



## Review article

# Sustainable Development in Rural Territories within the Last Decade: A Review of the State of the Art

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## ABSTRACT

Rural territories play an important role when progress is made toward a balanced regional development; thus, an analysis is required of the components and/or factors which have contributed to sustainable development. Therefore, the main subdimensions and variables identified represent the ecological, social and economic dimensions in rural areas.

Rural area development is characterised by complex social phenomena, such as the lack of job opportunities, conditions of poverty, unequal development and health services coverage and quality, among others. Consequently, the dynamics and realities of rural territories pose great challenges to sustainable development, arising the following question: What components and/or factors represent sustainable development in rural territories? Therefore, this study aims to use SLR to identify a set of variables relevant to sustainable development in rural territories under the economic, social, and ecological dimensions of sustainability.

Based on the foregoing discussion, the systematic literature review (SLR) method is applied. This process consists of four phases: approach, search and selection, extraction, and information analysis. Then, five subdimensions and 59 variables are established in the Economic Dimension, seven subdimensions and 63 variables in the Social Dimension and five subdimensions and 42 variables in the Ecological Dimension.

The results contribute to the comprehensive analysis of the object of study, the main subdimensions in which the ecological, social, and economic dimensions of sustainable development in rural territories are found. Likewise, it is intended to relate all these components found with some of the objectives of sustainable development so that, having a positive impact on these variables, the fulfilment of these objectives is reached to improve the well-being of rural regions.

## 1. Introduction

In the course of history, a lag in the development of rural areas when compared with urban areas has been observed, partly because of the political and economic processes urban elites went through, where the development of urban spaces has been prioritised over time [1]. Therefore, government stakeholders must balance equality of access to resources and opportunities needed by these territories.

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This is because they have great potential as seen in the great role family farmer-household units played in food supply during the health crisis and confinement of the pandemic [2].

It is important to provide answers to the following questions: 1) What are the main components that reflect that a rural territory can have sustainable development?; 2) What are the main variables that make up the different dimensions of SD?; 3) What techniques have been mainly used to determine these variables as influential in DS?; and 4) How can compliance with the Sustainable Development Goals be linked to the development of rural areas?

Regarding social development, it is evident that links must be strengthened with the stakeholders of a given territory because their knowledge and experience would aid the search for integral solutions that respond to the dynamics and challenges of the regions in question [3]. Another situation that creates considerable instability in the development of territories is the mass mobilisation of young people from rural areas to cities in search of new opportunities, which reduces the generational change of young people in the countryside [4]. It is for these reasons that a sustainable future for cities depends on achieving adequate living conditions in the rural world [5]. In accordance with this, it is projected that 85% of the population of Latin America will live in cities by the year 2050, which is one of the main reasons contributing to the modern conception of development, where a new understanding of the rural-urban interface in the development concept is defined, which seeks to increase mutually beneficial interactions between them [6].

Similarly, the ecological dimension identifies the conflict regarding land use related to the economic activities developed in these interest areas. In other words, inadequate land use is the underutilisation of soils in agriculture and overutilisation in cattle ranching, which reduces human and rural development in respect of employment generation, income and preservation and appropriate management of the environment and natural resources [7]. Furthermore, the supply of timber products has now reached a point where logging is carried out indiscriminately, causing severe damage to the environment, including an impact on, amongst others, soil erosion, riverbed sedimentation and increased flooding [8].

Regarding the Economic Dimension, it is acknowledged that “The rural territories of Latin America and the Caribbean are characterised as having thousands of micro and small enterprises with low productivity, precarious jobs, insufficient wages to cover basic needs and lesser social protection benefits, to a greater extent than the national and urban statistics state [9]. Moreover, it is recognised that the percentage of the rural population that is linked to the informal sector (wage earners with no contracts) is overwhelming, which is why having a proper job does not necessarily mean the same as having work, as the level of income does not allow the coverage of the minimum needs for the development of people [10].

Based on the foregoing, it is recognised that in rural areas the main dynamics of ecological, social, and economic development have persisted over time and that they have contributed little to balanced and just development, these areas are of great importance for the development of nations. Therefore, the research aims to identify what components and/or factors represent sustainable development in rural territories and their relationship with Sustainable Development Goals.

The article is structured in five sessions consisting, the first session presents the introduction to the topic and the problem. Then, in the second session, a conceptual framework of the elements of the object of study is presented, and in the third session, the phases of development of the methodology are explained. Then, in the fourth session, the main results are listed, and in the fifth session, the discussion finishes with the conclusion.

## 2. Conceptual framework

The research goal of the SLR is integrated by two major components: sustainable development and rural territories, due to this the

**Table 1**  
Documents related to the Study Subject-Matter.

Search Chain N°	Keyword 1	Con.	Keyword 2	SC	No. Art.	No. Rev.	No. Conf.	No. Other Doc.	Total Doc.
1	sustainable development	And	rural territories	1	17	0	10	1	28
2			rural zones	2	3	0	1	1	5
3			rural areas	3	142	3	54	23	222
4			countryside	4	7	1	2	4	14
5	sustainability	And	rural territories	5	7	1	0	0	8
6			rural zones	6	3	0	0	0	3
7			rural areas	7	71	4	16	10	101
8			countryside	8	4	0	0	1	5
Total					254	9	83	40	386
No.	Search Chains (SC)								
1	(TITLE (sustainable AND development) AND TITLE (rural AND territories))								
2	(TITLE (sustainable AND development) AND TITLE (rural AND territories))								
3	(TITLE (sustainable AND development) AND TITLE (rural AND areas))								
4	(TITLE (sustainable AND development) AND TITLE (countryside))								
5	(TITLE (sustainability) AND TITLE (rural AND territories))								
6	(TITLE (sustainability) AND TITLE (rural AND zones))								
7	(TITLE (sustainability) AND TITLE (rural AND areas))								
8	(TITLE (sustainability) AND TITLE (countryside))								

Con.: Connector – Art.: Articles – Rev.: Reviews – Conf.: Conference – Doc.: Documents.

following concepts are presented below.

Consequently, [Table 1](#) presents the results of the search chains designed by combining two groups of keywords, synonymous with the object of study and linked through the “AND” connector. Also, the Scopus database is used with a filter, and the search is done only among the titles of the articles. Thus, it is identified that the number of reviews carried out corresponds to 2.3% (9 articles) out of the published documents, where one duplicate article is identified and two systematic reviews are added that are of interest due to the space giving 10 review manuscripts in total.

Similarly, [Table 2](#) lists the study subject-matters of the 10 review articles, where the uniqueness of the research study can be seen as the study subject-matters analyzed by the experts differs from the object of analysis of this systematic review.

From [Tables 1 and 2](#), contributions are identified to specific problems and challenges in rural areas such as the development of sustainable and renewable energy, the sustainability of tourism based on the relationship between agriculture and tourism, factors involved in the sustainability of water supply systems, and the study of policies that are mainly oriented in the agricultural sector and in countering the demographic decline. Based on the foregoing analysis, this research contributes to a comprehensive understanding of the object of study by identifying the main sub-dimensions and variables that represent Sustainable Development in Rural Territories (SDRT).

### 2.1. Rural territories

Some definitions of the terms rural space, rural territory and rural development are presented.

Traditionally, rural relates to agrarian, this vision is obsolete because of the dynamics, processes and activities that have been taking place in these interest areas [\[21\]](#). Accordingly, it is difficult to define rural areas because the boundaries between urban and rural are increasingly complex and can become blurred. Similarly, the European Commission considers that ‘the notion of rural space or rural world goes beyond a simple geographic limit; it refers to an entire economic and social fabric comprised of a set of very diverse activities’ [\[22\]](#). In accordance with the above, Raffestain (2011) states that area and territory are not equivalent terms, since area is prior to territory, i.e. ‘territory is a space in which work, energy and information have been projected and which therefore reveals relationships marked by power [\[23\]](#)’.

Additionally, depending on the place defining what a rural area is, specific criteria is recognised to be applied. For example, in European Union countries such as Germany, Spain, France, Ireland and Italy, the main criterion that defines a space as rural is the population, while in the United Kingdom, Denmark, Belgium, Luxembourg and the Netherlands; the criterion of territorial development is considered [\[24\]](#). Furthermore, the Organization for Economic Cooperation and Development (OECD) and the European Statistical Office of the European Commission (EUROSTAT) apply population density criteria, which defines a limit of 150 and 100 inhabitants per km<sup>2</sup>, respectively [\[21\]](#).

Similarly, new conditioning factors are highlighted that need studying in development models, such as the links emerging increasingly between the rural–urban world, as well as changes in the types of economic activities that are being developed in rural territories, as there is a shift from agricultural activities, with this being the traditional work to secondary productive and service activities [\[25\]](#). Therefore, the definition of area/territory is identified as having changed over time, and it became a multidimensional concept because of the number of factors and/or criteria involved. Furthermore, it is recognised that in some contexts, they are used as synonyms or may vary according to the author’s point of view. However, the dichotomous division of what is rural or urban is losing relevance since current trends are not considered, which is why the appropriate term is considered ‘rural territories’.

**Table 2**

Contributions of the reviews in the secondary sources.

No.	Year	Ref.	Object of Study
1	2005	<a href="#">[11]</a>	This is sustainable energy development in the Chinese countryside and discusses the main problems of sustainable energy development during different periods.
2	2006	<a href="#">[12]</a>	This studies regional and agricultural policy in Spain from 1985 to 2006.
3	2011	<a href="#">[13]</a>	This presents the analysis and evaluation of biomass production based on energy crops in Poland in 2007 and 2009.
4	2014	<a href="#">[14]</a>	Efforts to build an association at local level to manage biomass production are being studied in the absence of an institutional plan and public investment.
5	2016	<a href="#">[15]</a>	This studies rural entrepreneurship and identifies that in the period of analysis a basic theoretical construct of rural entrepreneurship that has focused mainly on developed countries is recognised.
6	2017	<a href="#">[16]</a>	This studies the connections between agriculture and tourism by improving sustainable development in tourism as well as in rural communities and the agricultural sector.
7	2017	<a href="#">[17]</a>	This study was conducted in Zimbabwe to investigate factors influencing the sustainability of rural water supply systems.
8	2018	<a href="#">[18]</a>	Local knowledge of the territories is studied, where development practices and policies based upon counteracting demographic decline are identified.
9	2021	<a href="#">[19]</a>	This corresponds to the applicability of Geographic Information System (GIS) tools for the implementation of sustainable development principles in rural areas.
10	2022	<a href="#">[20]</a>	Identifies which factors have been taken into consideration in the expansion of entrepreneurship and renewable energy technologies in rural areas of developed countries.

## 2.2. Rural development

The concept of rural development has changed over time as new conditions in economic and social development impose changes on families and rural activities. However, the concept's goal remains the same, which is to improve the welfare of rural populations [26]. Furthermore [27], defines rural development as a 'process of balanced and self-sustainable revitalisation of the rural world based on its economic, social and environmental potential, through a regional policy and an integrated application of territorially based measures by participatory organisations,' with area and rural development being two closely related conceptual elements. Similarly [28], identifies abundant literature of the new paradigm of rural development, which contributes to the dynamics currently present in these territories. However, it recognises that the concept of rural development is ambiguous and poorly defined. Based on the above, the authors understand that rural development consists of improving living and working conditions in rural areas, whereby the social, cultural and environmental values of the territories are respected, i.e. rural development contributes positively to the quality of life of the population and the territory [28].

Similarly, contributions have been identified to the new approaches to rural development, which highlights a significant change in approach since the exogenous and sectoral that is paradigm of modernization was moved to a new approach of local character, endogenous and integrated, taking into account both economic and social and environmental objectives [29]. Therefore, European regional policy replaces traditional top-down (top-down) approaches with new bottom-up (bottom-up) approaches, pioneering these significant changes in rural development [30,31].

Accordingly, the consolidation of this new approach called endogenous development is characterized by local control over the development process, the use of the territory's available resources, and the retention of local profits [31]. Thus, with time the importance of extra-local factors is recognised, which is why the concept of neo-endogenous development arises, in which several authors refer to the same approach characterized by endogenous, local, and integral, so the term endogenous development in its flexibility conceives to include extra-local factors [30]. In short, neo-endogenous rural development originates according to local specificities and needs and is self-managed by the local population who are the development subjects themselves, which is why endogeneity is related to the competitiveness of the territories. The greater the endogeneity the better the competitiveness of rural areas [31].

## 2.3. Rural – Urban Linkages in Sustainable Development

Rural-urban relations are a crucial factor in the sustainable development of regions, as spatial differences between centres and peripheries are increasing [32]. Therefore [33], it measures that only three of the 28 countries have recorded a decrease in spatial inequalities, which is why there has been an increase in these differences in the other countries. In other words, these spatial inequalities require regional development studies to analyse the interdependence between rural and urban territories.

Accordingly, Fig. 1 relates the links between rural and urban areas where the flow of people, goods/services, information, and finance are mainly identified [34]. That is, the flow of people is related to human mobility between rural and urban areas. It principally affects rural areas due to the inequality of resources that reflects a lack of employment opportunities and markets in the medium and long term [35]. Also, the flow of goods and services transactions is one of the most significant connections between rural and urban regions, urban areas depend on natural resources (food, labor, and others) and rural areas depend on services in urban areas (health, education, etc.). [36]. Likewise, the flow of information meets the needs of the people, the state of markets, innovations, and new technologies to raise the level of agricultural production, lifestyles, and other aspects among the territories [37]. Finally, the flow of funds is associated with three types, the first formal - institutional (credits), the second informal (loans lenders), and the third the investment by the urban government and agencies that contribute to the development of rural areas [38].

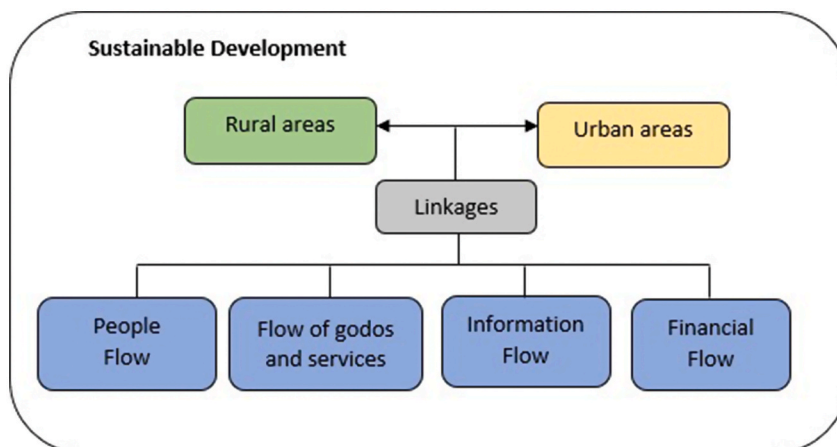


Fig. 1. Rural - urban linkages for sustainable development.

It is significant to mention that rural-urban links are closely interlinked. For that reason, it considers rural areas not as isolated entities, as they measure the relationship with the nearest urban areas [34]. For example, the non-agricultural income of the rural populations in the cities enables them use the remittances to increase agricultural production, improve lifestyle and send household members to urban areas. Therefore, if these links are well understood, they help guide policies toward development that contribute to reducing poverty and social vulnerability, especially in rural areas [34].

Rural areas play an indispensable role in the functioning of urban territories, as they provide vital ecosystem services such as food, water, wood, and raw materials, among others [36]. The rapid expansion of urban areas poses a significant threat to these rural ecosystem services, as it hinders their provision due to the influx of urban populations migrating to rural regions, thereby impacting the lives of rural communities [36]. In light of this, policy efforts should be directed towards enhancing and safeguarding the provision of rural ecosystem services. It is crucial for urban areas to invest in the preservation and protection of these invaluable ecosystem services [36].

In the same way, it is significant to mention the benefit that rural areas derive from urban development, such as the purchase of agricultural inputs, employment opportunities, and access to better health services and education. From the benefits received by both rural and urban areas, It is notable that the development of urban areas is highly dependent on the progress of the nearest rural areas, as urban development hardly exists in the absence of links with rural areas. Rural development is of great importance in planning [36].

Through rural-urban linkages, more opportunities for sustainable economic development in rural areas are identified. For that reason, sustainable development plays a major role in rural areas since it must preserve social and cultural traditions, take care of valuable natural spaces for recreation, and at the same time reduce territorial disparities, and generate a dynamic rural economy with diverse employment opportunities [32].

#### 2.4. Sustainable development

The concepts of development and growth are used in the environment as synonyms, which is flawed because they present different scopes, i.e., from a classical denotation, development is defined as ‘expanding or realising potentialities to gradually achieve a more complete state’, and growth as ‘naturally increasing size by adding material through assimilation or accumulation’ [39]. In other words, development identifies, recognises and generates the means to put strengths into practice, with the purpose of improving and moving toward a more complete state; on the other hand, growth leans towards a quantitative approach wherein the increase on a physical scale matter, which constitutes the monetary element, without considering the complexity of the environment and much less the consequences.

Similarly, in the literature, several definitions of sustainable development oriented toward the search for harmonisation or simultaneous realisation are identified [40] between the biological system objectives (genetic diversity, biological productivity and resilience), economic system (satisfaction of basic needs, improvement of equity and the increase of goods and services) and social system (cultural diversity, institutional sustainability, social justice and participation). These elements show the multidimensionality of the concept [41]. Also [42], the Brundtland Report defines it as ‘Meeting the needs and aspirations of the present without compromising the ability to meet those of the future’, and likewise [43], indicates, ‘Such development will be sustainable if it links economic decisions with social and ecological well-being, i.e. linking the quality of life with the quality of the environment and therefore with economic rationality and social welfare’ [44], establishes three pillars of sustainable development, the environmental factor that corresponds to the delimitation of human activities according to the ability to maintain the ecosystems; subsequently, the social factor that studies the balance of an individual’s need with the group need, public awareness and cohesion and ends with the economic factor that is the efficient use of resources in order to improve operating profits (maximising value in the market). According to the aforementioned, it is recognised that these are concepts that pose components and scopes that can be interpreted in many ways, but the main goal of sustainable development is the improvement of the life quality of mankind as long as the capacity of nature in the supply of resources and environmental services that allow the development of life is respected [45].

Furthermore, it is found that the terms of sustainability and the ability to be sustainable (*sustentabilidad* in Spanish) are used as synonyms properly or poorly, due to the translation of the term ‘sustainable development’ in the Brundtland Report, since some countries defined the term as sustainable development and in other Spanish-speaking countries as sustainable development [46]. In other words, the terms ‘sustainable development’ or ‘sustainability’, ‘sustentive development’ or ‘the ability to be sustentive (*sustentabilidad* in Spanish)’, it seems, do not present differences in substance since they originate from a confusion that is a product of

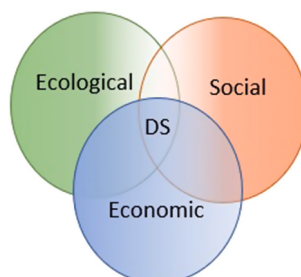


Fig. 2. Dimensions of sustainable development.

translation where in many documents relate to the term ‘sustainability’ and in others to ‘the ability to be sustenive (sustentabilidad)’ [47]. Similarly [48], establish that the two concepts are synonymous in terms of their application but that the connotation given depends on the geographical location. That is to say, in Europe, the term ‘sustainable’ is applied, and in America, the concept of ‘sustenance’ is applied, which relates to different interpretations as, in developed countries, such as those in North America, it focuses on the growth of the economy as the main strategy for improving the quality of life of the population, while, in the European vision, it is oriented towards the human–environment relationship that improves the living conditions of individuals, groups and institutions. Consequently, the semantic distortion of the term ‘sustainable’ has increased, since it is used in a fragmented way, economic sustainable development, social sustainable development and environmental sustainable development; this is the reason for the term of the ability to be sustenive (*sustentabilidad*) as it corresponds to interacting dimensions. Therefore, the definition of sustainable development is assumed as the search for balance between the ecological/environmental, social and economic dimensions in the territories.

Based on the above, Fig. 2 presents the main dimensions of sustainable development [49–51], and each of the components are set out below:

**Ecological Dimension:** It is important to define what is meant by ecology since it is confused with environment or milieu. In other words, ecology studies ‘the relationships between living beings, their environment, distribution, abundance, and how these properties are affected by the interaction between organisms and the environment in which they live (habitat), as well as the influence that each living being has on the environment’ [52]. That is to say, human beings are living beings, which, in turn, are surrounded by other living beings of all kinds and need the surrounding world to survive. Therefore, the Ecological Dimension is related to natural elements necessary for the satisfaction and sustenance of human life and the environment, which is why information on the ecological component (natural resources and ecosystem services) is needed in the process of planning the development of territories [53]. Therefore, it is necessary to consider rationality in the exploitation and use of the so-called natural capital and to incorporate the cost of the environmental impact that human activities have on the ecological component of the territories [54].

**Social Dimension:** It includes the social and cultural element that consists of overcoming poverty and satisfying the basic needs of the rural population, such as access to education at all levels, prevention and care of diseases in the health care system and housing, individual and collective security, participation and citizen engagement [54].

**Economic Dimension:** It is related to the production of goods and services necessary to meet the needs of human beings in search of development where cleaner production processes and the addition of value to raw materials among others are a priority [54]. Therefore, the institutional component is considered in the economic dimension, since it is a factor that determines the dynamics, limitations, and scope of production and service systems that are developed in rural territories.

## 2.5. Subdimensions of sustainable development in rural territories

Based on the analysis of the experts’ contributions, subdimensions are conceptually defined as corresponding to the main criteria representing the ecological, social and economic dimensions of the SDRT.

### 2.5.1. Subdimensions of the economic dimension

The definition and conceptual scope of each subdimension of the Economic Dimension is presented.

**Means of Production (MP):** It consists of the inputs, resources, technical assistance and infrastructure required in the processes of producing goods and in the provision of services. It is also identified that small farmers have difficulty in the management and achievement of some means of production because of the requirements of administrative processes from institutions that regulate these production resources [55].

**Labour Market (ML):** It studies labour supply and demand, represented by workers and employers [56]. Based on this, it is identified that the labour market in rural spaces presents complex phenomena, such as labour informality, low labour participation of rural women and child employment [57].

**Marketing (M):** It is the set of activities and tasks developed so that the products that leave the producer reach consumers. Some functions are buying, selling, transportation and storage [58].

**Governance (G):** It is the term used to analyse the way and action of governing, which is why it consists not only of the quality of public management (efficiency, effectiveness and public transparency) but also of the application of democratic principles that not only consider the ‘government’ actor but also the ‘citizen’ actor [59].

**Financial System (FS):** It consists of the ‘set of financing processes that take place in the economy, whose common characteristic is the existence of credits’ [60]. Also, the Financial Systems analyses and intervenes in the processes from the role of intermediaries and financial markets.

### 2.5.2. Subdimensions of the social dimension

The definition and conceptual scope of each of the subdimensions of the Social Dimension is presented.

**Population Density (PD):** It consists of ‘the average number of inhabitants or households in a given area’ [61] and is measured to estimate the needs in terms of infrastructure and services of the territories.

**Work Opportunity (WO):** It consists of promoting and expanding work opportunities, as, without productive employment, it is difficult to achieve a decent standard of living, let alone personal development [62].

**Culture (C):** Values, beliefs, symbols, language, technology and standards constitute culture, which, in turn, represents the knowledge and characteristic features of a society. That is to say, culture is the essence of how different human communities work as it

is a bond that unites people and reflects their ways of thinking and living [63].

**Infrastructure (I):** concerns the set of engineering structures and facilities that the territories need for their operation and development, for example, transport, energy and communications systems, hospitals, schools, drinking water supply and sanitation networks [64].

**Education (E):** Education is a training process that integrally consists of people and in which knowledge, skills, values and habits are learned [65]. It is important to mention that rural education is a right, which demands greater attention and work by the state, society and institutions as these are territories that have lived complex histories and unequal conditions in the development of education [66].

**Safety (S):** Safety concerns the right of people to feel safe in the territory wherein they live [67].

**Health (H):** This is understood to be full and comprehensive health ‘a state of complete physical, mental, social, environmental and spiritual well-being, and not merely the absence of disease or infirmity’ [68]. Likewise, health is a fundamental right of every human being and includes prompt, acceptable and affordable access to health services.

### 2.5.3. Subdimensions of the ecological dimension

The concepts of the subdimensions of the Ecological Dimension are related.

**Land Use (LU):** It is the type of activities carried out by people on the earth’s surface (soil), for example: urbanisation, mining and agriculture, among others [69]. Likewise [70], defines Land Use as the legal aptitude of certain property, used to develop certain activities from the land type (urban, rural, urban expansion, suburban or protection). Another concept of great interest is LU change, which refers to ‘the process of transforming the existing vegetation cover in a given place to convert it to uses other than the natural (original) one’ [69].

**Biodiversity (B):** Biodiversity is the variety of life that is consistent with biological organisation levels as well as the diversity of the plant species, animals, fungi, and microorganisms that inhabit a given space [71].

**Natural Resources (NR):** They are recognised as goods offered by the planet without human intervention and are of great importance for the survival of human beings and the development of societies as their exploitation allows for the development and well-being of the environment [72].

**Climate Change (CC):** It is a global phenomenon that manifests itself with the increase in temperature, sudden temperature variations and reduction of thermal equilibrium in the Earth’s atmosphere, which is mainly caused by human action (anthropogenic effect) [73]. In the present, the consequences of the impact of climate change are already clear in the world as is the lack of drinkable water, problems in food production and the increase in natural disaster mortality rates [74].

**Environmental Awareness (EA):** It is the level of relationship between the knowledge and commitment that human beings have with the environment and the behaviour or level of action for the environment. Based on the above, the role of education in strengthening people’s environmental awareness is fundamental [75].

From the sub-dimensions of the ecological component, it identifies that the sub-dimension of Land Use is not exclusive to the economic dimension, since there is a strong relationship between economic activities and the use of natural resources and ecosystem services in the territories. It, therefore, decided to categorize the sub-dimension of Land Use in the ecological dimension because the economic activities carried out by humans have managed to alter the balance of the planet Earth system [76]. For that reason, land use related to economic activities is a crucial component, as it determines progress toward balanced development in the ecological component of the territories.

Based on the foregoing definitions, the present article develops a systematic review of literature (SLR) in which new knowledge is generated that contributes to the integral understanding of the SDRT. There are five sections in the article. This first section corresponds to the introduction, which relates to the importance of the development of rural territories. The second section shows a conceptual framework, the third presents the development phases of the methodology, the fourth presents the results, the fifth presents the discussion, and the last section presents the conclusions.

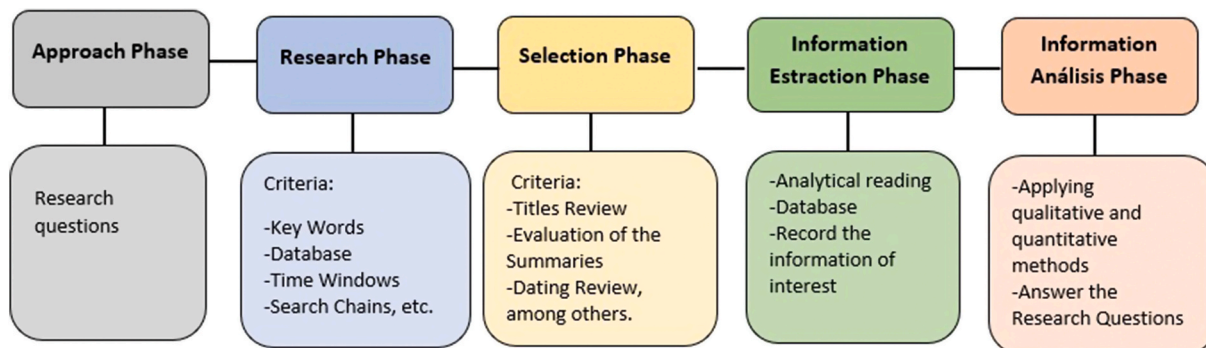


Fig. 3. Phases of research development methodology.

### 3. Methodology

The SLR consists of four phases regarding the information: the approach, search and selection, extraction and analysis (see Fig. 3). In the approach stage, the justification of the review is evaluated, and the research questions are formulated. The search and selection criteria of information are then defined; subsequently, the information is identified and extracted in accordance with the purpose of the review. Finally, an analysis that answers the questions is performed [77,78].

The following is a description of each stage in the development of this research work.

#### 3.1. Approach phase

At this stage, the research questions are presented: What are the main study subject-matters, methods and variables that have been explored in the SDRT, and what subdimensions represent the ecological, social and economic component in rural territories?

#### 3.2. Research phase

In Fig. 4 the criteria applied in the search stage is shown, which begins with a definition of the three categories (Fig. 5) that determine the keywords according to the purpose of the SLR. Namely, words are defined to designate formal structures in the first category, while there are two blocks of words in the second category in which the upper one corresponds to the type of the development of interest and the lower one relates to the words that determine the activities. In the third and last category, the geographic area of interest is established.

Next, the bibliographic database Scopus is selected, which 'is the largest international academic database and one of the most prestigious', and is characterised by its wide coverage of multidisciplinary publications, by the user-centred interface as it guides the search, analysis and evaluation of information and the application of unified tools to generate, among other things, the statistics of literature impact indices [79]. Furthermore, a preliminary search with the words 'sustainable development' and 'rural development' was defined without any other filters. In total, 13,289 documents were reported in this search; the articles that showed the greatest participation (65%) were selected as the types of documents to be verified by and as the review documents that were of interest to the SLR (Fig. 6). Similarly, the time window was defined from the preliminary search in which it was observed that the number of publications has increased in recent years (Fig. 7), thus providing sufficient reason to select a period of five years.

Based on the criteria, search chains were designed by combining the categories according to keywords with the connector (and), thereby producing a total of 480 items (see Table 3).

#### 3.3. Selection phase

This consists of the application of four criteria that correspond to the assessment of title evaluation, citation review, summary evaluation and open access. Each factor analyzed is explained below.

**Title Evaluation Criteria:** The grading scale listed in Table 4 is applied to measure the degree of correspondence, the titles of the 480 articles with the categories of interest. Therefore, the documents with a high and considerably high rating corresponding to 62.21% (275 items) were selected.

**Number of Citations and Title Criterion:** 82 of the 275 documents evinced citations, which indicates a low average factor because only 29.8% were referenced. Therefore, these 82 items were selected; the criterion was extended to include the documents with a considerably high rating (without citations), which corresponded to 109 articles, for a total of 191 documents.

**Criteria Summary Review:** The same rating scale of the titles is used in the revision of the 191 abstracts of the articles. Therefore, it is reviewed that the summaries have a context, method, results, and conclusions input to measure the scope and quality of the information. The correspondence with the object of study is then measured based on more extensive and precise information on the development of the research. The following manuscripts are selected with a rating greater than 4, which is equivalent to 101 items.

**Open Access Criterion:** Of the 101 documents, 67 were selected that were open access (i.e. the complete PDFs of these documents could be accessed).

#### 3.4. Identification and information extraction phase

At this stage, it is important to mention that the information of interest corresponds to the answers to the research questions posed

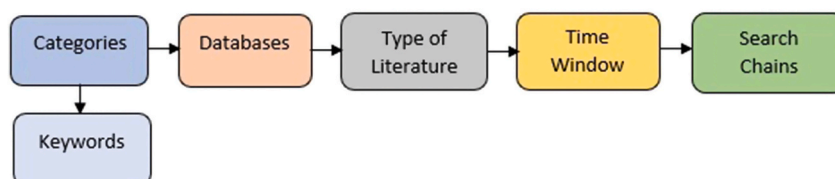


Fig. 4. Search process scheme.



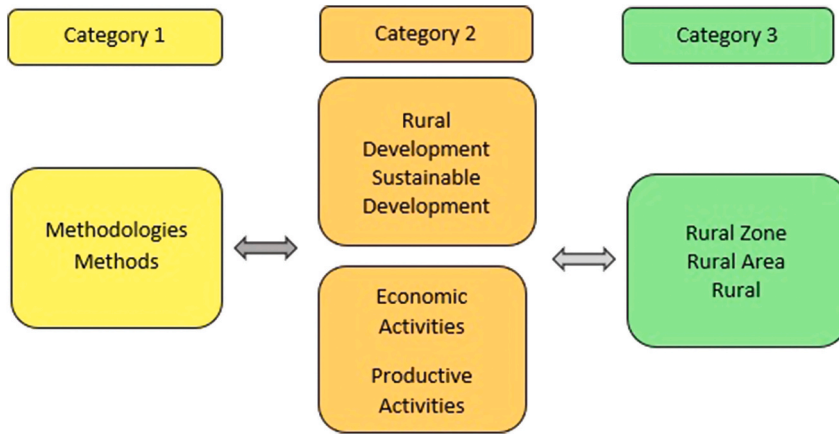


Fig. 5. Search categories.

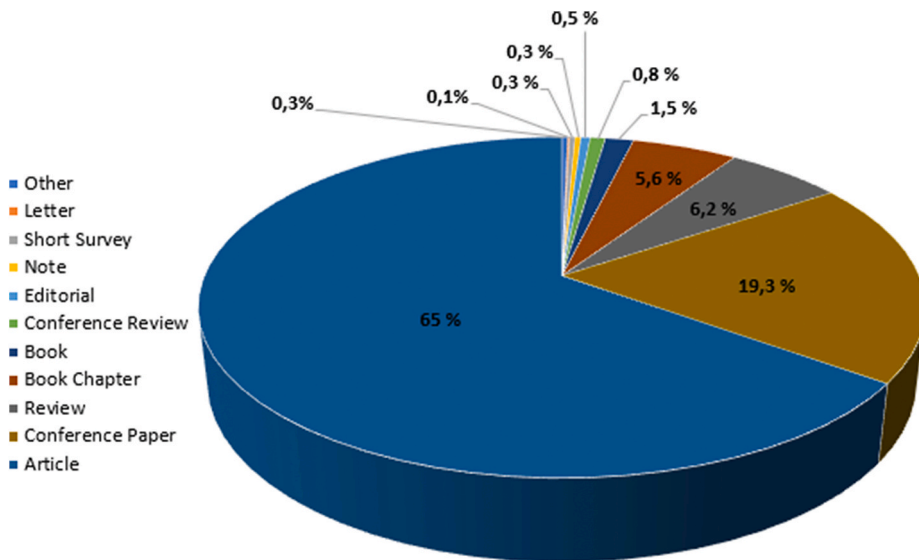


Fig. 6. Types of documents with the terms ‘sustainable development’ and ‘rural development’. Source: Scopus.

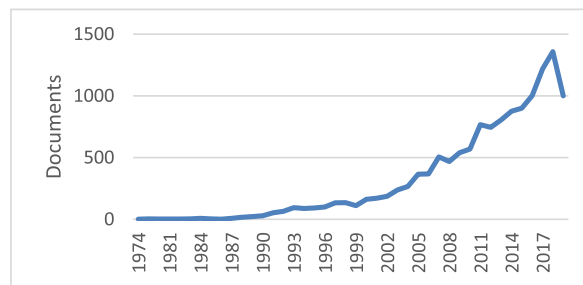


Fig. 7. Number of publications in the time period. Source: Scopus.

at the approach stage. Based on the above, an analytical reading is carried out to identify the study subject-matters, methods and variables presented by experts in the articles. Furthermore, the information of interest is recorded in a database as it organises, stores and manages data in a practical way. For example, counts are made according to subject-matters, methods and variables.

**Table 3**  
Results of search chains.

Search Chains	No. documents
(TITLE-ABS-KEY (methodology) AND TITLE-ABS-KEY ('sustainable development') AND TITLE-ABS-KEY (rural OR 'rural areas' OR 'rural zones')) AND DOCTYPE (ar OR re) AND PUBYEAR > 2014 AND PUBYEAR < 2020	177
(TITLE-ABS-KEY (methodology) AND TITLE-ABS-KEY ('rural development')) AND DOCTYPE (ar OR re) AND PUBYEAR > 2014 AND PUBYEAR < 2020	259
(TITLE-ABS-KEY (methodology) AND TITLE-ABS-KEY ('economic activities') AND TITLE-ABS-KEY (rural OR 'rural areas' OR 'rural zones')) AND DOCTYPE (ar OR re) AND PUBYEAR > 2014 AND PUBYEAR < 2020	38
(TITLE-ABS-KEY (methodology) AND TITLE-ABS-KEY ('productive activities') AND TITLE-ABS-KEY (rural OR 'rural areas' OR 'rural zones')) AND DOCTYPE (ar OR re) AND PUBYEAR > 2014 AND PUBYEAR < 2020	6
Total	480

**Table 4**  
Scoring of criterion 1 'evaluation of titles'.

Scale	Significance	No. of Articles
0-1	Very low	10
>1 - 2	Low	26
>2 -3	Medium	131
>3 -4	High	239
>4 -5	Very high	36
Total		442

### 3.5. Information analysis phase

Based on the information recorded by the experts, an affinity analysis is performed between the variables suggested by the experts, where the subdimensions of each of the three study dimensions are grouped by theme. This is done because not all authors (experts) refer in the same way to variables with the same meaning, for example "work" and "occupation". In this way, it contributes to the systematic understanding of the object of study [80]. From this affinity, the cause-and-effect diagram is elaborated, in which the dimensions are located as the first level causes of the DS "problem", the subdimensions as the second level causes and finally the related variables as the causes of third level. Tables and graphs that measure the importance of these given their citation frequency are constructed [81]. The Pareto Diagram is constructed, this measures the relative importance in the selected categories that represent the dimensions of the SD where, thanks to the 80/20 principle, which expresses that 20% of the causes, help define 80% of the problem [82].

## 4. Results

As a first contribution, the bibliographic review of the ten references analyzed in Tables 1 and 2 is improved, expanding it with the acquisition of more and more recent documents to build a better state of the art. The study subjects investigated by the experts are identified, and equally, the methods classified using two criteria were also recognised. The first criterion corresponds to the nature of the method (quantitative, qualitative and mixed); the second typifies the methods according to their purpose and frequency of application. In the same manner, the subdimensions of the ecological, social and economic dimensions of the SDRT are identified.

### 4.1. Study subjects

In Table 5, nine groups are defined, and the study objects are shown. The first group corresponds to economic activities that include

**Table 5**  
Identification of study subjects.

No.	Study Subjects	No. of Articles	References
1	Economic Activities	13	[83–95]
2	Government Entity Programmes	10	[96–105]
3	Sustainable Development	9	[49–51,106–111]
4	Rural Development	9	[26,28,112–118]
5	Institutions and Politics	6	[119–124]
6	Factor of Land Resources	5	[125–129]
7	Typification in Rural and Peri-Urban Areas	4	[130–133]
8	Cultural Heritage	3	[134–136]
9	Others	8	[137–144]
	Total	67	

the production and distribution of goods and services at all levels. Therefore, economic activities that are typical of rural areas, such as tourist attractions, agriculture, ecotourism, fisheries and commercial networks in small industry, are recognised. Subsequently, the second group primarily observes the government entity programmes that are guided toward land conservation, the strengthening of family farming, rural development support, subsidies and food production.

Along the same lines, the third group is related to sustainable development, where contributions are identified, such as state programmes in sustainable rural development (SDRT), efforts toward food security, the implementation of SDGs and efficient territorial planning for SDRT, are identified. Furthermore, the fourth group is called 'Rural Development' and corresponds to the articles that did not explicitly define sustainable development in the study subjects; in this group, self-sufficiency, resilient patterns, development and changes in municipalities, growth areas or desolation and the diversification of livelihoods can be found.

Similarly, the fifth group belongs to the institutional political object that corresponds to institutional tools and means supporting democratic processes, self-management and the administrative autonomy of the territories [145]. Accordingly, spatial diversity is identified based on structures and institutions as well as the intervention of public policies in family farming, the impact of public policies on rural development, sustainable development policies with land exchange, intelligent governance and social sustainability. Moreover, the sixth group is the factor of land resources, which constitutes natural and finite resources that require appropriate and sustainable use in rural areas; therefore, the identified contributions relate to economic losses from landslides, interventions from land restoration, unplanned uses in agricultural land and land consolidation.

In addition, the seventh group corresponds to the typification in rural and peri-urban areas that respond to the transition and transformation experienced by the territories, which led to the identification of methodologies that classify the environmental footprint and resilience of rural spaces based on particular criteria and present a group of villages in larger units, among other themes. The eighth group concerns cultural heritage, namely, the legacy that 'we receive from the past, which we live in the present and that we will transmit to future generations' (United Nations Education, 2020). This is identified as the live expressions inherited from ancestors such as rituals, knowledge, festivities, handicrafts and the monuments and natural places of exceptional value. According to the aspects, contributions are noted that relate to the inheritance and assets of the peasantry, landscape planning and the protection of cultural heritage.

Finally, other study subjects that have a lower frequency are reported; these subjects correspond primarily to Climate Change, economic growth in the economy and knowledge sector, the intelligent growth of a region and rural depopulation.

#### 4.2. Applied methods SLR

In Fig. 8, mixed methods are evidently those that show greater participation, followed by quantitative and qualitative methods. This is likely because mixed methods combine the use of qualitative techniques in the primary information collection stage and then continue with the refinement and analysis stage of information using quantitative methods. Therefore, the use of mixed methods integrates a variety of techniques, qualitative and quantitative that allows a deeper and broader perspective of the objects of study.

Table 6 shows the number of methods and the number of times they are applied, that is, 55% of the articles applied a single method, 25% made use of two methods, 18% employed three methods and 0.02% used four methods, for a total of 108 applications.

In the same manner, Table 7 shows the groups of methods as well as their purpose and frequency of application. Specifically, 31.5% corresponded to the analysis methods of Group D and E, which are differentiated by the number of applications. In these groups, an analytical hierarchy, a factorial analysis, main components, conglomerates, networks, scenarios and data envelopment are primarily identified within the analysis process.

Subsequently, Group I is positioned with a participation of 15.74% and comprises information collection methods that mainly involve primary sources by means of, for example, interviews, questionnaires, surveys, ethnographies, and focus groups. Similarly, Group A (10.18%) is identified and has some methods that are guided toward the potential of rural tourism, urban-rural settlements, landscape planning and land value loss, among others. Furthermore, Group G is established with geographic information systems (9.25%), being a considerably useful tool for multi-criteria analysis methods. In this group, it is mainly the development of spatial products that is related to the projection of Climate Change and the grouping of villages through spatial images to map the unplanned use of the land.

Similarly, in Group B, models are identified (7.40%) that are related to rural diagnosis, sustainable forage production, sustainable social change and the sustainable development of agriculture, among others. In addition, Group C (7.40%) comprises the contributions

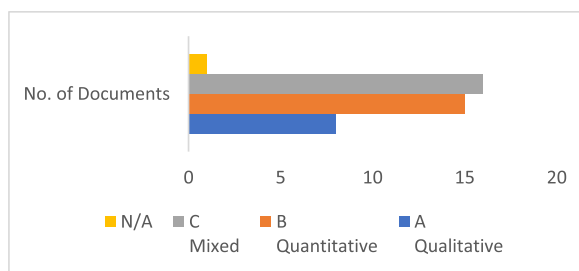


Fig. 8. Method types.

**Table 6**  
Number of methods and applications in the articles.

No. of Methods	No. of Articles	No. of Applications
1	36	36
2	16	32
3	12	36
4	1	4
Total	65	108

**Table 7**  
Identification of methods.

Group No.	Methods	No. of Times	Group No.	Methods	No. of Times
A	Methodologies	11	F	Conceptual Framework (3)	6
B	Models	8	G	Geographical Information Systems	10
C	Indicator Study	8	H	Binary Logistic Regression (2) Multiple Lineal Regression (2) Robust Ordinal Regression (1) Non-Parametric Regression (1)	6
D	Analytical Hierarchy Process Analysis (6) Multi-Criteria Analysis (5) Factorial Analysis (4) Principal Component Analysis (4)	19	I	Interviews (6) Literature Review (4) Survey/Questionnaire (3) Ethnography (2) Focus Groups (2)	17
	Note: analyses that have a frequency application of more than 4–6 times				
E	Conglomerate Analysis (3) Network Analysis (3) Data Wrapping Analysis (2) Scene Analysis—Dynamics of Systems (2) Univariate Analysis (1) Acceptability Analysis of Multiple Stochastic Criteria (1) Statistic Criteria Analysis (1) Data Exploration Analysis (1) Analytical Network Process Analysis (1)	15	J	Other methods: Problems Mapping (1) Cognitive Mapping (1) Comparative Method of Temporary Variations (1) Participatory Process using the Approach of Working with People (1) Matrix Method of Development Models (1) Framework for the Evaluation of Participative Impact (1) Multidimensional Spatial Focus (1) Leopold Matrix (1)	8
	Note: analyses that have a frequency application of more than 4–6 times				
Total = 108					

of indicators related to the LEADER (in English, Links between Actions for the Development of the Rural Economy) programme, rural development, intelligent development, migration, etc. Furthermore, Group H (5.55%) corresponds to regression models that are applied to identify the growth of small businesses, migration, the displacement of livestock, and so on. Subsequently, Group F (5.55%) involves conceptual frameworks that relate to the inheritance and heritage of the peasantry, intelligent governance and the end of rural hunger. Finally, Group J (7.40%) concerns methods that have a particular application such as the Leopold matrix, cognitive mapping and the comparative method of temporary variations.

### 4.3. Subdimensions and variables from the SDRT

In Table 8, 164 variables are found, grouped in each of the subdimensions of SDRT, which relate to the three main variables that correspond to what has been most researched by experts.

#### 4.3.1. Economic dimension (ED)

The ED is represented by five subdimensions and 59 variables (Table 8). The subdimension with the highest participation is the *Means of Production* with 46.67%, in which variables Land Use, technical assistance to productive units, competitiveness and productivity of small producers stand out. It is followed by the *Labour Market* subdimension, with 28.75%, which recognises different sources of income of the productive units, enterprises and labour force.

The *Marketing* subdimension is in third place, with 10.48%, represented by variables that define the means and purposes of marketing, such as the type of market, number of retail stores and e-commerce. The *Governance* subdimension is in fourth place, in which public management variables related to equity of the economic benefits, expenses and investments of the budget of the rural territories, with 10.48%. The *Financial System* subdimension is in last place, with 3.81%, wherein variables, such as access to financial services, savings potential and bank loans, made in the territories are related.

**Table 8**  
Subdimensions and variables of the dimensions of sustainable development.

ED			SD			EvD		
Sub-D	No. of V	Main Variables	Sub-D	No. of V	Main Variables	Sub-D	No. of V	Main Variables
MP	31	Land use (Economic activities) Coverage of technical assistance to productive units	WO	19	Average income of the rural population Young people who are employed in rural territories Tourism development	B	16	Quantity and variability of living organisms Levels of protection for ecosystems
LM	10	Competition and small producer productivity Income of productive units from agricultural and non-agricultural activities New rural entrepreneurship Workforce and capability	C	13	Network formation capability  Community participation Cultural Heritage Conservation	LU	16	Presence of threatened ecosystems Use and land change in rural areas (economic activities) Variety in crop planting Management of fertilisers and pesticides
G	8	Equity of economic benefits in rural areas  Expenditures/Budget investment in rural areas	I	10	Education infrastructure, health centres, among others State of road infrastructure in rural territories Proximity of the rural territories to the urban areas	CC	4	Temperature, rainfall and altitude gradients  Carbon dioxide emissions
M	6	Market categories in rural areas Number of retail stores in rural areas	PD	8	Rural population number Migration of rural population	EA	3	Connections between people and biodiversity Establishments with assistance in environmental management Natural resource-related problems
FS	4	Electronic commerce in production units Access to financial services Saving potential Bank loans used	E	7	Rural population aging rate Access to education services in rural areas Education level of rural population Access to networks and connectivity in rural areas	NR	3	Availability and quality of water and soil Natural sites Distance to water sources
Total		<b>59</b>	S	3	Cases of violence and conflict Level of security	Total		<b>42</b>
			H	3	Access to health services Access to social protection services Quality of health services			
			Total		<b>63</b>			

V: variables; Sub-D: subdimensions.

In Fig. 9, it can be seen that the subdimensions of greater incidence in the Economic Dimension correspond to *Means of Production* and *Labour Market*, with a share of 75.24%. In other words, the *Means of Production* and *Labour Market* are strong components that contribute to the productive and economic capacity of the territories. In addition, it is recognised that the *Labour Market* defines the sources of income that depend on the trend of work offers and demand; consequently, it is important to bear in mind that the labour supply requires an on-going training plan that responds to the new requirements of the productive sectors in such a manner that the sectors benefit from new job opportunities.

#### 4.3.2. Social dimension (SD)

The SD is described by seven subdimensions and 63 variables (Table 8). The *Population Density* subdimension has a share of 25.17%, being the highest value of the subdimensions, and the variables with the highest incidence are mainly migration, ageing rate and the number of rural population. Afterwards, the *Work Opportunity* subdimension is in second place with a share of 20.98%, in which variables such as average income, young people employed in rural areas and tourism development are of note and contribute to measuring the level of employment in the region.

Similarly, the subdimension *Culture* has a participation of 20.98% and is located in third position, in which variables such as networking capacity, community participation, cultural heritage conservation are related. Subsequently, the subdimension *Infrastructure* is in fourth position with a participation of 12.59%, in which the variables educational infrastructure and health centres, road infrastructure condition and the proximity to urban areas are significant.

Likewise, the *Education* subdimension is in fifth position with a participation of 11.89%, in which variables related to access to education services, level of schooling, access to networks and connectivity are identified. In addition, the subdimension of *Security* has a participation of 4.90% that is located in sixth position, reason for which variables such as cases of violence, conflict situations and level of security are identified. Finally, the subdimension *Health* is in last position with a participation of 3.50%, in which the variables access to health services, access to social protection services and quality of health services are recognised.

Similarly, in Fig. 10, the *Population Density*, *Work Opportunity*, *Culture* and *Infrastructure* subdimensions can be seen to represent 80% of the SD component. Accordingly, it is necessary to monitor *Population Density* in terms of increasing problems such as ageing and depopulation, which have the potential to create complex situations for those currently living in several rural areas [113]. Furthermore, the *Work Opportunity* determines the conditions for survival that affect individuals' quality of life, which is reflected in the welfare and development of people in society. Thus, *Population Density* and *Work Opportunity* are subdimensions that are mutually related because population is a key factor in productive development, which, in turn, generates job opportunities.

However, *Culture* is an essential factor in social development because it determines human behaviour in society. Namely, in rural territories, various groups are categorised as peasantry, indigenous people and/or Afro-descendants, which gives these regions a strong cultural component. Furthermore, *Culture* is identified as the source of motivation for collective work. However, it has been observed that the problems relating to the loss of identity, diversity and culture are problems forgotten by public policy, which constitutes the strongest threat affecting the peasantry [134].

#### 4.3.3. Ecological dimension (EvD)

The EvD is represented by five subdimensions and 42 variables (Table 8). The subdimension with the highest participation is 40.86% and corresponds to the subdimension *Land Use*, in which the variables soil use and change, polyculture plantation and management of fertilisers and pesticides are important. In the same order, the subdimension *Biodiversity* is in the second position with a participation of 25.81%, in which variables that measure the quantity and variability of living organisms, level of protection of ecosystems and presence of threatened ecosystems are evidenced.

The *Natural Resources* subdimension continues in third position with a share of 16.13%, in which variables such as the availability and quality of water and soil, distance to the water source and natural sites are mainly related. In addition, the *Climate Change* subdimension is related to variables such as temperature, precipitation, altitudinal gradients, CO<sub>2</sub> emissions, renewable energies, which is why it participates with 10.75% and is in the fourth position. Finally, the last subdimension is *Environmental Awareness* with a participation of 6.55%, in which variables related to environmental education, natural resource conflicts and connections between people and biodiversity are identified.

Furthermore, as shown in Fig. 11, the *Land Use*, *Biodiversity* and *Natural Resources* subdimensions have a share of 82.8% in the EvD trend in rural areas. Specifically, the *Land Use* is determined by the economic activity that people intervene in when modifying the

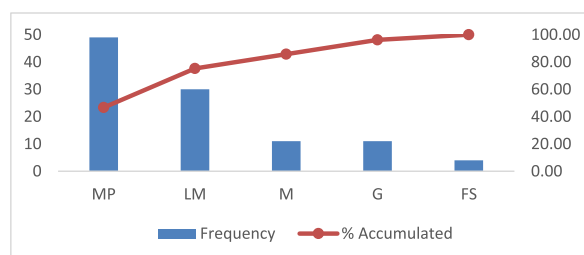


Fig. 9. Pareto chart of the subdimensions of the economic dimension.

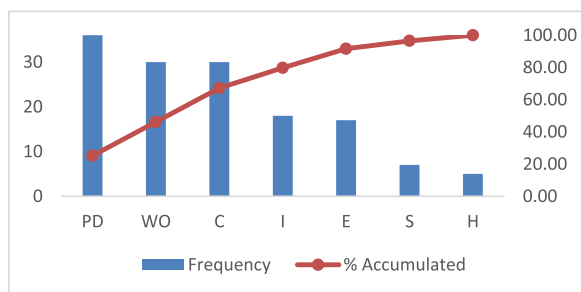


Fig. 10. Pareto chart of the subdimensions of the social dimension.

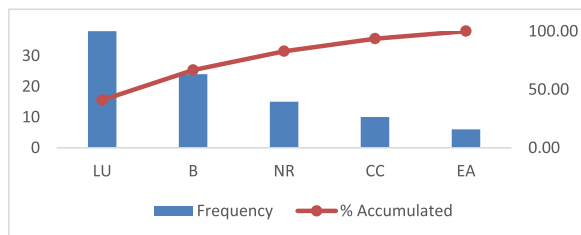


Fig. 11. Pareto chart of the subdimensions of the ecological dimension.

original conditions of the environment. Thus, the conflict of *Land Use* negatively affects natural ecosystems as it threatens, among other things, the survival of terrestrial, marine and plant species. The extractive and intensive activities in occupation serve as an example, as do the underutilisation of soils in agriculture and the overutilisation in livestock because this generates a national problem in which reduces human and rural development.

## 5. Discussion

The study subject-matters most researched by the scientific community correspond to economic activities (19.4%), government programmes (14.93%), sustainable development (13.43%) and rural development (13.43%).

Regarding the study of the search for rural sustainability, it is established that there are different perspectives of economic development as confirmed in Refs. [83–95,97,98,103]; compared to what is expressed in Table 5 and that represents approximately 23.8% of the review. However, in this and other thematic areas, it is observed that the frontiers of this knowledge are not exclusive since both visions of sustainability are confused. This is confirmed with the topic of government programs to promote sustainable development in rural territories in which it was detected in Table 5 that 14.93% of the papers work on this topic but are also collaterally analyzed in Refs. [83,86,89,96–105]. Likewise, the topics of sustainable development that are directly and indirectly referred to in Refs. [84,86,90,91,94,96,99,101–112,138,139,144], all this confirms that, although the search terms can catalog the documents in specific areas, the frontiers of knowledge are diluted especially by the very nature of sustainable development. The same happens with rural development, which originally represents 13.4% of the references according to Table 5, but its implications can be extended to other visions as found in Refs. [83,85,87,88,100,112–118,134].

Based on the foregoing information, the importance of economic activities is identified for activating and maintaining the dynamics of the territories, hence their relevance, and the requirement acknowledged for government entity programmes to improve and strengthen economic activities, as this factor determines the life quality of the rural population. Consequently, measurements are made on the effects and impacts that economic activities and government programmes have on the development of the territories. This is a main reason for the contributions that have been made within the framework of rural development and sustainable development, where these concepts are identified as being oriented towards the same goal: to improve the well-being of the population while also respecting the limits and potential of the ecological, social and economic components of the territory. Additionally, it is observed that 77.7% of the articles of the SD study subject-matter investigate at least three ecological, social and economic components, while rural development does not necessarily explore the three main components of SD in the contributions.

In the literature review it is also found that the theme of sustainable development is directly related to the fulfillment of the objectives of sustainable development, for example, in Refs. [107,119] they are related to the 17 goals. On the other hand, and without surprise, it was determined that the most related objectives are: Sustainable communities (11), referenced in Refs. [84,86,88,89,91,94,95,97,99,101–103,105,107,109,112], to Refs. [114,116–119,125,127–136,139,141–143]; it is followed by that of Responsible production and consumption (12) who study it in Refs. [85,89,94,98–101,103–105,107,117,119,120,122–126,131–135,141,144]; also that of Decent work and economic growth (8) where its main aspects are worked on in Refs. [83,85–89,99,101,105,107,119,122] [124], [125,128,129], [131–134,141,143]; It is worth noting that it is this objective that indirectly studies the fulfillment of other

**Table 9**  
Relationship between the SDGs and the SDRT subdimension.

SDGs	Key Words	Dim/ Sub-D	T	SDGs	Key words	Dim/ Sub-D	T
End of Poverty (1)	Satisfaction of basic needs Forms of poverty Most vulnerable populations	LU-EvD NR- EvD WO-SD PD-SD MP-ED LM-ED G-ED	7	Industry, innovation, infrastructure (9)	Investment in innovation, and infrastructure Sustainable industries	LU-EvD EA-EvD NR-EvD PD-SD WO-SD I-SD G-ED M-ED FS-ED	9
Zero hunger (2)	Nutritional needs Food insecurity Unustainable farming practices	LU-ED NR- EvD PD-SD MP-ED LM-ED G-ED	6	Reduced inequalities (10)	Internet access Income disparity Safe migration and movement of people	LU-EvD NR-EvD PD-SD WO-SD G-ED	5
Health and Well-being (3)	Access to health	PD-SD I-SD H-SD G-ED	4	Sustainable communities (11)	Safe housing Improvement of marginal settlements Public transport	LU-EvD EA-EvD NR-EvD PD-SD I-SD G-ED FS-ED	7
Good quality education (4)	Access to education at all levels  Education quality  Literacy	EA-EvD PD-SD I-SD E-SD G-ED	5	Responsible production and consumption (12)	Access to basic services  Methods of production Consumption of goods and resources Efficient management of natural resources	LU-EvD EA-EvD NR-EvD PD-SD I-SD G-ED FS-ED	9
Gender equality (5)	Forms of discrimination  Unequal work disparity Equal rights in accessing economic resources	C-SD G-ED	2	Climate action (13)	Way in which toxic waste and pollutants are eliminated  Greenhouse effect gases	LU-EvD CC-EvD EA-EvD NR-EvD PD-SD MP-ED M-ED G-ED	8
Clean water and sanitation (6)	Access to clean water Access to basic sanitation services Waste water	LU-EvD EA-EvD NR- EvD PD-SD I-SD G-ED	6	Marine life (14)	Marine pollution Marine and coastal ecosystems  Acidification impact of the oceans	B-EvD LU-EvD EA-EvD NR-EvD PD-SD MP-ED M-ED G-ED	8
Affordable and clean energy (7)	Access to electric energy Use of clean energy sources/ impact on energy production	LU-EvD EA-EvD NR- EvD PD-SD I-SD G-ED	6	Terrestrial ecosystem life (15)	Forests Biodiversity	B-EvD LU-EvD EA-EvD NR-EvD PD-SD MP-ED M-ED G-ED	8
Decent work and economic growth (8)	Ventures  Jobs offered Job quality Productivity levels  Technical revolution	LU-EvD EA-EvD NR- EvD PD-SD I-SD MP-ED LM-ED M-ED FS-ED	9	Peace, justice and stable institutions (16)	Reduce the loss of natural habitats Forms of violence Insecurities Operational state institutions	EA-EvD NR-EvD PD-SD S-SD G-ED	5
				Alliances to achieve objectives (17)	Cooperative alliances within territories	LU-EvD EA-EvD NR-EvD C-SD G-ED	5

DS: Sustainable development – Dim: Dimension – Sub: Subdimensions – T: Total of Subdimensions.



objectives such as End of Poverty (1), Zero hunger (2) and Reduced inequalities (10). Finally, those of Terrestrial ecosystem life (15) in Refs. [102,107–109,119,126–131,133–135,138,139,144], and the Climate action (13) analyzed in Refs. [107,119,138], and [144].

Based on the results, Table 9 shows the relationship between the subdimensions and the 17 Sustainable Development Goals (SDGs) of the United Nations Development Programme on the basis of the correspondence between the word classifications of the SDGs and the conceptualisation of the subdimensions.

Three SDGs are related to nine (9) of the 17 subdimensions, i.e. Decent Work and Economic Growth (SDG 8), Industry, Innovation and Infrastructure (SDG 9) and Responsible Production and Consumption (SDG 12), are related to the subdimensions of *Land Use, Environmental Awareness*, and *Natural Resources* from the Ecological Dimension, and these aspects are complex in rural territories. For example, *Land Use* conflicts impossibilitate adequate conservation and management of *Natural Resources*, which is partly due to the low *Environmental Awareness* of the system's stakeholders [92,109,135]. The subdimensions *Population Density, Infrastructure* and *Work Opportunity* are also connected, which correspond to essential factors in social development, as phenomena such as migration or depopulation, are seen due to the lack of work opportunities and the deficient infrastructure in education and health essential services, vital aspects for the integral development of the rural population [49,116]. Similarly, within the Economic Dimension, subdimensions *Means of Production, Labour Market, Commercialisation, Governance* and *Financial System* factors need to be strengthened to develop a productive, stable and competitive system in rural areas [134]. Consequently, research has shown that a good use of local resources and human capital allows for innovations in production, processing and marketing, which favour the profitability of traditional economic activities, especially agriculture, and of new sectors such as tourism in rural areas [26,28,108,113].

Governance relates to the formation of networks of formal and informal institutions, organisations and stakeholders, which permanently interact in rural territories; they create values, norms and behavioural patterns among the actors [134]. Thus, governance promotes the adoption of public policy, while concern for social exclusion, recognition of the importance of the countryside and protection of biodiversity are determining factors in the development of rural territories. Accordingly, one of the main mechanisms of rural territorial planning is the Integral Rural Reform, which recognises the problems of peasant agriculture and proposes programmes or action plans aimed at progress towards solutions and involves the active participation of the population that inhabits and knows the territories [121].

Based on the aforementioned discussion, a need to generate actions contributing to sustainable development in rural areas is identified, where stakeholders consider the ecological, social and economic aspects in the decision making, as the behaviours of the subdimensions have a positive or negative effect within the subdimension and among SD subdimensions [107,109–111,117].

In the same way, Climate Action (SDG 13), Life Underwater (SDG 14) and Life Terrestrial Ecosystems (SDG 15) are identified as

**Table 10**  
Contribution of new variables to the SDGs in rural territories.

No.	DS Objective	References	Variables	Dim	Sub-D
1	End of Poverty	[26,51,90,94,96,102,109,113,121,133,143]	Average income of the rural population	SD	WO
3	Health and Well-being	[92,105,108,109,113] [49,96,100,108,115,116,124,134,143]	Quality of health services in rural territories Rural population that has migrated to other regions	SD SD	H PD
5	Gender equality	[50,90,102,109,113,141] [26,51,121,134]	Conservation of cultural heritage in rural territories Economic dependency of rural women	SD ED	C LM
8	Decent work and economic growth	[51,83,96,99,109,115,132,133,143] [49,105,109]	Employment demand in rural territories Competitiveness of small producers in rural territories	ED ED	LM MP M
		[49,121,132,134]	Economic activities that take place in rural territories	EvD ED	LU MP
		[26,50,94,113,116,117,121,132,134,143]	Variety in planting crops in rural territories	EvD ED	LU MP
		[92,105,113,121,134]	Coverage of technical assistance to productive units/establishments of the primary sector in rural territories	ED	MP
9	Industry, innovation, infrastructure	[50,90,92,113,115,121,134] [92,99,111,121,134,141] [83,92,105,109,113]	Types of markets that develop in rural territories Maturity of enterprises in rural territories Level of integration of technology in the production process of agriculture	ED ED ED	M LM MP
11	Sustainable communities	[26,50,51,92,94,103,105,109,124]	Environmental education (awareness)	EvD	EA
12	Responsible production and consumption	[50,51,91,110,111,113,117,128,138] [51,91,104,113]	Production units/establishments that apply soil conservation practices Types and management of fertilizers and pesticides applied on crops	ED EvD ED	LU EA MP
15	Terrestrial ecosystem life	[96,121,138] [102,113]	Soil erosion due to human activities in rural areas Disease control in wildlife in rural territories	EvD EvD	LU B
16	Peace, justice and stable institutions	[51,102,135] [90,105,109,123] [51,109,133]	Rural population that have had conflicts over natural resources Equity of economic benefits in rural territories Expenses and Investment of the budget in rural territories	EvD ED ED	EA G G

being related to the economic, ecological and social dimensions. In the social dimension, there is the Population Density subdimension in which man is the main actor in the relationship with the environment. Therefore the creation of new communities is a regional development issue which must consider the existing factors in the environment [135]. Thus, strategic development should be planned in the new communities wherein activities that contribute to balanced development and progress towards the solutions for demographic problems and the critical state of the ecological component are prioritised in rural areas [135]. Likewise, the means of production, marketing and governance are factors that determine the quality of life of the population and conservation of natural resources. Therefore, agrarian and productive structures (governance) are fundamental to the emergence of economic development with social inclusion [119,124]. Furthermore, we highlight the importance of land ownership in promoting greater equality of opportunities; thus, the distribution and legalisation of rural land determine the dynamics in the type of economic activities that are developed and in the articulation with territorial markets and stakeholders [109,119]. Likewise, in the ecological dimension, the sub-dimensions Land Use, Natural Resources and Environmental Awareness are related. These are variables that allow measuring the use and conservation of the ecological component of rural areas. For example, wildlife management units (WMUs) are a public policy instrument as they promote the conservation of the ecosystem and rural development. Thus, WMUs protect vegetation and address climate change, and an increase in the efforts and strategies to improve people's understanding of ecological processes is fundamental, as the success of WMUs depends on the ecological, economic and socio-cultural factors of the region [144].

Furthermore, SDG No. 5 (gender equality) is related to discrimination, unequal division of labour and access to economic resources, i.e., social problems that have persisted over time. Thus, public policies have prioritised production concerns, especially those of the agricultural (economic) sector, leaving aside social problems such as the loss of identity, diversity and the culture of the regions, which have become a threat that affects the quality of life of the Mexican peasantry [134]. Moreover, the cultural sub-dimension (C2) shows that, in recent years, the labour participation of rural women has become more and more representative in economic activities related to agriculture and ecotourism due to the positioning and leadership skills shown by women in rural territories [87,103].

Similarly, Table 9 identifies the two subdimensions that have the most relationships with the 17 SDGs in each of the dimensions. These are Governance related to 16 of the SDGs, Population Density in 15 of the SDGs, Natural Resources present in 14 of the SDGs, Land Use for 13 of the SDGs, Infrastructure (related to 8 of the SDGs) and Media. Production (in 6 of the SDGs). According to this, the importance of the subdimensions in the balanced development of rural territories is recognised. This is one reason as to why it is essential that the decisions made in the development of the regions are analyzed in a comprehensive manner from an economic, ecological and social point of view.

It is important to mention that the subdimensions of the SDRT are related to the 17 SDGs, making it evident that SDGs respond to the dynamics of rural territories at a general level; however, the idea of expanding or adding new SDGs that respond to particular factors in these areas of interest is not ruled out, such as the need to explore the cultural component that builds the identity of rural territories, being essential to understand the diversity in the ways of being and acting of the population.

From the analysis of the results, it is identified that a large part of the variables analyzed are related to the indicators of the goals established by the SDGs. Therefore, in Table 10 new variables are proposed, which are related to the SDGs according to the dimension and subdimension to which it belongs.

According to Table 10, variables are provided for nine of the SDGs that are related to the dynamics and behavior of rural territories. Some of the variables that stand out are the rural population that has migrated to other regions, preservation of cultural heritage, demand for employment, type of economic activities, maturity of enterprises, level of integration of technology in agriculture, rural population that has had conflict over natural resources, among others.

Therefore, rural employment has been readjusted towards other non-agricultural sectors through land conversion programmes that are formulated according to the needs of the territories. For example, farmland-to-forest programmes in countries such as China have had a positive impact on the income of rural households [26,90,96,102]. Similarly, rural tourism is one of the most representative activities for sustainable rural development, as it generates new employment opportunities that create alternative sources of income for the rural population. Therefore, several methodologies have been designed to assess the tourism potential of rural territories, and tourism models oriented towards a balanced development in rural areas are proposed [83,87,108].

Likewise, rural depopulation causes low development in the territories and is mainly characterised by the lack of income, jobs, accessibility to transportation and coverage of basic services [115,116]. Therefore, specific policies that provide solutions to the migration of the rural population are required [116,143], so rural tourism is an activity that reduces the migration of rural youth because it increases the retention of the economically active population and strengthens development of a local market of products that come from organic agriculture and specialities and handicrafts typical of the territories [83,87].

In contrast, land use is a political decision that is formulated and approved through agrarian reforms in some of the countries. In other words, the processes of agrarian reform or expansion are complex as they define the structure of land ownership, land use change and land production [109]. Thus, a participatory approach is necessary at local, regional and national levels in order to develop a land use plan in which rural policies focus on the development of smallholders, competitiveness and market access, which are key factors in reducing poverty, increasing welfare and social equity, safeguarding food security and even increasing resilience to climate change [26,109,132,144]. Sustainable production projects have been promoted, which are often designed at the local level, with a burden that is not representative of the regional, national and international dynamics. Thus, it is important to jointly and comprehensively analyse the dynamics and development behaviour at the different scales of the territories [124].

Finally, it is worth highlighting the importance of respectful behaviour towards natural resources and ecosystem services, which have great value and significance in the development of rural territories. Therefore, environmental awareness and education strengthen responsible consumption, due to which the productive sectors generate clean production strategies and green markets according to the dynamics of their development [103,139]. The above highlights the design of green business models, characterised by

the nutritional values of food and a dynamic perspective that supports the competitive advantage of rural women as local entrepreneurs based on functional foods and that gives greater confidence to consumers [102,103].

Another significant factor is that the dynamics and behaviors of rural areas define the TRSD indicators. In other words, from the rurality level of the zone, the indicators representing the social, ecological, and economic development of the territory are selected. Therefore, it is essential to mention the concept of rurality, since it measures the characterization of an area as rural, through methods that define factors and thresholds that allow an adequate differentiation of processes, activities, and way of life due to the heterogeneity and diversity of rural areas [21].

It is significant to understand that to characterize the level of rurality there are methodologies that typify by intermediate scales and measure the transition between rural vs. urban areas. Some of the methodologies define three categories corresponding to disadvantaged rural areas (high degree of rurality), intermediate rural areas (medium rurality), and dynamic rural areas (low rurality) [146]. Furthermore, the classification in peri-urban rural areas, rural areas to be revitalized, and intermediate rural areas are recognised [147], as is the classification in rural, semi-rural, semi-urban, and urban [148]. Therefore, social, ecological, and economic development presents particularities in rural territories, which are explained from the geographical context of the area, since it determines fundamental conditions in the development of territories. For example, the type of natural resources and ecosystem services define the economic activities projected in rural areas. Likewise, the degree of rurality provides information on the dynamics of rural territory that is measured by factors such as the population, the types of economic activities, and the distance to the nearest urban area, among others. Therefore, the level of rurality guides the selection of the most appropriate indicators according to the dynamics and needs of rural areas.

## 6. Conclusions

By representing the dimensions of SDRT, five subdimensions and 59 variables were established in the Economic Dimension, seven subdimensions and 63 variables were established in the Social Dimension and five subdimensions and 42 variables were established in the Ecological Dimension. Therefore, the Social Dimension is recognised as having the greatest number of dimensions and variables, which indicates the interest in and the importance of human behaviour when interacting with the environment, because this has a direct influence over the relationships and behaviours that emerge with the ecological and economic component. Furthermore, the Ecological Dimension is identified as yielding less information (variables), the reason for this is that there is less information or statistics on the measurement of the ecological component in the territories.

SDRT is the balance existing between the ecological, social, and economic dimensions, where the priority is given to subdimensions that have greater representation in the study dimensions and that contribute to the understanding of the study subject-matter. Accordingly, the Ecological Dimension includes the subdimensions *Land Use, Biodiversity and Natural Resources*. Similarly, in the Social Dimension, there are the subdimensions *Population Density, Work Opportunity and Culture*, and in the Economic Dimension, there are *Means of Production and Labour Market*.

One limitation in the SLR occurs regarding the open access criteria of documents in the selection phase as 33.6% of the articles were dismissed because of the availability of full PDFs, and this factor depends on the scope of affiliation of institutions with the international database Scopus.

A challenge has been identified on a global, national, regional and local level in terms of moving towards SDRT as it is a complex system because of the number of components (ecological, social and economic), the specific conditions of rural areas and the type of relationships within each subdimension, between the subdimensions of the same component and between the subdimensions of the different components. Therefore, it is of interest to continue investigating the levels of relationships between the subdimensions prioritised in this research study with the purpose of continuing to contribute knowledge towards fully and integrally making progress in the understanding of the SDRT, such that different strategies can be assessed, oriented towards development that seeks harmony between the ecological, social and economic dimensions in rural territories.

All the SDGs are important and vital to guarantee social well-being, especially in rural regions, but some of these are more imperative to improve due to the urgency of the needs that are to be met in these regions, which are the ones with the least resources and most unprotected. The analysis of this literature review marks an orientation on the relationships that exist between the subdimensions and the variables that make up the three dimensions considered in sustainable development, against the fulfilment of these objectives; especially for those that refer to putting an end to poverty and hunger, at the same time that a healthy life can be guaranteed, access to the largest number of services, starting with the vital ones such as health, education and services quality public services and guarantee the sustainability of the environment of these rural regions.

Finally, it is evident in the literature reviewed that there is no systematic review regarding the scope of the research's study subject-matter, where the knowledge is provided, so that it is possible to identify research topics, methods and variables investigated by experts, as well as subdimensions that contribute to a comprehensive understanding of the ecological, social and economic dimensions of SDRT.

## Author contribution statement

All authors listed have significantly contributed to the development and the writing of this article.

## Data availability statement

Data included in article/supp. material/referenced in article.

## Additional information

Supplementary content related to this article has been published online at [URL].

## Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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