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REVIEW

Sustainable development goals assessment of Erzurum province with SWOT-AHP analysis

Çağlar Kıvanç Kaymaz[1] · **Salih Birinci**[1] · **Yusuf Kızılkan**[1]

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Abstract

Sustainable development is one of the issues that many developed and developing countries focus on in the world. The sustainability of human and natural resources is of great importance for securing the world and humanity's common future. In this context, this study aims to evaluate the socio-economic structure of Erzurum with analytical hierarchy process (AHP) and digitized strengths, weaknesses, opportunities and threats analysis considering sustainable development goals (SDGs). The items included in the Agenda 21 report of the United Nations and 17 SDGs determined by the United Nations were taken into consideration in this endeavour. In line with expert opinions, the strengths, weaknesses, opportunities and threats created by the sustainable development goals for Erzurum province were analysed statistically with the AHP. Priority and weighted values of each sub-criterion were calculated. According to this analysis, "the richness of natural, cultural and historical resources for tourism potential" ranks first among the strengths of the province regarding sustainable development goals. Weaknesses include "insufficient investment and entrepreneurial culture". However, "priority region status for development" criterion stands out as the most important opportunity. Threats include "loss of labour force due to migration from agricultural areas" criterion. After the statistical analysis, the quantitative results of made for the best realization of sustainable development for the area were assessed to specify new goals and strategies. Suggestions were offered to define opportunities and strengths, threats and weaknesses with new-build strategies and to make the plans accordingly.

Keywords Erzurum province · Sustainable development · AHP · SWOT analysis

✉ Çağlar Kıvanç Kaymaz
ckkaymaz@atauni.edu.tr

Salih Birinci
sbirinci@atauni.edu.tr

Yusuf Kızılkan
yusuf.kizilkan@atauni.edu.tr

[1] Department of Geography, Faculty of Letters, Ataturk University, Yakutiye, 25240 Erzurum, Turkey

1 Introduction

The concept of sustainable development gained increasing attention during the second half of the twentieth century. The concept was first used in the report titled "The Limits to Growth" published by the Club of Rome after the 1972 Stockholm Conference. Though this report, special committees were established to investigate five major global concerns such as industrialization, rapid population growth, widespread malnutrition, depletion of non-renewable resources and degraded environment (Botkin et al., 2014; Meadows et al., 1972). The concept of comprehensive sustainable development is attributed to the Brundtland Report which implies, “We must ensure that development meets the existing needs without compromising the future generations’ ability to meet their needs”. Sustainable development is a process of change where consideration of resource exploitation, direction of investments and technological development and institutional change are made consistent with both future and existing needs (Hulse, 2007; WCED, 1987).

Ensuring sustainable development is challenged by several ecological and social aspects such as single-sector resource management, resource scarcity, environmental pollution and continuity of forced labour (Jansen, 2003; Lafferty, 2006). Undoubtedly, these challenges are interrelated. Therefore, harmonious international cooperation is necessary for permanent solutions. The United Nations (UN) specified goals as the SDGs in 2015 to measure the progress towards sustainability, eliminating poverty and hunger, promoting innovation and economic growth. These goals are developed through international and interdisciplinary cooperation and it is indicated that countries can designate self-suitable strategies (UN, 2015). In this context, SDGs, comprising 17 goals and 169 targets to transform the world, aims to tackle multiple and complex challenges faced by humanity to ensure human well-being, economic well-being and environmental protection (Nilsson et al., 2016). Accordingly, Telfer and Sharpley (2015) summarized the fundamental principles of sustainable development at three points. First, the *holistic* approach takes social, economic and ecological issues on a global scale as a whole. Second, the principle of *equality* ensures that resources are shared fairly and equally, both globally and across generations, to enable development for all generations. Third, *the future* focuses on ensuring the sustainability of the ecosystem and the people on a global scale in the long term (Telfer & Sharpley, 2015).

Therefore, solution-oriented studies are necessary to support the transformation towards sustainable development in line with the SDGs, which aim to end poverty, protect the world and provide prosperity for all. A sustainable strategy should be developed within this perspective to better manage the interdependence of socio-economic systems and natural resources (Schmandt, 2010).

In this context, sustainable development and studies on international literature have become the hotbed of discussion in recent years. Although sustainability research has made significant progress in numerous areas, the concept of sustainable development is multidimensional. In order to discover these dimensions comprehensively, interdisciplinary studies with environmental, social and economic sciences should be emphasized (Aagaard Nielsen et al., 2010). Moreover, sustainability studies in developing countries fall behind of the studies made in developed countries, which negatively affects developing countries, leading to the lack of information in return (Mukhopadhyay et al., 2014).

For successful sustainable development, discussions are held on all three dimensions of the concept. The first is the economic dimension, which relates to the use of scarce resources. An economically sustainable system is a system that can produce goods and services according to the principles of continuity, avoids sectoral imbalances that damage

agricultural and industrial production, and ensures manageable sustainability of internal and foreign debts. The second is the social aspect which is human-oriented. A socially sustainable system is a system that can ensure the adequacy and equal distribution of social services such as education, health, gender equality, political responsibility and participation. The third is the environmental dimension, which stipulates the balanced biological and physical systems. The aim is to ensure that ecosystems adapt to changing conditions. An environmentally sustainable system should avoid the exploitation of renewable resource systems. An environmentally sustainable system should consume only the resources that have been adequately replaced by investments. This system also includes the conservation of biodiversity, atmospheric balance and other ecosystem elements, which cannot be classified as economic resources (Giddings et al., 2002; Harris, 2000).

There are striking differences in terms of sustainable development at regional and local levels. Ensuring sustainable development rests on the determination of priorities and projects or strategy development for these areas. In this regard, this article is an attempt towards answering the following questions. What are the strengths in sustainable development in Erzurum province? What are the weaknesses that could hinder sustainable development? What opportunities are available to promote sustainable development? What are the threats against sustainable development?

In this study, the criteria pertaining to the strengths and weaknesses as well as the opportunities and threats (SWOT) in Erzurum with regard to the United Nations Sustainable Development Goals (UN SDGs) were identified in accordance with expert opinions. Within this framework, expert opinions were received in order to measure and determine the statistical significance of the criteria. Using the analytical hierarchy process (AHP) method, pairwise comparisons were made between the criteria, and priorities of the strengths and weaknesses as well as the opportunities and threats were identified. In this context, various suggestions have been provided regarding the sustainable development goals of Erzurum province.

2 Background

Various implementation and policy suggestions are included in the meetings themed Sustainability and Development organized by the UN to preserve the current and the future resources regarding many issues. The United Nations Conference on the Human Environment held in Stockholm in 1972 resulted in 26 basic sustainability principles considering the need for common perspective and principles to guide countries in the protection and improvement of the human environment with its social, economic and environmental dimensions (UNCED, 1972). The World Conservation Strategy (WCS) meeting held in 1980 with the collaboration of International Union for Conservation of Nature and Natural Resources (IUCN), United Nations Environment Program (UNEP) World Wildlife Fund (WWF), the Food and Agriculture Organization of the United Nations (FAO) and the United Nations Educational, Scientific and Cultural Organization (UNESCO) under the theme of sustainability of the environment can be shown among these important developments.

A comprehensive meeting was held by the World Environment and Development Commission with the theme of Our Common Future in 1987, which played a complementary role to the knowledge and experience of the United Nations and various organizational initiatives for sustainable development (WCED, 1987). This meeting designed the scope

and principles of sustainable development with the Brundtland final report. The contents of comprehensive implementation aimed at satisfying the current development needs by considering future generations were specified with the criteria included in Agenda 21 report of the United Nations Conference on Environment and Development (UNCED) in 1992 as a result of the UNCED. Agenda 21 Report comprised social, economic and environmental approaches accepted by 178 countries, hence forming the basis of sustainable development with 40 criteria. These approaches include implementation recommendations and roadmaps for sustainability policies that combine the past and present (UNCED, 1992). Accordingly, the World Sustainable Development Summit (Johannesburg) and 2012 Rio + 20 (UNCED) Conference were held in 2002 according to the sustainable development goals of the field in the past and important progress was made. At the summits of Johannesburg and Rio + 20, the commitment to sustainable development and sustainable development goals was renewed. In addition, the necessity for concrete and urgent action by governments and non-governmental organizations for promoting a sustainable future in line with sustainable development goals was emphasized (Hens & Nath, 2003; UN, 2012).

Sustainable development concept evolved quite substantially since 1972 when it was first introduced and now includes objectives such as combating poverty, ensuring sustainable environmental integrity, measures against land degradation, accelerating industrialization, reducing malnutrition, demographic structure, biodiversity, resource, adhering to the targets set in Agenda 2030. Furthermore, numerous basic strategies such as sustainable agriculture, animal husbandry, tourism and education, protection of sensitive and fragile areas, reducing global climate change, ensuring health services, economic stability and prosperity all over the world, were developed. Approaches that comprise these strategies emerged in 2015 as the SDGs to ensure the continuity of sustainable development worldwide. SDGs have been identified as strategies to achieve sustainable development by 2030. The 17 main goals set by the UN are to end poverty and hunger, ensure food security and welfare for all age groups, sustainable agriculture, education, energy, economy, global partnership themes for the promotion of industry, cities and societies, production and consumption and conservative environment, gender equality, water and sanitation, durable infrastructure, reducing national and international inequalities, sustainability in water resources, combating climate change, ensuring peace, justice, strong cooperation and sustainable development (UN, 2016).

States need tools that can both predict and facilitate progress towards social, environmental and economic goals to ensure and achieve the societal development in line with the goals and objectives of sustainable development processes. Therefore, the selection and interpretation of "sustainability indicators" have become an integral part of national and international policy in recent years (Reed et al., 2006). There are a large number of recently developed tools for multi-criteria decision-making (MCDM) methods in the application of SWOT analysis, which is used as a tool to create and rank optimal strategies. These tools have broadened the scope of their implementation and opened new arrays for objective decision-making (Arsić et al., 2017). Various approaches are used to monitor potential sustainable development practices of today and the future and the policy and plan development for these practices. For an analysis of sustainable development goals with MCDM methods in terms of SWOT has become a common approach model for studies in this field (Helms & Nixon, 2010; Pickton & Wright, 1998). Sustainable development practices designed through the SWOT analysis is quite common in local, regional, national and international publications. Assessments performed with SWOT analyses include environmental, sociological, economic and cultural trends within the scope of sustainable tourism (Arsić et al., 2017; Asadpourian et al., 2020); ecotourism strategies in terms of sustainable

development (Ghorbani et al., 2015; Mondal & Haque, 2017; Yılmaz et al., 2013); and development examples based on SWOT analyses of sustainable development, rural tourism and planning relationships (Sabokkhiz & Sabokkhiz, 2010; Shang et al., 2020). There are international studies using SWOT analysis with regard to sustainable energy (Bai, 2012; Markovska et al., 2009; Njoh, 2017; Tugrul & Cimen, 2016). Several studies focus on the correlation between sustainable development and sustainable environment through SWOT analysis (Baudino et al., 2017; Dzonzi-Undi & Li, 2015; Gao et al., 2017; Kong et al., 2012; Leandri et al., 2020). SWOT analysis studies related to mining, transportation systems (Akbar et al., 2019; Hatefi, 2018; Ocilková et al., 2019) for sustainable development practices and infrastructure improvements are also exemplary studies in this field. SWOT analysis in social and economic terms, the main dimensions of sustainable development, is another common implication area (Fan & Xue, 2018; Kneafsey et al., 2013; Mollenhorst & De Boer, 2004; Mulyadi, 2019; Pesonen & Horn, 2013; Vittersø et al., 2019). The introduction of AHP to studies focusing on sustainable development through a SWOT analysis, examined from different aspects, has made a substantial contribution to the development of the research dimensions and relevant findings.

There are numerous studies on the SWOT-AHP-sustainable development connection which includes statistical information handled with guiding dimensions of SWOT analysis processes. Environmental, economic and social studies that constitute the basic dimensions of sustainable development are evaluated under this study in terms of sustainable development through AHP and SWOT analyses. There is a substantially broad literature on broadening the scope of SWOT-AHP based on sustainable development, economy, industry, supply chain and selection practices in terms of economic and social sustainability (Awasthi et al., 2018; Bas, 2013; Calabrese et al., 2019; Centobelli et al., 2017; Dania et al., 2018; Govindan et al., 2014, 2020a, 2020b, 2020c; Kim & Park, 2019; Lenis Escobar et al., 2020; Mangla et al., 2018; Mani et al., 2014; Raza et al., 2018; Tavana et al., 2016). There have been numerous attempts elaborating on the AHP and SWOT connection within the scope of environmentally sustainable development such as the selection of potential areas and suitable routes in various areas according to geographic features (Coruhlu et al., 2020; Datta, 2020; De La Vega et al., 2018; Kumari & Pandey, 2020), sustainable environmental relationship and appropriate agricultural land location selection (Feng, 2020; Sarı & Koyuncu, 2021), sustainable energy and environmental impact assessment (Anser et al., 2020; Ervural et al., 2018; Solangi et al., 2019; Wang et al., 2020), natural resource sustainability (Kajanus et al., 2012), sustainable tourism (Asadpourian et al., 2020; Fabac & Zver, 2011; Kişi, 2019; Najafinasab et al., 2020; Navarro-Martínez et al., 2020; Zorlu & Yılmaz, 2020) and residential areas sustainability (Esmaeilzadeh et al., 2020; Fatourehchi & Zarghami, 2020; Kramar et al., 2019). Furthermore, environmental, economic and social sustainability studies regarding national and regional characteristics (Alipouri et al., 2020; Calabrese et al., 2019; Jayaraman et al., 2015; Modibbo et al., 2020) related to general issues of sustainable development has narrow literature.

The scholarship associated SWOT and AHP to overcome the problems in decision-making methods in AHP processes with additional applications to AHP approaches and provide choices according to the application areas, as hybrid studies are also developed. Some of these are hybrid SWOT-ANP-FANP (Arsić et al., 2017); A'WOT hybrid method (Kişi, 2019); SWOT-AHP hybrid approach (Najafinasab et al., 2020); SWOT and F-AHP (Kramar et al., 2019); AHP-Fuzzy and TOPSIS models (Alipouri et al., 2020); SWOT-Fuzzy AHP approach (Wang et al., 2020); ANP and Fuzzy-TOPSIS-SWOT (Ervural et al., 2018); SWOT-AHP and Fuzzy-TOPSIS (Solangi et al., 2019); fuzzy axiomatic design approach (Feng, 2020); Fuzzy-AHP-VIKOR(Awasthi et al., 2018); Fuzzy-AHP (Calabrese

et al., 2019); Fuzzy-AHP and SWOT (Tavana et al., 2016); SWOT-Fuzzy, TOPSIS with AHP (Bas, 2013); AHP-ELECTRE (Borajee & Yakchali, 2011); SWOT-Fuzzy COPRAS (Hatefi, 2018); Fuzzy-AHP-TOPSIS (Ocampo, 2019); Fuzzy-AHP–TOPSIS(Aksu & Küçük, 2020); Fuzzy DEMATEL MCDA (Yıldızbaşı et al., 2020); and MCDA-AHP-TOPSIS-VIKOR (Kaymaz et al., 2020) as hybrid multi-criteria decision-making approach literature keeps developing.

The studies reviewed in the context of the SWOT-AHP and sustainable development correlation focus only a few of the sustainable development goals and objectives. This research introduces a distinct approach with a more comprehensive SWOT-AHP assessment including social, economic and environmental dimensions in terms of sustainable development aspects, sustainable development goals and the criteria set in the UN Environment Conferences. The SWOT-AHP assessment, according to 24 criteria regarding the social, economic and environmental dimensions of sustainable development in this research, is more comprehensive than the criterion dimensions used in the studies reviewed in this section. There are similarities in the approaches exemplified in this section regarding criteria such as health, tourism, agriculture, infrastructure and energy. However, this study differs partially from previous studies in terms of determining sustainable development priorities by SDGs targets in a study field.

3 Study area

Erzurum is located within the borders of the Eastern Anatolia Region. The provincial administrative area is geographically located between the Black Sea and the Eastern Anatolia Region. The provincial land was limited to the borders of Rize, Artvin and Ardahan from the north, Kars and Ağrı from the east, Muş and Bingöl from the south, and Bayburt and Erzincan from the west (Fig. 1). Erzurum has a surface area of approximately 25.000 km^2 within these limits and is Turkey's 4th largest province in terms of surface area. While the northern districts of İspir, Pazaryolu, Tortum, Uzundere, Oltu, Olur and Narman positioned North in the Black Sea, other districts are in the Eastern Anatolia Region borders. In this respect, the physical, human and economic geography diversity is noteworthy.

Erzurum consists of mountains, plains and plateaus. The city has a noteworthy high average elevation. The province is geomorphologically limited to Rize Mountains from the north, Kop and Dumanlı from the west, Bingöl Mountains from the south, and Allahuakbar Mountains and Ardahan plateaus in the east. Apart from these, Palandöken Mountains in the south and Dumlu and Kargapazarı Mountains lie in the north of Erzurum city. Wide plateau plains, mountains and the plains spread in depressions lying between mountainous areas (Atalay, 1978; Arınç, 2016; Koday and Kaya, 2012). Plateaus spread with large surface areas within the city limits. Besides the production of forage crops, livestock activities are carried out on these plateaus. The northern part of the province gained a very slopped and hilly appearance due to the deep fractions formed by the rivers in the topography. Agricultural lands are very limited in these areas and agricultural activities are carried out in small parcels for subsistence. On the other hand, plateau plains in the high sections of the mountains offer suitable environments for livestock activities.

Continental climate conditions are existent in a large part of Erzurum province. The areas in the north of the province are in the transition area from the continental climate to humid climatic conditions similar to the Black Sea climate. Humid climatic conditions are explicitly observable in the lower parts of the Çoruh Valley in the north. On

Fig. 1 Location map of Erzurum province

the other hand, heavy continental climate conditions are noticeable in the rest of the province. The average annual temperatures in these areas are around 6 ºC and the average temperatures are below 0 °C between November and March (Turkish State Meteorological Service, 2019). In addition, low annual rainfall adversely affects agricultural and livestock activities. Besides, the fact that the precipitation during the winter season is in the form of snow and the snow stays on the ground for a long time offers suitable conditions for winter tourism.

Erzurum province constitutes the source of three important river basins, namely Çoruh, Euphrates and Aras. A substantial part of the waters flowing from the lands of Erzurum reaches the Black Sea with the Çoruh River, the Persian Gulf with Karasu river and its connection to the Euphrates River, and the Caspian Sea with the Aras River. Moreover, Tortum Lake and its waterfall within the province borders, frozen waterfalls formed in Uzundere district during winter and floating islands are also among the important hydrographic sources that stand out for tourism.

The vegetation cover includes natural steppes and meadows due to the climatic conditions in Erzurum province. This situation supports the development of livestock activities in the province.

According to 2019 Turkish Statistical Institute (TURKSTAT) data, a total of 762.062 people, of which 379.893 are men and 382.169 women, live in Erzurum province (TURKSTAT, 2019). However, it is observed that more than half of this population (422.832 people) is concentrated in the city centre and its immediate vicinity (Yakutiye, Palandöken and Aziziye).

The city of Erzurum was established on the south-eastern end of Erzurum Plain and the northern slopes of the Palandöken Mountains and has been an important military, transportation and trade centre since its position on the silk road (Altaş, 2015; Doğanay, 1983). Besides the service sector (trade, education, health, administrative, etc.), manufacturing, small-scale industry, livestock and agriculture sectors are observed to be in the foreground regarding economic terms in Erzurum city (Altaş, 2015). Wheat, barley, sugar beet, potato, sunflower, forage crops and various vegetables and fruits are produced in the province, especially in plains such as Erzurum and Pasinler and other small agricultural areas. Moreover, the large meadow and pasture areas positively affect the development of cattle and ovine livestock activities (Koday, 2005). The fact that the average elevation of the provincial land is high and the vegetation diversity formed by height differences increase the economic potential of Erzurum city, especially with beekeeping activities and honey production in the summer months. Therefore, numerous migratory beekeepers in Turkey come to Erzurum for honey production (Bulut & Zaman, 2003). Moreover, winter tourism in the Palandöken Mountains as well as natural and cultural (mosque, church, chapel, etc.) tourist attractions in various parts of the city of Erzurum allow the tourism industry to develop rapidly.

4 Methods

SWOT is a list of statements or factors that explain the current and future trends of both indoor and outdoor environments in general. The expressions regarding individual factors are the definition of subjective opinions as general and short (Eslamipoor & Sepehriar, 2014). AHP is one of the MCDM methods (Lee & Chan, 2008). MCDM methods are substantial in making important decisions that cannot be determined directly. Today, there are several MCDM methods to utilize in studies. AHP method was selected for this study. The advantage of this theory is that the qualitative views obtained from the SWOT analysis are converted into quantitative weights with the AHP approach, which allows the variable priority to be defined in a specific context (Santopuoli et al., 2016). This method also requires a higher number of bidirectional comparisons (Kajanus et al., 2012; Shrestha et al., 2004). Bidirectional comparisons of the SWOT-AHP method allow to maintain a manageable level with these and then form the basis of formulated strategies (Brunnhofer et al., 2020).

AHP, introduced by Saaty (1977), is one of the most common multi-criteria decision-making techniques. Saaty (1980) and Saaty (1982) developed a comparison method that models a hierarchical decision problem framework including several criteria with one-way relationships by applying this principle. Bidirectional comparisons of the AHP method allow to maintain a manageable level with these and then form the basis of formulated strategies (Brunnhofer et al., 2020). AHP is essentially based on logical and numerical consistency for establishing hierarchies and determining superiorities (Saaty & Vargas, 2001; Wind & Saaty, 1980). AHP functions with a hierarchy that can combine both subjective and objective criteria (Aksu & Küçük, 2020; Fiore et al., 2020; Saaty, 1980). It is a powerful and comprehensive methodology designed to facilitate sound decision-making for the decision-maker utilizing both the empirical data and subjective decisions (Escobar et al., 2004; Sólnes, 2003). In other words, the AHP is a systematic approach developed to make a decision based on experience, foresight and intuition based on the structure of a well-defined methodology derived from sound mathematical principles (Bhushan & Rai, 2004).

Thus, AHP is widely used to solve a particular problem type involving the prioritization of potential alternative solutions (Byun, 2001).

Multi-criteria methods offer a system for modelling preferences, collecting, saving and organizing all relevant information. Therefore, the subject is studies with flexibility in the decision-making process to produce the final solution and makes it noticeable and transparent (Cinelli et al., 2014; Hokkanen & Salminen, 1997). This method is an applied combination of analysis tools to develop policies based on results from SWOT and AHP (Gottfried et al., 2018). The purpose of integrating AHP to the framework of SWOT is a systematic evaluation of SWOT factors and equalization of their intensity (Eslamipoor & Sepehriar, 2014). Besides, the idea of implementing AHP within a SWOT framework is to systematically evaluate SWOT factors and make their intensity proportional. This provides a good basis for examining the current, an expected situation or an alternative strategy in a more comprehensive way (Hamurcu & Eren, 2020; Kurttila et al., 2000).

The SWOT-AHP analysis of Erzurum province comprises several stages according to the SDGs (Fig. 2). First, the SWOT-AHP method was selected as the most suitable method

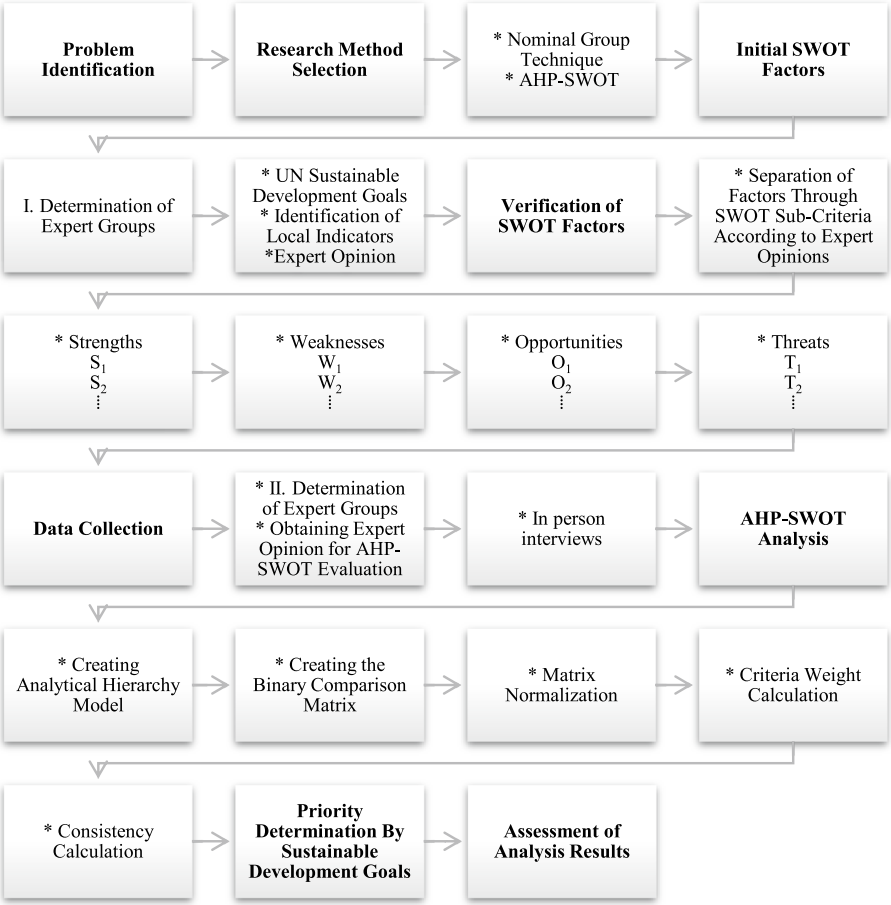

Fig. 2 Data collection and implementation framework of this study

for the analysis and the research puzzle. Second, the most appropriate factors for SWOT analysis were formulated through using the nominal group technique taking the literature on sustainable development and the UN's SGDs into account. The SWOT factors that were formulated at the initial stage then modified by the local indicators in line with the opinions of the previously determined experts. At this stage, an expert group of 5 individuals were consulted for the determination of the criteria factors as a distinct group of 6 evaluated the criteria during the data collection phase. All of the experts in both groups are academics who study sustainable development and carry out projects on behalf of the state in various institutions and organizations. Third, the factors determined by expert opinions produced in the first group were verified and sectioned as four groups as strength, weakness, opportunity and threats according to SWOT sub-criteria. Fourth, in-person interviews were held with the second group of experts for their evaluation of the criteria to initiate data collection. The data collected in the fifth step were evaluated by AHP-SWOT analysis. The analytical hierarchy model and binary comparison matrix were formed. Then, matrix normalization, calculation of criterion weights and consistency ratio were performed. In the last stage, the priorities of the sub-criteria by the SWOT of SDGs were determined through the analysis. The results were assessed in the findings and discussion sections. Numerous strategies have been propounded, and recommendations are presented for achieving sustainable development in the province.

Binary comparison is an important step conducted by experts in AHP. However, this complex process is often criticized, especially when there are numerous criteria or alternatives in AHP. In this case, especially in the process of comparing several criteria to each other, the possibility of making false or incorrect decisions increases due to boredom (Lee & Chan, 2008). Functional alternatives and criteria were determined to avoid complexity. The factor or criterion definition is a very important stage as the example or stakeholder selection should be impartial and balanced (Haque et al., 2020). It has been tried to avoid the problems that may arise from contradictions that may occur in expert decisions and to maintain a consistency rate. In this context, 4 main criteria and 6 sub-criteria were determined under the heading of strength, weakness, opportunity and threats to determine SWOT analysis of Erzurum's sustainable development potential with AHP method (Table 1). This factor definition is a very important step as the choice of samples or stakeholders should be objective and balanced (Haque et al., 2020). Therefore, the SDGs were selected as a basis in the process of setting the criteria. Thus, a hierarchical model was formed with a total of 24 criteria consisting of 4 main and 6 sub-criteria for each (Fig. 3).

In the second stage, a model consisting of 24 criteria in 4 main categories was applied to 6 specialists consisting of academicians with academic studies related to the research subject and researchers of development agency in the region. In this way, relative priorities have been achieved in line with expert opinions. In the process of determining the priorities, a 9-point scale ranging from 1 to 9 used in AHP studies was used (Saaty, 1990; Table 2). In the study, pairwise comparisons were made according to the values given by each expert to the criteria under 4 main criteria.

The priority value of criteria was determined by calculating the consistency of the priorities of the criteria and the judgments (evaluations) of the experts with the comparative matrix. The consistency rate (CR) is important in this process and should be less than 0.1 (Forman, 1990; Hafeez et al., 2002). In this context, all comparative matrices were found to be within the consistency limits and evaluations were carried out accordingly. Therefore, the priority steps of SWOT analysis are given below (Kurttila et al., 2000):

Step 1 SWOT analysis is finalized. The relevant factors of the outer and inner environment are identified and included in the SWOT analysis. When standard AHP is applied,

Table 1 SWOT categories priorities regarding priority determination in sustainable development of Erzurum province

SWOT criteria	SWOT factors (sub-criteria)	
Strengths (S)	S_1	Favourable environmental conditions for agriculture and livestock activities
	S_2	Potential underground and ground resources
	S_3	Developed state of transportation systems and their use for commercial purposes (airline, road and rail)
	S_4	Opportunities related to a healthy life, education and social welfare
	S_5	Promotion of gender equality in rural and urban areas
	S_6	The richness of natural, cultural and historical resources for tourism potential
Weaknesses (W)	W_1	Insufficient investment and entrepreneurial culture
	W_2	High unemployment rate and migration
	W_3	Challenges in the joint action of businesses and civil society organizations for sustainable development goals
	W_4	Inadequate conservation of resources (historical, natural and cultural) for development and mismanagement
	W_5	Lack of developed incentives, innovation and production–consumption patterns within the scope of sustainable industry
	W_6	Lack of legal processes at national and international level for sustainable development, and knowledge and decision-making
Opportunities (O)	O_1	Priority region status for development
	O_2	Universities' role in supporting socio-economic development
	O_3	Revitalization of local culture, festivals and local handicrafts
	O_4	Supporting products grown in the province for agriculture and rural development
	O_5	Revitalizing global, national and regional collaborations, providing financial resources with public supports and functionalizing them
	O_6	The existence of community-oriented facilities and practices for sustainable development

Table 1 (continued)

SWOT criteria	SWOT factors (sub-criteria)	
Threats (T)	T_1	The existence of factors damaging nature and tourism areas in terms of infrastructure and superstructure (HEPP, mining enterprises, misuse of agricultural areas)
	T_2	Ineffective usage of incentives and supports for investment
	T_3	Loss of labour force due to migration from agricultural areas
	T_4	Failure in the adequate struggle against hazardous solid wastes and wastewater that will cause environmental pollution in water, air and soil
	T_5	Insufficient effective policies to protect, renew and promote sustainable use of air, marine and land ecosystems and biodiversity (sustainable management of forests, desertification, global warming, soil loss, etc.)
	T_6	Failure to provide reliable food, sustainable life and renewable energy, and failure to increase purchasing power for everyone in the province

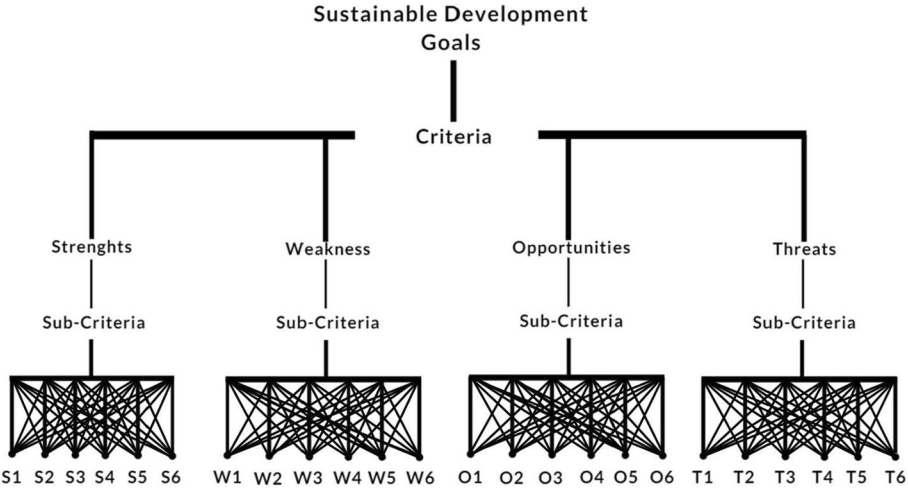

Fig. 3 Hierarchical model of sustainable development

Table 2 Evaluation scale

Significance level	Meaning
1	Items are of equal importance or feel indifferent between them
3	The 1st item is a little more important or a little more preferred than the 2nd one
5	The 1st item is very important or preferred over the 2nd one
7	The 1st item is too important or too much preferred than the 2nd one
9	The 1st item is overly important or highly preferred over the 2nd one
2, 4, 6, 8	Intermediate values

Source (Saaty, 1990)

the number of factors in a SWOT group should not exceed 10 as the number of bidirectional comparisons needed in the analysis increases rapidly (Saaty, 1980). This may result in some errors in the consistency value.

Step 2 Bidirectional comparisons between SWOT factors are performed in each SWOT group. When performing comparisons, these are the questions: (1) which of the two factors compared is a greater strength, weakness, opportunity or threat? and (2) what is the difference? With these comparisons as input, the relative domestic priorities of the factors are calculated using the eigenvalue method. These priorities reflect the decision-maker's perception of the relative importance of the factors.

Step 3 Bidirectional comparisons are made among the four SWOT groups. The factor with the highest domestic priority is selected from each group to represent that group. These four factors are then compared and their relative priorities are calculated as in step 2. These are the scaling factors of the four SWOT groups and are used to calculate the overall (global) priorities of the independent factors within them. This is done by multiplying the local priorities of the factors defined in step 2 by the value of the corresponding scaling factor of the SWOT group.

Step 4 The results are utilized in the strategy formulations and evaluation process. Contribution to the strategic planning process is realized with numerical values for the factors. Thorough consideration of the most important factors enables setting new targets, defining strategies and planning such practices.

The analysis carried out with the AHP method for SWOT analysis was formulated in four steps, as well. These can be summarized as follows (Bouraima et al., 2020; Franek & Kresta, 2014; Kurttila et al., 2000; Polat et al., 2017; Saaty, 1977, 1980; Solangi et al., 2019).

The pairwise comparison matrix (Eq. (1)) was built in Step 2. The pairwise comparison matrix is $a_{ij} = 1/a_{ij}$ and thus, when $i = j$, $a_{ij} = 1$. The w_i value can range from 1 to 9, and 1/1 indicates equal significance, while 9/1 indicates extreme or absolute significance.

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$$A = \left(a_{\mathrm{ij}}\right)\begin{bmatrix} 1 & W_1/W_2 & \cdots & W_1/W_n \\ W_2/W_1 & 1 & \cdots & W_2/W \\ \vdots & \vdots & \ddots & \vdots \\ W_n/W & W_n/W_2 & \cdots & 1 \end{bmatrix} \quad a_{\mathrm{ii}} = 1,\ a_{\mathrm{ji}} = 1/a_{\mathrm{ij,\,aij}} \neq 0 \tag{1}$$

Some inconsistencies emerge during comparisons and these qualities are accepted. In cases where the A value is inconsistent, prediction priorities and eigenvalue techniques (Eq. 1) are used as the input matrix (Eq. 2).

$$\left(A - \lambda_{\max} I\right) q = 0 \tag{2}$$

where $\lambda_{\max}$ is the largest eigenfactor of A matrix; q is the true eigenfactor; and I is the unit matrix. The true eigenfactor, q, forms estimates of relative priorities. It is the first major component of the pairwise comparison matrix. If the matrix does not show any inconsistencies, that is, if the decisions made by a decision-maker are consistent, q is exactly the prediction of the priority vector. Each eigenfactor is scaled to a total to obtain priorities.

The AHP method provides a functional way to analyse and test the consistency of the double matrix. CI measures consistency between binary comparisons (Solangi et al., 2019). Saaty (1977) proved that $\lambda_{\max}$ of coupling matrix is always equal to or bigger than A (= number of rows = number of columns). If binary comparisons are completely consistent, A matrix has a value of 1 and $\lambda_{\max} = 1$. In this case, the weights can be obtained by normalizing any row or column of A (Wang & Yang, 2007). Moreover, $\lambda_{\max}$ is eigenvalue and n is the number of criteria in the judicial matrix problem. If double comparisons do not have any inconsistencies, $\lambda_{\max} = n$. The more consistent the comparisons, the closer value of the computed $\lambda_{\max}$ and the n value. The consistency index, CI, is built based on this property (Eq. 3) (Saaty, 1977).

$$\mathrm{CI} = \frac{\lambda \max - n}{n - 1} \tag{3}$$

Then, a consistency ratio CR, which is independent of n, is calculated since CI is dependent on n (Eq. 4). This measures the consistency of binary comparisons. The CI average consistency index of randomly generated comparisons must be calculated to estimate CR. CI functionally changes according to the size of the matrix. CI measures consistency between binary comparisons and is expressed as:

$$CR = \frac{CI}{RI} \tag{4}$$

CR indicates the random probability of the values obtained in the pairwise comparison (Yılmaz, 1999). In this context, all comparative matrices were found to be within the consistency limits and evaluations were carried out accordingly. Furthermore, each element of this vector shows the scores of decision alternatives. Among these values, the sum of which is 1, the alternative with the highest score (importance) is designated as the most suitable alternative (Dinçer & Gorener, 2011). The results of the comparisons are quantitative values expressing the priorities of the factors in the SWOT analysis. Thus, new quantitative information for sustainable development is obtained. In this regard, opportunities and strengths with high significance in the process of establishing sustainable goals and strategies should be emphasized or some measures should be taken against the threats and weaknesses among the sub-criteria for sustainable development. Planning shall give better results in this way.

5 Results and discussion

SWOT analysis is one of the most reliable and frequently used strategic planning tools (Ervural et al., 2018). Internal factors of SWOT analysis include strengths and weaknesses. Analysing these factors means identifying and evaluating the organizational aspects that may affect the success or failure of the adopted strategies in the field in which they are applied. External factors include opportunities and threats. The analysis of these factors includes looking for environmental factors that cannot be controlled by the organization, but that may affect their performance (Rauch et al., 2015; Tavana et al., 2016). Moreover, it offers the opportunity to categorize factors about a decision as internal (strengths, weaknesses) and external (opportunities, threats), thus enabling the comparison of opportunities and threats with strengths and weaknesses (Etongo et al., 2018). Eventually, strategies are proposed to encourage growth by implementing strengths, minimizing weaknesses, taking advantage of opportunities and avoiding threats (Khan, 2018).

Within the scope of sustainable development of Erzurum province, expert opinions were determined after the pairwise comparisons and matrixes were built as the average weight ratio was determined to specify the priorities regarding SWOT (Table 3; Fig. 4). Accordingly, it is determined that the province has the S6 coded "the richness of natural, cultural and historical resources for tourism potential" with a weight of 0286 in the first place in strengths regarding the sustainable development goals. The S1 coded "favourable environmental conditions for agriculture and livestock activities" with 0221 weight and S3 coded "transportation systems developed and commercial use (airline, highway, railway)" with 0163 weight comes after, respectively (Table 3; Fig. 4). In this context, the fact that tourism, agriculture and livestock activities and transportation systems have developed in the strength aspects regarding sustainable development of the province indicate that the province has a high potential in these areas. Palandöken and Konaklı Ski Centres, located in the Palandöken Winter Sports Tourism Centre, particularly highlights Erzurum for winter tourism (Altaş et al., 2015). Besides, hosting Universiade 2011 winter games (25th World Universities Winter Games) and the 2017 European Youth Olympic Festival (EYOF, 2017) also paved the way for Erzurum to have a share from the national and international winter tourism market. Moreover, many infrastructure facilities (such as jumping towers, ice skating halls, Kandilli Ski Centre) built in the province for winter tourism have enabled to

Table 3 SWOT groups and sub-criteria weights

Sub-criteria	Criteria						Avg. weight	Avg. %	Rank	CI/RI
Strengths (S)										
S1	0.069	0.118	0.307	0.315	0.175	0.344	0.221	22.13	2	0.007
S2	0.188	0.06	0.167	0.046	0.32	0.069	0.141	14.17	4	0.026
S3	0.106	0.329	0.104	0.171	0.08	0.188	0.163	16.30	3	0.023
S4	0.188	0.118	0.072	0.108	0.059	0.188	0.122	12.22	5	0.022
S5	0.106	0.047	0.043	0.046	0.046	0.106	0.065	6.57	6	0.025
S6	0.344	0.329	0.307	0.315	0.32	0.106	0.286	28.68	1	0.007
Weaknesses (W)										
W1	0.245	0.231	0.051	0.424	0.383	0.261	0.265	26.58	1	0.007
W2	0.129	0.072	0.067	0.152	0.059	0.133	0.102	10.20	6	0.002
W3	0.245	0.118	0.144	0.152	0.128	0.133	0.153	15.33	3	0.272
W4	0.057	0.231	0.234	0.068	0.082	0.133	0.134	13.42	5	0.019
W5	0.245	0.231	0.095	0.152	0.219	0.261	0.200	20.05	2	0.015
W6	0.081	0.118	0.408	0.052	0.128	0.078	0.144	14.42	4	0.002
Opportunities (O)										
O1	0.055	0.128	0.096	0.418	0.334	0.072	0.183	18.38	1	0.014
O2	0.115	0.383	0.159	0.150	0.100	0.118	0.170	17.08	3	0.015
O3	0.197	0.128	0.066	0.066	0.182	0.231	0.145	14.50	6	0.013
O4	0.197	0.219	0.096	0.150	0.182	0.231	0.179	17.92	2	0.013
O5	0.36	0.082	0.159	0.150	0.100	0.118	0.161	16.15	4	0.002
O6	0.076	0.059	0.424	0.066	0.100	0.231	0.159	15.93	5	0.002
Threats (T)										
T1	0.096	0.188	0.138	0.180	0.182	0.292	0.179	17.93	2	0.008
T2	0.292	0.069	0.088	0.068	0.100	0.096	0.118	11.88	5	0.007
T3	0.292	0.344	0.228	0.476	0.334	0.292	0.327	32.77	1	0.015
T4	0.064	0.106	0.395	0.043	0.100	0.096	0.134	13.40	3	0.046
T5	0.159	0.106	0.088	0.053	0.182	0.064	0.108	10.87	6	0.002
T6	0.096	0.188	0.062	0.180	0.100	0.159	0.130	13.08	4	0.008

the development of winter tourism and attracted new investments thanks to these games (Birinci & Kaymaz, 2015; Kızılkan et al., 2019). Besides winter tourism, historical buildings (such as museums, castles, mosques, churches, chapels, bastions, inns, fountains, historical baths) and natural attractions (mountains, valleys, geological structures, rivers, waterfalls, lake, fairy chimneys, fauna and floras) that have the potential of natural and cultural tourism are spread throughout the province. Thus, Erzurum has suitable environmental conditions for performing numerous tourism activities such as nature, ecotourism, thermal tourism, rural tourism, specialty tourism, adventure tourism, cultural tourism and mass tourism (Kaymaz et al., 2017; Zaman et al., 2018). The Turkish Ministry of Culture and Tourism's statistics shows that 434.433 local and foreign people accommodated in the municipality certified accommodation facilities and 186.496 people accommodated in the accommodation facilities with tourism business licenses.

Agriculture and livestock potential ranks second in the strengths of the province's sustainable development priorities. Erzurum is a primary city in Turkey regarding the livestock sector, especially with extensive meadows and pastures, and the production of

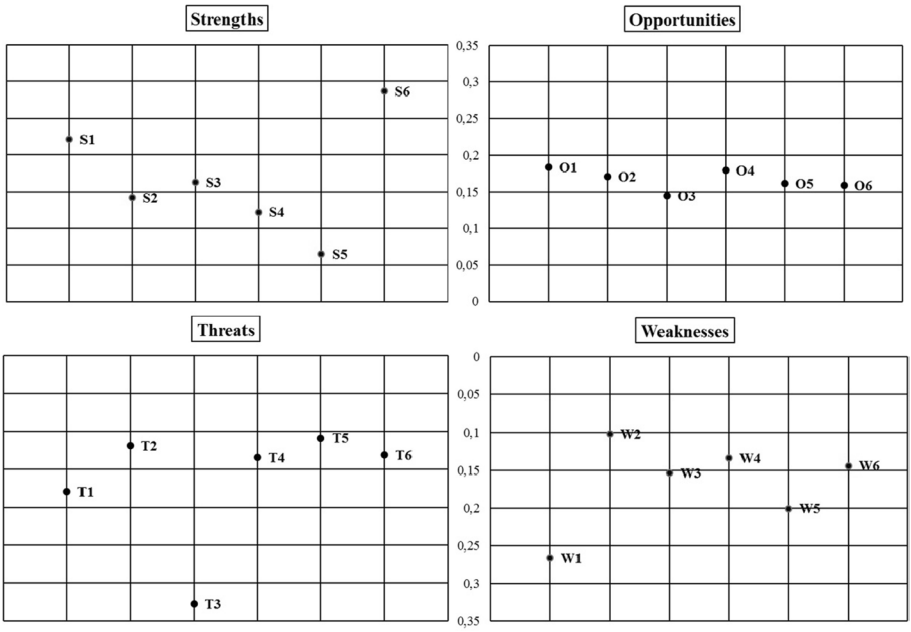

Fig. 4 SWOT groups and sub-criteria weights

forage crops in agricultural areas (Durmuş, 2020; Kopuzlu et al., 2016; Okçu, 2020). In this framework, sustainable development potential can be improved with the support on the sustainable development projects in rural areas, and its provincial potential can be increased by new projects and incentives. Erzurum is the centre of the region where it is located regarding highway, railway and airline transportation facilities. The fact that it is located on the main route of trade particularly with Iran, the Caucasus and Turkic States, highlights transportation services in the sustainable development of the province. Moreover, the establishment of a logistics centre in the city shall contribute to the development of Erzurum in future (Ünalan & Yapraklı, 2017).

Expert opinions indicated that the lowest impact on the strengths in sustainable development priorities was the S5 coded “promotion of gender equality in rural and urban areas” with a weight of 0.065 (Table 3; Fig. 4). High gender inequalities and a low number of women entrepreneurs and female employment remain among the most salient issues. Furthermore, the low level of education in rural areas, the fact that girls don’t have access to further education than compulsory education and the patriarchal social structure have caused this outcome. However, it is noteworthy that there is a relative change in the equality of women and men thanks to the efforts of the Turkish state and non-governmental organizations.

In the sustainable development weakness priorities, W1 coded "insufficient investment and entrepreneurial culture", with 0.265 weight, comes first. Besides, W5 coded “lack of developed incentives, innovation and production-consumption patterns within the scope of sustainable industry” is second with 0.020 weight, while W3 coded “challenges in the joint action of businesses and civil society organizations for SDGs” is third with 0.015 weight ratio (Table 3; Fig. 4). In particular, the lack of entrepreneurship culture has circumscribed new investments in the province. Besides, the lack of development regarding innovative

studies for production reveals the weaknesses of sustainable development in Erzurum. It has been found by the previous research that the entrepreneurship culture is not sufficient in the province. The same study concluded that this condition limited the industrial development and the ratio of women entrepreneurs in the province was low (Çalmaşur & Tanas, 2018). This deficiency is tried to be eliminated, especially with regional incentives provided by the public authority (Ministry of Industry Development Attraction Centres Program, etc.). Moreover, opportunities should be provided to achieve sustainable development by providing all facilities in priority issues such as development, support, promotion and competitiveness enhancement of small, medium-sized industrial sites and crafts in technology and economy.

Besides, W2 coded priority has the lowest weight (0.010) among the weaknesses of sustainable development in Erzurum province. Expert opinions indicate that "high unemployment rate and migration" does not constitute a significant problem for the sustainable development of the province. Similarly, it is revealed that W4 coded priority "inadequate conservation of resources (historical, natural and cultural) for development and mismanagement" has a low level of impact regarding sustainable development with 0.134 weight (Table 3; Fig. 4).

Erzurum has opportunities for sustainable development with various features. The priorities determined in this extend are specified through the analyses made according to the expert opinions. Accordingly, the criterion of "priority region status for development" with the code of O1 was identified as the most important opportunity as its weight is 0.183. Among the opportunities, the O4 coded criterion of "supporting products grown in the province for agriculture and rural development" is in the second place with 0179 weight, and the O2 coded criterion "universities' role in supporting socio-economic development" with 0.170 weight is in the third place (Table 3; Fig. 4). The fact that Erzurum is considered as a priority province in development by ministries (such as the Ministry of Agriculture and Forestry, ministry of industry and development) and supported with different incentive programmes within this framework provides significant advantages to Erzurum regarding sustainable development. Investors and businesses in the province have the opportunity to grow their existing investments, as well as the opportunity for new investments (Çalmaşur & Tanas, 2018; Toy & Gündüz, 2016). Moreover, such incentives enable entrepreneurs and investors from outside the city to make investments in Erzurum. In addition, two universities in the province (Atatürk University and Erzurum Technical University) support socio-economic development. Particularly the studies conducted in the faculties affiliated to Atatürk University (agriculture, veterinary medicine, medicine, education, engineering, tourism) in the fields of agriculture, livestock, health, education, tourism, industry regarding sustainable development and cooperation protocols with various institutions and organizations significantly contribute to Erzurum's cultural development.

The lowest impact of opportunities in sustainable development priorities belongs to O3 coded criterion "revitalization of local culture, festivals and local handicrafts" (0.145). The O6 coded "the existence of community-oriented facilities and practices for sustainable development" criterion was also seen as an important opportunity in the sustainable development process of the province according to expert opinions with 0.159 weight (Table 3; Fig. 4). In other words, O3 and O6 criteria have low value regarding opportunities for sustainable development. However, festivals based on local culture and investments based on traditional handicrafts have the potential to develop opportunities for Erzurum in the future (Toy et al., 2017). In this context, Oltu stone and silver engraving, pyramid and rug weaving unique to Erzurum, are the handicrafts that can be utilized with the highest potential. In this regard, promotion days held in the national and international arena can be asserted

as an effective way for advertisement. Besides, the most efficient way of developing and improving the living standards of the society and establishing strong ties with the local community is to form close relationships with others who are the member of the same community (Westhauser, 1994). Peace, unity, integrity, solidarity, convergence, awareness and integration will be established in this way rather than division within the society. Hence, the development and implementation of social sensitivity projects are of great importance.

It was determined that the T3 coded “loss of labour force due to migration from agricultural areas” criterion came first among the threats in the sustainable development process of Erzurum province (Table 3; Fig. 4). The fact that Erzurum is one of the sending provinces and the intense migration movement, especially from the countryside, causes problems for the development of the agriculture and livestock sector, which are among the strength priorities in sustainable development (Coşkun, 2008; Güreşci & Yurttaş, 2008). Likewise, migration from rural areas impedes the full realization of agricultural and rural supports for sustainable development, which are certain development opportunities. Therefore, realizing projects for sustainable development as immediate as possible will prevent rural migration also contributing to sustainable development. In this context, agricultural and livestock loan supports, village return projects and projects to support young farmers are among the effective ways to solve this issue.

Among the threats in the field of sustainable development in Erzurum, T1 coded “the existence of factors damaging nature and tourism areas in terms of infrastructure and superstructure (HEPP, mining enterprises, misuse of agricultural areas)” criterion has a weight of 0.179. In addition, expert opinions indicate that T4 coded "failure in the adequate struggle against hazardous solid wastes and wastewater that will cause environmental pollution in water, air and soil" is considered as an important threat to the sustainable development of the province. However, T5 coded “insufficient effective policies to protect, renew and promote sustainable use of air, marine and land ecosystems and biodiversity (sustainable management of forests, desertification, global warming, soil loss, etc.)” criterion constitute the lowest threat priority in the sustainable development of the province with 0.108 weight (Table 3; Fig. 4). In this respect, it is necessary to use effective solutions such as the establishment of cultural environment sustainability with a protection–usage balance in general, the treatment of solid waste and sewage waters, the overcoming pollution with advanced technology, modern facilities, recycling and the use of renewable energy sources. Sustainability will be ensured comprehensively through ecosystem protection and biodiversity with effective planning, goals and strategies.

6 Conclusions

This paper reveals the sustainable development priorities of Erzurum province determined by AHP-SWOT approach. Considering the sustainable development priorities of Erzurum province in general, it is asserted that the tourism potential, agriculture and livestock sectors stand out in the strengths of the province. Furthermore, the fact that the province is among the priority provinces for development and that the products grown here are among the products funded in terms of agricultural and rural incentives provide certain opportunities for sustainable development. However, insufficient investments and entrepreneurship constitute the most significant weak point of the province. Besides, the intense migration movement from the rural areas and the empty agricultural

areas are seen as a major threat in terms of agriculture and livestock activities, which are the most important strengths and opportunities in the sustainable development of the province. Preparing various regional or domestic development projects considering the priorities emerging in this context will contribute to the sustainable development of Erzurum. Therefore, this effort might set an example for determining the sustainable priorities of similar regions.

Several strategies for the sustainable development process of the province have been formulated based on the strength, weakness, opportunity and threats determined according to the SWOT analysis. In this context, new investments in the field of tourism were recommended by taking advantage of the fact that the province, which has rich tourism potential, is also among the priority regions for development. As investments in thermal tourism, rural tourism, local handcraft development should be focused to spread tourism revenues with an increase throughout the year in the area with sufficient infrastructure for winter tourism. Furthermore, new projects should be implemented in the livestock sector considering the agriculture and rural development incentives in the province where agriculture and especially livestock potential is high. Incentives for the establishment of modern meat and dairy production facilities apart from the support provided to livestock shall positively affect the livestock sector development. Migration and agricultural labour loss, which are seen as threats in the province, will be limited to a certain extent in this way. Moreover, sustainable tourism, agricultural policies and practices shall contribute to the elimination of threats such as natural resource protection and the problems in combating environmental problems in the province. The threats shall be minimized with the strategy detailed with its strengths.

The weaknesses of the province regarding sustainable development can be overcome through strategies for exploiting the opportunities. These strategies should be developed with the technical support and exemplary applications provided by the universities in the province (Atatürk University and Erzurum Technical University) to reduce weaknesses such as the entrepreneurship culture and the underdevelopment of the industry. The cooperation and educational activities between university and industry, university and agriculture and university and tourism shall contribute to the development of investment and entrepreneurship culture. This situation shall lead to the emergence of new investments in industry, agriculture, tourism and other sectors using the opportunity brought by the province's development area priority status.

Developing an entrepreneurial culture to solve the problem of immigration and unemployment in the province and bringing new investments through effective and appropriate incentives are necessary to reduce the weaknesses and threats for sustainable development. Furthermore, a sustainable environmental management policy should be applied to avoid problems such as natural resource protection and environmental problems in terms of sustainable development in the province. In this context, the misuse of natural resources, protection of water resources, air and soil pollution are issues requiring utmost attention. Moreover, impact assessments for economic activities related to the natural environment should be made meticulously and transparently.

The results shall guide the central and local government as well as non-governmental organizations in determining the planning and investment strategies for the initiatives to be executed for sustainable development in the province. Moreover, research methodology and criteria can be used by scholars in different fields to create sustainable development policies at a regional level. In this respect, the study has a distinct methodology for planning and developing sustainable development policies in areas that need further development.

7 Research limitations

Certain limitations were encountered during the preparation of the study. First is the limited number of experts whose opinions were used to determine the priorities of the criteria determined by the AHP method. Second, some of the experts avoided in-person meetings for binary comparisons in criteria priority determination due to the Covid-19 pandemic. These circumstances caused the number of consulted experts to be less than the desired number and prevented a more elaborated study with a comparative method using opinions from different groups other than the expert group.

Author contributions This paper is the output from the study on which three authors (Çağlar Kıvanç Kaymaz; Salih Birinci and Yusuf Kızılkan) have worked on mapping, methodology, validation, formal and analysis, sought the opinion of experts, were involved in original draft preparation, had contributed to writing, reviewing and editing and took part in visualization. All authors have read and agreed to the published version of the manuscript.

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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