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SUSTAINABLE URBAN DEVELOPMENT: AN ANALYSIS OF INTERNATIONAL SCIENTIFIC PRODUCTION

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ABSTRACT

Population concentration in urban centers has been a hallmark of the world development process. In this sense, the challenges of sustainable development are increasingly concentrated in cities. Thus, considering the relevance of city planning for a more sustainable development, especially for living in an increasingly urban society, this study aims to identify the main characteristics of the international scientific production related to this theme in the last ten years. For that, a bibliometric study was developed through the Web of Science database, relating the terms “sustainable development” and “urban”. It is noteworthy that when analyzing citations from related publications, it is observed that this combination of topics is considered a hot topic, insofar as it has a high impact index, and can be considered an exclusive topic, with areas of knowledge or unique characteristics. We also analyzed the most relevant studies in this area, through the evaluation of the ten studies most cited throughout this period. It was verified, through this work, that the theme is approached in several areas of knowledge, evidencing its importance and multidisciplinary.

Keywords: Sustainable development; Urban; Sustainable cities; Bibliometrics.

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1. INTRODUCTION

Population concentration in urban centers has been a hallmark of the world development process. The urban population represents approximately 55% of the world's population. At the beginning of the 20th century, this rate indicated only 10% of people. It is estimated that by the middle of the 21st century, 68% of people will be living in urban environments (UNITED NATIONS, 2018). In Latin America, where 81% of the population is urban, it is estimated that by 2030, 86% of the population will be living in cities, accompanying Western European indexes. This is the largest proportion among developing regions, surpassing some developed countries (SIEMENS AG, 2010).

Often accelerated growth of cities is confused with development, however, alongside the benefits, these spaces have brought disastrous impacts to the quality of life of its inhabitants and to the planet's environmental conditions (ROSSETTO, 2003). Although the common and desired goal for the cities is to provide adequate infrastructure, conditions of comfort and health, spaces of public uses with quality, opportunities of social and economic growth for all population, the picture presented by the Brazilian urban network is another.

It can be seen that urban problems are serious because of the uncontrolled growth, unmet demand for resources and services, obsolescence of the existing physical and administrative structure, inefficiency of management and the progressive deterioration of the urban environment (ROSSETTO, ORTH and ROSSETTO, 2006). Increasingly, therefore, the planning of more sustainable cities is needed, in view of increased pollution, high carbon emissions and the resulting climate threat (GEHL, 2013).

Some cities have become exponents when it comes to urban sustainability. In Europe, Copenhagen stands out among those with the best rates, accompanied by Vienna, Amsterdam and Zurich, as well as cities located in Nordic countries, for example: Stockholm, Oslo and Helsinki. In North America, San Francisco, Vancouver and Seattle are among the cities that have developed the best projects for sustainable urban development (SIEMENS AG, 2012). In Latin America, Curitiba is recognized as the main sustainable city of the continent. Other Latin American cities such as Bogotá, Belo Horizonte and Brasília stand out in some categories of analysis. In Asia, the performance of Singapore is highlighted, and in Africa, the city of Accra is mentioned among those which have developed good action programs (SIEMENS AG, 2012).

Sustainable development is designed to promote citizens a quality of life and reduce environmental impacts. A sustainable city provides quality of life for its citizens and for future generations, through solutions to reconcile environmental and social aspects (ROGERS, 2013). Thus, considering the relevance of city planning for a more sustainable development, especially for living in an increasingly urban society, this study aims to identify the main characteristics of the international scientific production related to this theme in the last ten years. For that, a bibliometric study was developed through the Web of Science database, relating the terms "sustainable development" and "urban". We sought to identify and analyze the most relevant studies in this area, by means of a survey of the ten most cited studies over the last decade.. To reach the proposed objective, the study begins with the theoretical contribution referring to sustainable urban development. Next, the study method is presented. Subsequently, the results obtained in the analysis of the international scientific production involving the thematic of the study are described.

2. THEORETICAL REFERENCE

The United Nations report, *Our Common Future* (CMMAD, 1991), proposed the concept of sustainable development as the basis of a global economic policy: meeting our current needs without compromising future generations and actively directing our development in favor of the majority of the world - the poorest.

For Leite and Awad (2012), sustainable city is much more than the set of sustainable constructions. It should encompass sustainability parameters in urban development, both public and private. It is necessary to develop models of urban sustainability that allow development to follow principles of sustainability. Cities need market concentration and knowledge, between innovative and dynamic sectors, in an attempt to add competitive advantages and stand out in the new industrial paradigm. New forms of urban planning and management, such as the so-called city marketing, urban regeneration projects and strategic planning, are now required (LEITE and AWAD, 2012).

The construction of urban space and the emergence of cities represent an increase in the impacts of men's actions on natural resources, since urban structures must absorb the new demands of the growing population, adapting to the changes of society in their production activities and consumption, behaviors, ways of life, types of relationships, among others (MARTINS and CÂNDIDO, 2013).

As the urbanization process occurs, sustainable development increasingly depends on success in managing urban growth, especially in low- and middle-income countries where the pace of urbanization projected is faster. Many countries will face challenges to meet the needs of their growing urban populations, including for housing, transportation, energy systems and other infrastructure, as well as for employment and basic services such as education and health care. In order to ensure that the benefits of urbanization are fully shared and inclusive, a policy focus is needed on access to infrastructure and social services for all, such as housing, education, health care, decent work and the environment, focusing on the most vulnerable groups (UNITED NATIONS, 2018).

As Rotmans and Van Asselt (2000) point out, among the many challenges and opportunities that involve urban issues, we emphasize the changing role of cities in pursuit of sustainable development. The authors point out that in the past cities were seen as "problem-building hubs", as they produced large-scale garbage, high pollution, huge traffic jams, sources of poverty and crime. However, over the years, cities have come to be understood as a "problem solving hubs", insofar as they are promoters of regional development and innovation centers (ROTMANS; VAN ASSELT, 2000). Among the main assumptions for this development is the investment in infrastructure, highlighting the issue of urban mobility, which has a great impact in the search for competitiveness. In addition, technology is also considered a key aspect, since it assists in delivering efficiency and transparency to citizens. These initiatives are part of the creation of public-private partnerships (PPPs), in particular the search for solutions in technology and infrastructure (GLOBESCAN; MRC MCLEAN HAZEL, 2007).

In this sense, the challenges of sustainable development are increasingly concentrated in cities. These aspects are even more important, particularly in low- and middle-income countries, where the rate of urbanization is even faster. Integrated policies to improve the lives of urban and rural residents are extremely necessary (UNITED NATIONS, 2014).

Planning a sustainable city requires understanding the relationships between the various variables - citizens, services, transportation policies and electric power generation, among

others - by assessing their full impact on the local environment and, regionally, on a broader basis. Thus, for achieving sustainable development in the urban environment, all these factors must be considered and related (BICHUETI, 2016). According to Williams (2010), it is necessary to understand the vision of sustainable urban development, that is, to know what is really meant by a sustainable city, in order to develop a deeper understanding of the multiple processes of change that are related in order to achieve a degree of maturity and thus achieve sustainable development.

The concept of sustainability in the urban environment is quite broad. According to Bulkeley and Betsill (2005), despite a general understanding that building sustainable cities is a desirable goal, understanding what this represents in practice is less accurate. Guy and Marvin (1999) define the multiplicity of views on urban sustainability as a motivating element to advance research and practice around this theme. According to Williams (2010), among the important aspects, stand out the cultural patterns and geographic specificities, making the ways to achieve urban sustainability, are different between different regions of the planet.

3. METHOD OF RESEARCH

This chapter aims to describe the method of study and the procedures adopted in the development of the research. It is worth mentioning that this study consists of a quantitative bibliometric research aimed at identifying the main characteristics of the international scientific production related to the themes “sustainable development” and “urban” in the last ten years. In this sense, a search was developed in the Web of Science database of the Institute for Scientific Information (ISI), comprising the period of publications between 2007 and 2016, using the keywords “sustainable development” and “urban”. The results were analyzed based on their main characteristics, such as the types of production, the main authors, the institutions, the countries and the funding agencies, the year, the data sources, the thematic areas and the language of the publications.

According to Silva (2004), bibliometric aims to analyze scientific or technical activity through the quantitative study of publications. Thus, a bibliometric study consists of the application of the statistical methods on the set of bibliographical references and the knowledge of the stage of evolution in which the research in a particular area is found (ROSTAINING, 1997; MACEDO, CASA NOVA and ALMEIDA, 2009)

The number of citations and the impact of these studies were analyzed. For that, the h-b-index and the m-index were used. The h-index was proposed by Hirsch (2005) as a way to characterize the scientific production of a researcher. Later, Banks (2006) proposed the hb-index, an extension of the h-index, obtained through the number of citations of a topic (or combination of topics) in a given period, listed in descending order of citations. The hb-index is expressed by the number of publications that obtained a number of citations equal to or greater than their ranking position. The m-index, in turn, is calculated by dividing the hb-index by the period of years that information is desired (BANKS, 2006). According to the author, the following classification is performed, according to the m-index, as shown in Table 1, below.

Table 1 - Classification of the publication according to the m-index

M-index	Topic or Topic Combination
$0 < m \leq 0,5$	The topic / combination may be of interest to researchers in a particular research field, which encompasses a small community.
$0,5 < m \leq 2$	The topic / combination can probably be a “hot topic” as a research area, where the community is very large or the topic / combination has very interesting characteristics
$m \geq 2$	It is a unique topic / combination, where the consequences have a reach not only in your own research area. It is likely to be a topic / combination with application effects or unique features

Source: Based on Banks (2006)

From the characterization of the study, one can move towards the results of the research.

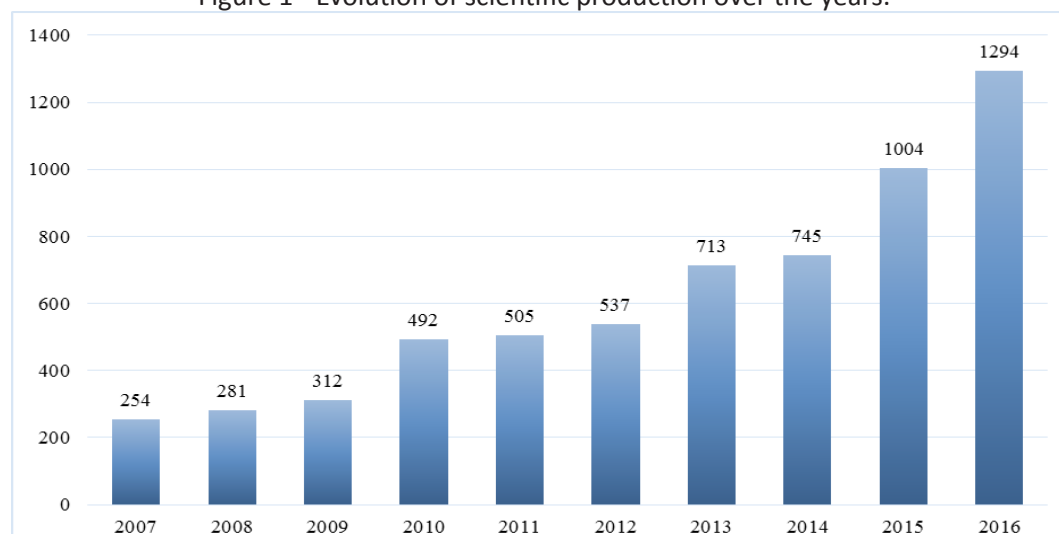
4. RESULTS ANALYSIS

As proposed in the objective of this study, this section presents the main characteristics of the international scientific production related to the topics “sustainable development” and “urban”. The results presented initially refer to the survey of the main characteristics of scientific production in the period between 2007 and 2016, through a survey carried out on September 4, 2017 in the Web of Science database. Next, an analysis of the citations of articles included in this research is presented.

4.1 Characteristics of Publications

A survey conducted on the Web of Science database resulted in a survey of “human development” and “urban”. Over the ten-year period, a scientific research associated with the latest trends in significant growth, from 254 publications in the year 2007, to 1,294 studies in 2016, as presented in Figure 1. In this period, one can distinguish a scientific production of the year 2015, which had a significant growth, compared to the previous year.

Figure 1 - Evolution of scientific production over the years.



Source: Research Data - Web of Science.

It should be noted that most of the studies are articles published in journals, representing approximately 55% of these, as evidenced in Table 2. Papers published in annals of congresses, with 43% of the documents, stand out. Thus, it can be said that most of these publications are considered scientific production.

Considering that journal articles and papers are predominant among publications, it is important to highlight the titles of the main sources of studies that deal with the themes of “sustainable development” and “urban”. In this sense, Table 3 presents the names of journals and annals of congresses with the largest number of publications in this subject.

Table 2 - Classification of production as to the type of study.

	Type of production	Publications ¹	% of 6679
1º	Articles	3632	54,38%
2º	Proceedings Paper	2874	43,03%
3º	Review	207	3,10%
4º	Materials Editoriais	40	0,60%
5º	Book Review	33	0,49%

¹ Studies can be classified into more than one category.

Source: Research Data - Web of Science

Table 3 – Main sources of studies

	Source Titles	Publications
1º	Sustainability	174
2º	Advanced Materials Research	138
3º	Applied Mechanics and Materials	129
4º	Procedia Social and Behavioral Sciences	106
5º	Habitat International	99
6º	Procedia Engineering	98
7º	Journal of Cleaner Production	95
8º	Wit Transactions on Ecology and the Environment	92
9º	Cities	79
10º	International Multidisciplinary Scientific Geoconference Sgem	68
11º	Landscape and Urban Planning	65
12º	Ecological Indicators	52
13º	Energy Procedia	51
14º	Land Use Policy	48
15º	Procedia Environmental Sciences	48
16º	Fabbrica Della Conoscenza	46
17º	International Journal of Sustainable Development and World Ecology	44
18º	International Archives of the Photogrammetry Remote Sensing and Spatial Information Sciences	41
19º	Renewable & Sustainable Energy Reviews	41
20º	Transportation Research Procedia	41
21º	Journal of Environmental Management	39
22º	Lecture Notes in Computer Science	38
23º	2011 International Conference on Green Buildings and Sustainable Cities	37
24º	European planning studies	37
25º	Proceedings of the First International Conference on Sustainable Urbanization ICSU 2010	37

Source: Research Data - Web of Science

According to Table 3, the most important sources are: “Sustainability”, “Advanced Materials Research”, “Applied Mechanics and Materials”, “Social and Behavioral Sciences”, “Habitat International”. It should be noted that, although each journal covers different fields of knowledge, all seek for issues related to sustainable development, highlighting the importance of sustainability and urbanization for a favorable growth in all the research areas.

We also analyzed the main authors of the studies in these themes and the number of publications associated with them. As described in Table 4 below, the authors Y. Zhang, H. Wang and Z.L. Zhang stand out among those who have higher production in this area. It is also possible to highlight a small concentration of scientific production, since several authors appear with relatively equivalent quantity of publications.

Table 4 - Main authors of the publications.

	Author	Publications		Author	Publications
1º	Zhang Y	34	14º	Zhang J	17
2º	Wang H	31	15º	Yigitcanlar T	16
3º	Zhang XL	28	16º	Lehmann S	15
4º	Gambardella C	20	17º	Wang X	15
5º	Li Y	20	18º	Liu Y	14
6º	Wang L	20	19º	Shen Ly	14
7º	Zhang L	20	20º	Wang K	14
8º	Li J	19	21º	Wu Yz	14
9º	Wang Y	19	22º	Geng Y	13
10º	Yang Zf	19	23º	Liu L	13
11º	Zhang H	19	24º	Salvati L	12
12º	Wang J	18	25º	Sun Y	12
13º	Chen B	17			

Source: Research Data - Web of Science

In Table 5, it is possible to identify the countries of origin of the scientific production involving the themes “sustainable and urban”. It is observed the predominance of the studies coming from China, and also the presence of Brazil in this ranking, occupying the 19th position among the countries with the largest number of publications in this area.

Table 5 - Main countries of origin of publications.

	Countries	Publications		Countries	Publications
1º	China	1783	14º	Turkey	138
2º	The USA	803	15º	Malaysia	135
3º	England	442	16º	Poland	122
4º	Italy	387	17º	Japan	119
5º	Australia	336	18º	Iran	118
6º	Germany	255	19º	Brazil	116
7º	Netherland	220	20º	Portugal	106
8º	Canada	212	21º	Switzerland	102
9º	Spain	205	22º	South Africa	94
10º	France	172	23º	Greece	88
11º	Sweden	167	24º	Lithuania	79
12º	Romania	159	25º	South Korea	79
13º	India	148			

Source: Research Data - Web of Science

It is noteworthy that, despite the multiplicity of countries and the superiority in the number of publications in China, English is predominant in international publications. As shown in Table 6, approximately 96% of the studies listed in the survey are available in this language.

Tabela 6 – Publications in available languages

	Languages	Publications	%
1º	English	6406	95,913%
2º	Spanish	89	1,333%
3º	Chinese	44	0,659%
4º	Portuguese	28	0,419%
5º	German	27	0,404%

Source: Research Data - Web of Science

The results of the research show the main institutions according to the number of publications that addresses the themes studied. According to Table 7, it is important to emphasize that the institution that predominates the scientific production related to “sustainable development” and “urban” is the Chinese Academy of Sciences, evidencing the high publications from the country.

Analyzing Table 5 and Table 7 show that although Brazil is ranked among the 19 countries with thematic domains, no teaching or research institution was created among 25 prominent institutions.

Table 7 – Main institutions according to the number of publications.

	Institutions	Publications
1º	Chinese Academy Of Sciences	200
2º	University Of London	75
3º	Beijing Normal University	72
4º	University Of California System	68
5º	University Of Chinese Academy Of Sciences	66
6º	Peking University	58
7º	Arizona State University	50
8º	Vilnius Gediminas Technical University	50
9º	Delft University Of Technology	48
10º	Hong Kong Polytechnic University	47
11º	Islamic Azad University	47
12º	Nanjing University	46
13º	Zhejiang University	45
14º	Tsinghua University	43
15º	Harbin Institute Of Technology	42
16º	University College London	42
17º	Tongji University	41
18º	Wuhan University	41
19º	Beijing Jiaotong University	38
20º	Chongqing University	38
21º	Queensland University Of Technology Qut	38
22º	University Of Belgrade	37
23º	Universiti Teknologi Malaysia	36
24º	University Of Melbourne	36
25º	Universidade De Lisboa	34

Source: Research Data - Web of Science

The five research funding agencies are shown in Table 8. It should be pointed out that 4 are Chinese and, moreover, that the *National Natural Science Foundation of China* shows a great superiority of other agencies. This is evidenced by the great investment of China in scientific research and, evidently, in this subject of study.

Table 8 - Financing agencies

	Financing Agencies	Publications
1º	National Natural Science Foundation Of China	234
2º	Fundamental Research Funds For The Central Universities	32
3º	National Science Foundation	25
4º	Chinese Academy Of Sciences	22
5º	China Postdoctoral Science Foundation	21

Source: Research Data - Web of Science

In order to verify the scope of the analyzed subject, the research areas of publications related to the terms “sustainable development” and “urban” are exposed. Table 9 presents the 25 areas highlighted in the results obtained in this survey.

Table 9 - Main research areas

	Research Area	Publications
1º	Ciência Ambiental e Ecologia (<i>Environmental Sciences Ecology</i>)	2458
2º	Engenharia (<i>Engineering</i>)	1589
3º	Estudos Urbanos (<i>Urban Studies</i>)	946
4º	Ciências Tecnológicas e Outros Tópicos (<i>Science Technology Other Topics</i>)	784
5º	Administração Pública (<i>Public Administration</i>)	609
6º	Economia de Negócios (<i>Business Economics</i>)	605
7º	Tecnologia de Construção Civil (<i>Construction Building Technology</i>)	469
8º	Geografia (<i>Geography</i>)	434
9º	Ciência da Computação (<i>Computer Science</i>)	412
10º	Combustíveis Energéticos (<i>Energy Fuels</i>)	382
11º	Recursos Hídricos (<i>Water Resources</i>)	373
12º	Arquitetura (<i>Architecture</i>)	367
13º	Transporte (<i>Transportation</i>)	326
14º	Geologia (<i>Geology</i>)	273
15º	Ciências Sociais e Outros Tópicos (<i>Social Sciences Other Topics</i>)	268
16º	Ciência de Materiais (<i>Materials Science</i>)	218
17º	Geografia Física (<i>Physical Geography</i>)	204
18º	Sensoriamento Remoto (<i>Remote Sensing</i>)	174
19º	Agricultura (<i>Agriculture</i>)	173
20º	Ciência da Gestão e Pesquisa Operacional (<i>Operations Research Management Science</i>)	163
21º	Educação, Pesquisa Educacional (<i>Education Educational Research</i>)	142
22º	Saúde Ocupacional Pública (<i>Public Environmental Occupational Health</i>)	124
23º	Conservação da Biodiversidade (<i>Biodiversity Conservation</i>)	87
24º	Meteorologia, Ciências atmosféricas (<i>Meteorology Atmospheric Science</i>)	64
25º	Ciência da Imagem e Tecnologia Fotográfica (<i>Imaging Science Photographic Technology</i>)	61

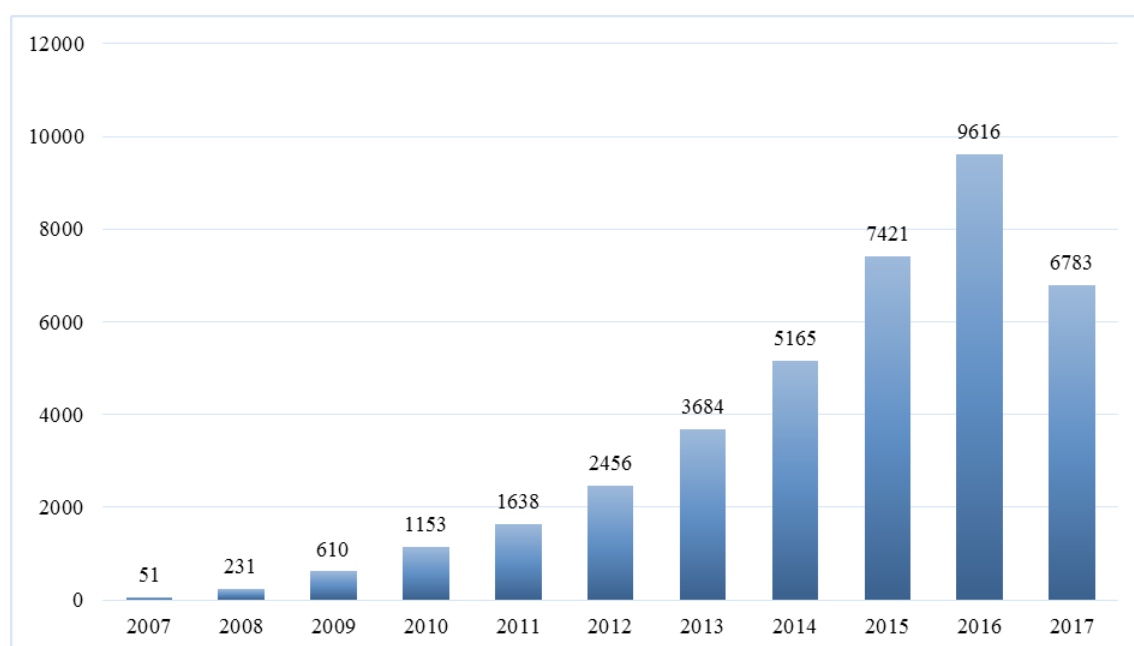
Source: Research Data - Web of Science

According to the results presented in Table 9, it can be seen that the research area with the largest number of Publications, “Environmental Sciences Ecology”, is associated to environmental aspects, which corroborates evidence of a closer approximation of these studies with the theme of sustainability. The following areas are highlighted: Engineering, Urban Studies, Science Technology Other Topics and Public Administration. There is also evidence of the multidisciplinary of research associated with “sustainable” and “urban” development, insofar as they cover different fields of knowledge and analyze the phenomenon from different perspectives. These results are in line with the understanding that the concept of sustainable urban development is very broad and multifaceted (WILLIAMS, 2010; BULKELEY and BETSILL, 2005; GUY and MARVIN, 1999).

4.2 Identification and analysis of the most mentioned articles.

From the survey and the characterization of the 6,679 publications resulting from the research with the terms “sustainable development” and “urban”, the characteristics of the citations of these works were identified. Initially, in Figure 2, the evolution of citations of these publications over the last years is presented.

Figure 2 - Citations of these publications over the last years.



Source: Research Data - Web of Science

It is possible to observe, therefore, the positive evolution of the citations of the articles, which shows the growing concern with this theme in recent years, especially in the last five years, when the increase was more pronounced. The lower number of citations in 2017 is due to the fact that this consultation occurs in September of that year, and that is why, the total number of citations in this year is not consolidated. It is also worth noting, according to the survey data, that the average number of citations is equivalent to 3880.8 per year. Next, the main characteristics of the impact of this set of publications are presented, as described in Table 10.

Table 10 - Characteristics of citations

Characteristics ¹	
Number of publications	6,679
Total citations	38,808
Total citations, excluding self-citations	35,495
Number of articles cited by the Publications	29,000
Number of articles citing the publications, excluding self-citations	27,504
Average citations per publication	5.81
Index h-b	69
M-index	6.9

¹The values refer to the query on 04/09/2017

Source: Research data - Web of Science.

As shown in Table 10, the 6,679 publications related to the topics “sustainable development” and “urban” were cited 38,808 times. Excluding self-citations, that is, when the citations are made by the authors themselves, we have the number of 35,495 citations of these publications. Citations were identified in 29,000 different articles, and of these, 27,504 articles do not have occurrence of self-citation.

The hb-index and the m-index of this set of publications are also highlighted. These results highlight the relevance of the scientific publication associated to the topics “sustainable development” and “urban”, insofar as it can be considered, according to Banks (2006), a hot topic. According to the author, a set of publications that has index-m > 2 can be described as a unique topic, with consequences of reaching in several areas of knowledge and application effects or unique characteristics.

In order to verify the relevance of the studied subject, we present the studies with higher indexes of citation among related publications. As noted in Table 11, Bettencourt, L.M.A. et al. and the pace of life in cities is considered the most cited article in the period 2007-2016 between the articles associating the terms “sustainable” and “urban”. Also noteworthy are the journals “Renewable & Sustainable Energy Reviews” and “Journal of Environmental Management”, which are among the journals with the highest number of articles (Table 3), as well as articles which are among the ten most cited.

Table 11 - Ten most cited articles

Publications	Number Citations
Article 1 Title: Growth, innovation, scaling, and the pace of life in cities Authors: Bettencourt, Luis M. A.; However, Helbing, Dirk; et al. Keywords: Population, sustainability, urban studies, increasing returns and economies of scale. Objectives: To show that the social organization and the dynamics of urbanization for economic development and the creation of knowledge, among other social activities, are very general and appear as non-trivial quantitative regularities common to all cities in all urban systems. Study theme: Economies of scale. Country / city of study: Not specified. Results: In spite of the enormous complexity and diversity of human behavior and the extraordinary geographical variability, we show that cities belonging to the same urban system obey generalized relations of scale with population size, characterizing rates of innovation, wealth creation, consumption patterns and human behavior as well as properties of urban infrastructure.	517
Article 2 Title: The changing metabolism of cities. Authors: Kennedy, Christopher; Cuddihy, John; Engel-Yan, Joshua Keywords: Global cities, industrial ecology, material flow analysis (MFA), sustainable cities, urban environment and urban metabolism. Objectives: Review previously published metabolism studies to elucidate what we know about how urban metabolism is changing and identify critical processes in urban metabolism that threaten the sustainable development of cities. Theme of study: Sustainable cities Country / city of study: Brussels, Tokyo, Hong Kong, Sydney, Toronto, Vienna, London and Cape Town. Results: Many of the data suggest that city metabolism is increasing. Cities that have implemented large-scale recycling have seen reductions in residential waste disposal in absolute terms, but other waste streams - such as commercial and industrial waste - may be on the rise. Similarly, emissions of SO₂ and particulate matter may have declined in several cities, while other air pollutants such as NO_x have increased. The changes in urban metabolism are quite varied between cities.	343
Article 3 Title: A review on biomass as a fuel for boilers. Authors: Saidur, R.; Abdelaziz, E. A.; Demirbas, A.; et al. Keywords: Boilers, biomass, combustion, biomass impact and biomass problems and solutions. Objectives: To investigate several aspects associated with biomass burning in boilers, such as biomass composition, estimating the highest heating value of biomass, comparison between biomass and other fuels. Theme of study: Sustainable energies. Country / city of study: Not applicable. Results: It has been found that the use of biomass in boilers offers many advantages, such as mitigation of hazardous emissions such as CO₂, NO_x, CH₄, SO_x and CO, diversification of fuel supply and energy security, potential use of oceans and soils low quality and restoration of degraded lands, economic, social and environmental benefits, such as net financial savings, conservation of fossil fuel resources and creation of employment opportunities. However, other environmental impacts of biomass, such as land and water resources, soil erosion, loss of biodiversity and deforestation, should be considered.	338

Article 4

Title: Smart Cities in Europe

Authors: Caragliu, Andrea; Del Bo, Chiara; Nijkamp, Peter

Keywords: None.

Objectives: To clarify the often difficult definition of forgetting the concept of "smart city".

Theme of study: Smart cities.

Country / city of study: European cities.

Results: Positive association between urban wealth and the presence of a large number of creative professionals, a high score in an indicator of multimodal accessibility, the quality of urban transport networks, the diffusion of ICTs (most noticeably in the e-government industry) and, finally, the quality of human capital. These positive associations clearly define a political agenda for smart cities, although clarity does not necessarily imply ease of implementation.

264

Article 5

Title: Sustainable construction - The role of environmental assessment tools.

Authors: Ding, Grace K.

Keywords: Performance construction, environmental assessment, sustainable construction, sustainable development.

Objectives: To analyze current environmental assessment methods used in different countries in terms of their characteristics and limitations in assessing the sustainability of the building.

Theme of study: Sustainable construction.

Country / city of study: Not applicable.

Results: Using a single-dimension conventional assessment technique to aid in decision making is no longer appropriate. A much more sophisticated model needs to be used to deal with multidimensional arrays of data. The use of a sustainability index will greatly simplify the measurement of sustainable development and thus contribute positively to the identification of optimal design solutions and facility operations.

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Article 6

Title: The coasts of our world: Ecological, economic and social importance.

Authors: Martinez, M. L.; Intralawan, A.; Vazquez, G.; et al.

Keywords: Costs, environment, ecosystem services products and human population.

Objectives: To summarize and integrate the emerging information on the ecological, economic and social importance of the coasts. Analyze quantitative and qualitative information to assess the relative importance of the coasts beyond their traditional economic value as sources of trade, fisheries and human populations.

Subject of study: Geography

Country / city of study: Not specified.

Results: Given the current scenario and the review of climate change, coastal environments will face serious environmental problems that must be addressed in advance in order to achieve a sustainable development of the most valued sites in the world.

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Article 7

Title: Land use and land cover change in Greater Dhaka, Bangladesh: Using remote sensing to promote sustainable urbanization

Authors: Dewan, Ashraf M.; Yamaguchi, Yasushi

Keywords: Grande Dhaka, soil use and soil cover (SUSC), remote sensing, change detection and urban expansion.

Objectives: To explore the characteristics of SUSC changes and characterize driving forces underlying in the Greater Dhaka region, making use of remote location data and socioeconomic information.

Study subject: Soil study.

Country / city of study: Dhaka - Bangladesh.

Results: The analysis revealed that urban areas increased resulting in a substantial reduction in the area of waterfalls, vegetation, cultivated areas and wetlands / lowlands. The dramatic expansion of the urban areas of Dhaka showed clear spatio-temporal differences. Conversion of bodies of water, vegetation and lowland areas to urban lands caused extensive and varied environmental degradation in the study area, and vulnerability to flooding and slum growth were the main negative results associated with rapid urban development. The expansion of urban land has been largely driven by rising population growth and economic development.

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Article 8

Title: Solid waste management in European countries: A review of systems analysis techniques

Authors: Pires, Ana; Martinho, Graca; Chang, Ni-Bin

Keywords: Solid waste management, systems analysis, integrated solid waste management and sustainability.

Objectives: Analyze all possible trends and assess the current situation of SWM systems in EU countries in terms of waste processing systems, policies and decision-making issues.

Study topic: Solid Waste Management.

Country / city of study: European countries

Results: It is believed that trends in current SWM systems and future SWM perspectives in association with potential applications by integrating a myriad of different systems engineering models with a variety of system assessment tools should lead to a better understanding and generate a set of better policies and management strategies needed for the future.

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Article 9

Title: Urban water management in cities: historical, current and future regimes.

Authors: Brown, R. R.; Keath, N.; Wong, T. H. F.

Keywords: Social research, sustainability, transitions theory and urban water.

Objectives: To assist urban water managers in understanding the scope of social hydro contracts currently operating in various cities to determine capacity building initiatives and cultural reforms needed to effectively accelerate the transition towards sustainable water management, finally, to cities sensitive to water.

Subject of study: Water Resources Management

Country / city of study: Australia

Results: Given the significant challenges of climate change and population growth facing cities, there is a critical need for strategic investment in solutions that deliver sustainable long-term results. The proposed table of urban water transitions is offered as a tool to assist urban water strategists with the challenging task of identifying the attributes of more sustainable urban states and the development of capacity and institutional reform needed.

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Article 10

Title: Impediments and solutions to sustainable, watershed-scale urban stormwater management: Lessons from Australia and the United States

Authors: Roy, Allison H.; Wenger, Seth J.; Fletcher, Tim D.; et al.

Keywords: Rainwater runoff, water resources management, watershed protection, policy, restoration and sustainability.

Objectives: Find barriers, cite examples and make a comparison between Australia and USA.

Subject of study: Water Resources Management

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Country / city of study: Australia and United States

Results: Identifies seven main impediments

for sustainable management of urban stormwater: (1) uncertainties in performance and cost, (2) insufficient engineering standards and guidelines, (3) fragmented responsibilities, (4) lack of institutional capacity, (5) (6) lack of funding and effective market incentives, and (7) resistance to change. In comparing the experiences of Australia and the United States, it highlights the challenges facing the sustainable management of urban stormwater and provides several examples of successful regional implementation.

Source: Research data - Web of Science.

In the analysis of ten most cited articles for the terms “Sustainable Development” and “Urban” we can see a multidisciplinary theme that presents, since the titles such as the keywords and the topic of study encompass: thematic areas of innovation, economy of scale, industrial ecology, energy, fuels, sustainable construction, smart cities, geographical analyzes, soil analysis, remote sensing, solid waste management, management of water resources. The cities and countries where the research focus of most cited studies are located, mainly, not in Europe. The explanation for this result can be attributed to the progress that this continent presents in the theme Sustainable Urban Development strategy, with emphasis on the best sustainability practices. The number of surveys in underdeveloped domains, for example, is more than the number of surveys in social, environmental and economic domains, primarily lacking data management services without sustainable urban development.

When the objectives and results of these works are ascertained, the environmental issue is the most representative of the tripod of sustainability. In this analysis, topics such as recycling, emission reduction, recovery of degraded areas, conservation of fossil fuels, environmental construction, study of coastal environments, climate change, vegetation, solid waste and water resources emerge. A possible explanation for a greater focus on the environmental dimension may be associated with the cities and countries studied in these works, such as those located in the European continent, as mentioned, as well as the United States and Australia, that is, developed countries with better indexes social and economic.

5. CONSIDERATIONS

The present study aimed to identify the main characteristics of the international scientific production related to the terms “sustainable development” and “urban” in the last ten years. In this context, a bibliometric study was developed through the Web of Science database, relating the mentioned topics, identifying 6,679 publications, of which scientific articles and papers published in annals, which together correspond to 97% of these.

Among the main results can be highlighted the growth of production associated to the theme in recent years. The journals “*Sustainability*”, “*Advanced Materials Research*” and “*Applied Mechanics and Materials*”, stand out those with the largest number of publications. Among the institutions, *Chinese Academy Of Sciences* is more representative, evidencing the high publications from the country. Authors Y. Zhang, H. Wang and Z.L. Zhang stand out among those who have the largest production in this area, with 34, 31 and 28 publications, respectively. For

the most part, the studies come from China and are associated with the research areas 'Ciência Ambiental e Ecologia' (*Environmental Sciences Ecology*), 'Engenharia' (*Engineering*) e 'Estudos Urbanos' (*Urban Studies*). In this sense, it is evident the concern with environmental and planning aspects related to the sustainability theme linked to urban development.

It is noteworthy that in analyzing the citations of related publications, this combination of topics "sustainable" and "urban" is considered a hot topic, since it has a high impact index and that can be considered a unique topic, with scope in several areas of knowledge or unique characteristics. The predominant cities and countries in the focus of these studies are located mainly in the European continent, besides the United States and Australia, and these countries are the ones that least need urban solutions with a view to sustainable development. Also, the environmental dimension overlapped to the social and economic dimensions in the analysis of the most cited ones is highlighted, having as possible explanation that the countries focus of these studies present few social or economic problems to be debated.

As limitation of this study, it is considered the fact that this has been operationalized in only one database. It is suggested, therefore, to carry out further research inquiries with greater amplitude.

Finally, it should be emphasized that the results of this research are relevant, therefore, for the construction of scientific knowledge on the subject matter. The bibliometric research is allowed to enlarge the understanding of the themes and approaches used in the construction of this field of knowledge. It also enabled the identification of the studies related to sustainability in the subject, with a view to the urban environment and how its planning impacts on sustainable development.

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