273	0.333	0.333	0.333	0.429	0.429	0.000	0.429	0.333	0.333	0.333	0.429	0.429	0.333	0.333	0.375	0.333	0.333	0.333	0.333	0.375	0.300	0.375	0.375	0.375	0.429
C.4.4	0.111	0.100	0.182	0.200	0.182	0.182	0.222	0.222	0.222	0.143	0.143	0.250	0.000	0.222	0.222	0.222	0.286	0.286	0.222	0.222	0.250	0.222	0.222	0.222	0.222	0.250	0.200	0.250	0.250	0.250	0.286
C.5.1	0.333	0.400	0.333	0.333	0.333	0.333	0.400	0.400	0.333	0.333	0.400	0.333	0.500	0.000	0.333	0.400	0.333	0.200	0.333	0.333	0.333	0.400	0.286	0.250	0.333	0.400	0.333	0.222	0.400	0.333	0.500
C.5.2	0.333	0.200	0.333	0.333	0.333	0.333	0.200	0.200	0.333	0.333	0.200	0.333	0.000	0.400	0.000	0.600	0.333	0.400	0.333	0.333	0.333	0.200	0.286	0.375	0.333	0.200	0.333	0.333	0.200	0.167	0.000
C.5.3	0.333	0.400	0.333	0.333	0.333	0.333	0.400	0.400	0.333	0.333	0.400	0.333	0.500	0.600	0.667	0.000	0.333	0.400	0.333	0.333	0.333	0.400	0.429	0.375	0.333	0.400	0.333	0.444	0.400	0.500	0.500
C.6.1	1000	1000	1000	1000	1000	1000	0.500	1000	0.500	1000	0.500	1000	0.000	0.333	0.500	0.200	0.000	1000	0.333	0.500	1000	0.333	0.167	0.400	0.000	0.000	0.000	0.250	0.333	0.000	0.000
C.6.2	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.500	0.000	0.500	0.000	0.000	0.667	0.500	0.800	1000	0.000	0.667	0.500	0.000	0.667	0.833	0.600	1000	1000	1000	0.750	0.667	1000	0.000
A01	0.103	0.083	0.080	0.083	0.077	0.087	0.111	0.091	0.130	0.091	0.095	0.100	0.111	0.095	0.091	0.091	0.095	0.077	0.000	0.050	0.200	0.111	0.111	0.118	0.118	0.105	0.105	0.100	0.100	0.111	0.125
A02	0.069	0.083	0.080	0.083	0.077	0.087	0.056	0.091	0.043	0.136	0.143	0.100	0.056	0.048	0.045	0.045	0.048	0.077	0.105	0.000	0.100	0.111	0.111	0.118	0.059	0.105	0.105	0.100	0.100	0.111	0.125
A03	0.069	0.083	0.120	0.083	0.077	0.043	0.056	0.091	0.087	0.091	0.095	0.100	0.111	0.095	0.091	0.091	0.095	0.077	0.105	0.150	0.000	0.111	0.111	0.118	0.118	0.105	0.105	0.100	0.100	0.111	0.125
A04	0.069	0.083	0.080	0.083	0.077	0.087	0.056	0.045	0.087	0.091	0.095	0.100	0.111	0.095	0.045	0.045	0.095	0.077	0.105	0.150	0.050	0.000	0.056	0.059	0.059	0.105	0.105	0.050	0.000	0.000	0.000
A05	0.103	0.125	0.120	0.125	0.115	0.130	0.111	0.136	0.130	0.136	0.143	0.150	0.111	0.095	0.136	0.136	0.143	0.115	0.105	0.100	0.100	0.111	0.000	0.118	0.118	0.105	0.105	0.100	0.100	0.167	0.125
A06	0.069	0.083	0.080	0.083	0.077	0.087	0.056	0.091	0.087	0.091	0.048	0.050	0.056	0.048	0.091	0.091	0.095	0.077	0.105	0.100	0.100	0.111	0.111	0.000	0.118	0.105	0.105	0.100	0.000	0.000	0.000
A07	0.069	0.083	0.080	0.083	0.077	0.087	0.111	0.091	0.087	0.091	0.095	0.100	0.111	0.095	0.091	0.091	0.095	0.077	0.105	0.100	0.100	0.111	0.111	0.118	0.000	0.105	0.105	0.100	0.150	0.056	0.063
A08	0.069	0.083	0.080	0.083	0.077	0.087	0.111	0.091	0.087	0.091	0.095	0.100	0.111	0.095	0.091	0.091	0.095	0.077	0.105	0.100	0.100	0.111	0.111	0.118	0.118	0.000	0.105	0.100	0.100	0.111	0.125
A09	0.103	0.083	0.080	0.083	0.115	0.087	0.111	0.091	0.087	0.091	0.095	0.100	0.111	0.095	0.091	0.091	0.095	0.077	0.105	0.100	0.100	0.111	0.111	0.118	0.118	0.105	0.000	0.100	0.100	0.167	0.188
A10	0.069	0.083	0.080	0.083	0.077	0.087	0.111	0.091	0.087	0.091	0.095	0.100	0.111	0.143	0.136	0.136	0.143	0.154	0.105	0.100	0.100	0.056	0.111	0.059	0.118	0.105	0.053	0.000	0.050	0.111	0.063
A11	0.069	0.083	0.080	0.083	0.077	0,087	0.056	0.045	0.043	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.056	0.063
A12	0.069	0.042	0.040	0.042	0.077	0.043	0.056	0.045	0.043	0.000	0.000	0.000	0.000	0.095	0.091	0.091	0.000	0.115	0.053	0.050	0.050	0.056	0.056	0.059	0.059	0.053	0.053	0.150	0.100	0.000	0.000
A13	0.069	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0.000	0.000	0.053	0.000	0.100	0.000	0.000

TABLE A3 E1 cluster matrix

	C1	C2	C3	C4	C5	C6	A
C1	2	3	3	3	2	3	3
C2	3	1	2	3	2	3	3
C3	2	2	1	2	2	2	3
C4	3	3	2	2	2	2	3
C5	2	2	2	2	2	2	2
C6	1	2	2	1	2	1	2
A	3	3	3	3	3	3	2

TABLE A4 E1 cluster matrix normalized

	C1	C2	C3	C4	C5	C6	A
C1	0.1250	0.1875	0.2000	0.1875	0.1333	0.1875	0.1667
C2	0.1875	0.0625	0.1333	0.1875	0.1333	0.1875	0.1667
C3	0.1250	0.1250	0.0667	0.1250	0.1333	0.1250	0.1667
C4	0.1875	0.1875	0.1333	0.1250	0.1333	0.1250	0.1667
C5	0.1250	0.1250	0.1333	0.1250	0.1333	0.1250	0.1111
C6	0.0625	0.1250	0.1333	0.0625	0.1333	0.0625	0.1111
A	0.1875	0.1875	0.2000	0.1875	0.2000	0.1875	0.1111

TABLE A5 E1 weighted matrix

	C.1.1	C.1.2	C.1.3	C.1.4	C.2.1	C.2.2	C.3.1	C.3.2	C.3.3	C.4.1	C.4.2	C.4.3	C.4.4	C.5.1	C.5.2	C.5.3	C.6.1	C.6.2	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11	A12	A13
C.1.1	0.000	0.018	0.042	0.063	0.051	0.047	0.075	0.075	0.060	0.047	0.042	0.047	0.044	0.033	0.033	0.033	0.070	0.070	0.050	0.061	0.067	0.061	0.067	0.067	0.074	0.067	0.067	0.074	0.074	0.074	0.083
C.1.2	0.047	0.000	0.042	0.063	0.051	0.047	0.050	0.050	0.060	0.023	0.042	0.047	0.044	0.033	0.033	0.033	0.047	0.047	0.033	0.030	0.033	0.030	0.033	0.033	0.037	0.033	0.033	0.037	0.037	0.037	0.042
C.1.3	0.047	0.054	0.000	0.000	0.051	0.047	0.050	0.050	0.040	0.070	0.063	0.047	0.067	0.050	0.050	0.050	0.047	0.070	0.050	0.045	0.050	0.045	0.050	0.050	0.037	0.050	0.050	0.037	0.037	0.037	0.042
C.1.4	0.031	0.054	0.042	0.000	0.034	0.047	0.025	0.025	0.040	0.047	0.042	0.047	0.044	0.017	0.017	0.017	0.023	0.000	0.033	0.030	0.017	0.030	0.017	0.017	0.019	0.017	0.017	0.019	0.019	0.019	0.021
C.2.1	0.107	0.094	0.094	0.094	0.000	0.063	0.080	0.080	0.067	0.113	0.094	0.094	0.133	0.067	0.067	0.067	0.188	0.094	0.111	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.111	0.167	0.167	0.188
C.2.2	0.080	0.094	0.094	0.094	0.063	0.000	0.053	0.053	0.067	0.075	0.094	0.094	0.067	0.067	0.067	0.067	0.000	0.094	0.056	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.083	0.056	0.000	0.000	0.000
C.3.1	0.025	0.025	0.025	0.025	0.025	0.025	0.000	0.022	0.022	0.025	0.025	0.025	0.027	0.022	0.027	0.033	0.042	0.031	0.033	0.042	0.033	0.056	0.042	0.042	0.033	0.042	0.056	0.042	0.056	0.056	0.063
C.3.2	0.050	0.050	0.050	0.050	0.050	0.050	0.033	0.000	0.044	0.050	0.050	0.050	0.053	0.044	0.053	0.033	0.000	0.031	0.033	0.042	0.100	0.056	0.042	0.042	0.033	0.042	0.056	0.042	0.056	0.056	0.063
C.3.3	0.050	0.050	0.050	0.050	0.050	0.050	0.033	0.044	0.000	0.050	0.050	0.050	0.053	0.067	0.053	0.067	0.083	0.063	0.100	0.083	0.033	0.056	0.083	0.083	0.100	0.083	0.056	0.083	0.056	0.056	0.063
C.4.1	0.063	0.056	0.051	0.038	0.051	0.051	0.030	0.030	0.030	0.000	0.054	0.047	0.038	0.030	0.030	0.030	0.018	0.036	0.037	0.037	0.042	0.037	0.037	0.037	0.037	0.042	0.033	0.042	0.042	0.042	0.027
C.4.2	0.042	0.056	0.051	0.056	0.051	0.051	0.030	0.030	0.030	0.054	0.000	0.047	0.038	0.030	0.030	0.030	0.018	0.000	0.037	0.037	0.021	0.037	0.037	0.037	0.037	0.021	0.050	0.021	0.021	0.021	0.027
C.4.3	0.063	0.056	0.051	0.056	0.051	0.051	0.044	0.044	0.044	0.054	0.054	0.000	0.057	0.044	0.044	0.044	0.054	0.054	0.056	0.056	0.063	0.056	0.056	0.056	0.056	0.063	0.050	0.063	0.063	0.063	0.080
C.4.4	0.021	0.019	0.034	0.038	0.034	0.034	0.030	0.030	0.030	0.018	0.018	0.031	0.000	0.030	0.030	0.030	0.036	0.036	0.037	0.037	0.042	0.037	0.037	0.037	0.037	0.042	0.033	0.042	0.042	0.042	0.054
C.5.1	0.042	0.050	0.042	0.042	0.042	0.042	0.053	0.053	0.044	0.042	0.050	0.042	0.067	0.000	0.044	0.053	0.042	0.025	0.037	0.037	0.037	0.044	0.032	0.028	0.037	0.044	0.037	0.025	0.044	0.037	0.063
C.5.2	0.042	0.025	0.042	0.042	0.042	0.042	0.027	0.027	0.044	0.042	0.025	0.042	0.000	0.053	0.000	0.080	0.042	0.050	0.037	0.037	0.037	0.022	0.032	0.042	0.037	0.022	0.037	0.037	0.022	0.019	0.000
C.5.3	0.042	0.050	0.042	0.042	0.042	0.042	0.053	0.053	0.044	0.042	0.050	0.042	0.067	0.080	0.089	0.000	0.042	0.050	0.037	0.037	0.037	0.044	0.048	0.042	0.037	0.044	0.037	0.049	0.044	0.056	0.063
C.6.1	0.063	0.063	0.063	0.063	0.125	0.125	0.067	0.133	0.067	0.063	0.031	0.063	0.000	0.044	0.067	0.027	0.000	0.063	0.037	0.056	0.111	0.037	0.019	0.044	0.000	0.000	0.000	0.028	0.037	0.000	0.000
C.6.2	0.000	0.000	0.000	0.000	0.000	0.000	0.067	0.000	0.067	0.000	0.031	0.000	0.000	0.089	0.067	0.107	0.063	0.000	0.074	0.056	0.000	0.074	0.093	0.067	0.111	0.111	0.111	0.083	0.074	0.111	0.000
A01	0.019	0.016	0.015	0.016	0.014	0.016	0.022	0.018	0.026	0.017	0.018	0.019	0.022	0.019	0.018	0.018	0.018	0.014	0.000	0.006	0.022	0.012	0.012	0.013	0.013	0.012	0.012	0.011	0.011	0.012	0.016
A02	0.013	0.016	0.015	0.016	0.014	0.016	0.011	0.018	0.009	0.026	0.027	0.019	0.011	0.010	0.009	0.009	0.009	0.014	0.012	0.000	0.011	0.012	0.012	0.013	0.007	0.012	0.012	0.011	0.011	0.012	0.016
A03	0.013	0.016	0.023	0.016	0.014	0.008	0.011	0.018	0.017	0.017	0.018	0.019	0.022	0.019	0.018	0.018	0.018	0.014	0.012	0.017	0.000	0.012	0.012	0.013	0.013	0.012	0.012	0.011	0.011	0.012	0.016
A04	0.013	0.016	0.015	0.016	0.014	0.016	0.011	0.009	0.017	0.017	0.018	0.019	0.022	0.019	0.009	0.009	0.018	0.014	0.012	0.017	0.006	0.000	0.006	0.007	0.007	0.012	0.012	0.006	0.000	0.000	0.000
A05	0.019	0.023	0.023	0.023	0.022	0.024	0.022	0.027	0.026	0.026	0.027	0.028	0.022	0.019	0.027	0.027	0.027	0.022	0.012	0.011	0.011	0.012	0.000	0.013	0.013	0.012	0.012	0.011	0.011	0.019	0.016
A06	0.013	0.016	0.015	0.016	0.014	0.016	0.011	0.018	0.017	0.017	0.009	0.009	0.011	0.010	0.018	0.018	0.018	0.014	0.012	0.011	0.011	0.012	0.012	0.000	0.013	0.012	0.012	0.011	0.000	0.000	0.000
A07	0.013	0.016	0.015	0.016	0.014	0.016	0.022	0.018	0.017	0.017	0.018	0.019	0.022	0.019	0.018	0.018	0.018	0.014	0.012	0.011	0.011	0.012	0.012	0.013	0.000	0.012	0.012	0.011	0.017	0.006	0.008
A08	0.013	0.016	0.015	0.016	0.014	0.016	0.022	0.018	0.017	0.017	0.018	0.019	0.022	0.019	0.018	0.018	0.018	0.014	0.012	0.011	0.011	0.012	0.012	0.013	0.013	0.000	0.012	0.011	0.011	0.012	0.016
A09	0.019	0.016	0.015	0.016	0.022	0.016	0.022	0.018	0.017	0.017	0.018	0.019	0.022	0.019	0.018	0.018	0.018	0.014	0.012	0.011	0.011	0.012	0.012	0.013	0.013	0.012	0.000	0.011	0.011	0.019	0.023
A10	0.013	0.016	0.015	0.016	0.014	0.016	0.022	0.018	0.017	0.017	0.018	0.019	0.022	0.029	0.027	0.027	0.027	0.029	0.012	0.011	0.011	0.006	0.012	0.007	0.013	0.012	0.006	0.000	0.006	0.012	0.008
A11	0.013	0.016	0.015	0.016	0.014	0.016	0.011	0.009	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.008
A12	0.013	0.008	0.008	0.008	0.014	0.008	0.011	0.009	0.009	0.000	0.000	0.000	0.000	0.019	0.018	0.018	0.000	0.022	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.006	0.006	0.017	0.011	0.000	0.000
A13	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.006	0.000	0.011	0.000	0.000

TABLE A6 E1 priorities obtained from limit matrix

		LIMIT	NORM
C1 Decent work and economic growth	C.1.1	0.0504	0.0612
	C.1.2	0.0413	0.0502
	C.1.3	0.0469	0.0570
	C.1.4	0.0299	0.0364
C2 Reduced inequalities	C.2.1	0.0865	0.1051
	C.2.2	0.0652	0.0792
C3 Industry, innovation and infrastructure	C.3.1	0.0288	0.0351
	C.3.2	0.0424	0.0516
	C.3.3	0.0551	0.0670
C4 Peace, justice and strong institutions	C.4.1	0.0388	0.0471
	C.4.2	0.0361	0.0439
	C.4.3	0.0496	0.0603
	C.4.4	0.0303	0.0368
C5 Sustainable development	C.5.1	0.0414	0.0503
	C.5.2	0.0376	0.0457
	C.5.3	0.0459	0.0559
C6 Health and welfare	C.6.1	0.0605	0.0736
	C.6.2	0.0359	0.0436
Alternatives	A01	0.0168	0.0946
	A02	0.0136	0.0769
	A03	0.0155	0.0872
	A04	0.0138	0.0779
	A05	0.0218	0.1228
	A06	0.0139	0.0782
	A07	0.0158	0.0893
	A08	0.0159	0.0896
	A09	0.0169	0.0952
	A10	0.0178	0.1002
	A11	0.0060	0.0339
	A12	0.0088	0.0498
	A13	0.0008	0.0046