

Knowledge Society and Built Spaces in Ecuador and the Italian Veneto: State-of-Art

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Abstract— Following the international agreements established at the World Summit on the Information Society, organized by the UN and the Digital Agenda for Latin America and the Caribbean, Ecuador, and the Italian Veneto invest resources destined to transform the production matrix towards knowledge. Among the strategies they use are training human talent and constructing spaces that promote innovation and knowledge production. Thus, clusters are formed in different areas, urban districts are formed, or cities based on knowledge, as in the Ecuadorian case. Spaces that change and impact the usual functioning of the city. This article aims to build a state-of-the-art advanced knowledge society focused on the built spaces of Ecuador and Veneto. For this, three case studies are selected: the Yachay Knowledge City, considered an emblematic project, Loja as a canton in which the change in the production matrix induced by the National Development Plan is reviewed; and Verona as a representative case of the Italian Veneto, which houses knowledge clusters and an interpret part of the European corridor. A mixed methodology supported by a qualitative documentation review from the corresponding governments and scientific articles was used. In addition, a bibliometric review is made using 353 articles obtained from the Scopus database. Advances are checked against your regional standards. Built spaces are found, although not always in accordance with the projected results. The advances in both cases are below the regional, Latin, and European average, respectively.

Keywords— Knowledge city; knowledge-based urban; digital district; urban theory.

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I. INTRODUCTION

The knowledge society (KS) is strengthened through international agreements such as the one in Geneva/Tunisia developed at the World Summit on the Information Society (WSIS), the digital agenda for Latin America and the Caribbean (eLac), or the European smart spatialization strategies [1], [2], the same ones that propose goals for their strengthening, with progress monitoring. As a result of this, local governments are considering the construction of knowledge cities (KC), Knowledge-Based Urban Developments (KBUD), or others based on the production of knowledge and innovation [3]. These terms are, at the same time, tools introduced in the literature to describe emerging structures. Thus, resources are invested in various countries, and spaces are built in this direction. The objective of this work is to know the state-of-art of the knowledge society focused on the built spaces in the cases of Urcuquí Loja, and

Verona, having as a guide its regional principles and the theoretical components of the knowledge city.

The first case was chosen because it is an emblematic project concerning the KS of the Ecuadorian case. And the other ones are representative cases of intermediate cities of their country or region. Although it is not comparative research, seeing cases of countries with different realities within their regional averages helps us, in turn, to have an approach to the differences in regional progress.

As for the three cases: (i) Yachay is located in a rural area of the San Miguel de Urcuquí canton, it originated as a Yachay Knowledge City (YKC) project. Urcuquí had 15,671 inhabitants in 2010, and a Gross Added Value (GVA) was generated in the primary sector, contributing 2.6% to the provincial GVA [4]. (ii) The city of Loja is located in southern Ecuador, with 226,531 inhabitants as of 2020. 78% of the economy is concentrated in the service sector (Municipio de Loja, 2021 p. 38) and contributes 1.4% to the National GVA (PDOT Loja, 2014). Finally, (iii) Verona is located in

northeastern Italy, located between the intersection of the trans-European corridors TEN-T1 and T6 and between the A4 and A22 motorways. According to I.stat 2021 data, Verona has 927,810 residents.

The spaces of the KS form cities, KBUDs and/or clusters in specific areas, bringing together academic, research, public management, production, cultural, and other buildings that complement spaces to live, work, and play. [5], [6]. As a recurring element, there are also support spaces for entrepreneurs, such as incubators, accelerators, co-working spaces, etc. [7].

ONU, through the WSIS, establishes eleven principles to strengthen the knowledge society, of which we take four that are related to the construction of knowledge spaces: Governance and ICT promotion (C1); Infrastructure (C2); Innovative Environment (C6) and ICT Applications (C7). As a result of this, Europe proposes smart specialization strategies, the same ones followed by Veneto (RIS3 2021-2027), on issues such as Digital Transition and Territory and new skills.

CEPAL, following the WSIS agreements, establishes the eLAC Digital Agenda, from which we review three areas that are most closely connected to the construction of spaces: digital infrastructure (DI), transformation and digital economy (DE), and inclusion of digital skills (ID) and within these we focus on objectives 1, 2, 5, 7, 8, 18 and 24.

In the formation of KC, an innovative environment is developed, which is formed in delimited territories with a specific external image, sense of belonging, and collective learning [8]. They comprise institutions that work collaboratively and belong to research centers, universities, public administration, production companies with R&D, financing institutions, and cultural and living spaces. These innovative environments specialize in various areas of knowledge, forming clusters, and the union of various clusters forms the KC or KBUD [6], [9].

There is very little scientific literature on the cases studied and much less literature related to knowledge spaces on which this work focuses. The objective of this research is to present a state-of-art on this. However, there are papers on state-of-art in other topics as the Camero study [10], which use the same bibliometric method.

In the Ecuadorian case, Yachay Knowledge City (YKC) is projected as an emblematic project of insertion into the KS and transforming the production matrix. The YKC is projected to be a metropolitan city in 2040, with 667 ha of urban area, with an expansion area of 4,489 ha [4]. Yachay Tech University is part of a group of four universities and other projects aimed at the construction of the KS and, in turn is part of three strategic national projects located in the Urcuquí canton, projects related to irrigation, clean energy, and water for human consumption [4].

In the Loja case, territorial planning is aligned with the National Development Plan 2017-2021. Objective 10 of axis 2 of the national plan proposes the transformation of the production matrix based on the knowledge economy. In this framework, Loja develops the Territorial Development and Land-use Plan (TDLP), whose objective 10, mentions the change of production matrix, proposing actions linked to agricultural production and links with universities [11].

In 2021, the potential of Loja as a national connection node, administrative center, culture, and art, among others, is recognized, including as a goal the increase in internet connectivity, including rural parishes where the deficit is between 96% and 100% [12]. The TDLP also mentions a Smart City project for Loja. Although the TDLP does not refer explicitly to the knowledge society, it appears to be connectivity projects, promotion of ICTs, entrepreneurship, and cultural industries. Likewise, universities contribute to creating incubators, accelerators, and innovation networks with productive associations [12].

Based on the WSIS, Verona promotes spaces for debate by creating the Internet Governance Forum. The Ministry of Economic Development, with Ministerial Decree 01-14-2020, created the General Directorate for Communication Technologies and Computer Security [13]. The Department of Research, Innovation and Energy [5] oversees the Regional Operational Program (Veneto 2014-2020) and the RIS3 in the Veneto Region. Under the regional program are the Regional Innovative Networks, made up of private and public companies at the regional level, to contribute to initiatives and projects of the regional economy. According to the mapping research system in the Veneto-Know-Man project, Verona has nine Business clusters, three Research Centers, an innovation promoter, and a science park that are a fundamental part of the Innoveneto regional project [14].

II. MATERIALS AND METHOD

The study used a mixed methodology, divided into two phases. The first with a qualitative inductive approach, starting from the case studies [15], official documentation from the local government is collected until it reaches the national government, scientific articles from the Scopus database are also reviewed, and in Ecuadorian cases, given the limited production, regional articles, in Latindex, from the Scielo database are added. 43 articles and 18 official documents are qualitatively analyzed using two matrices: i) eLac 2020 principles ii) Tunis/Geneva 2003 principles. The first according to the standards for Latin American cities (DI, DE, and ID areas objectives: 1,2, 5 -8, 18 and 24) [1] and the second with the Geneva/Tunisia standards in the Italian case (principles: C1, C2, C6, and C7) [2]

The second phase uses a bibliometric analysis open to all articles on knowledge society (KS) related to the three case studies. We searched Scopus for the documents that contain: ["knowledge society" OR "information society" OR "informational society" OR "digital society"], and depending of the case: [AND Imbabura OR Urcuquí OR Yachay] was added for the first case; [AND Loja AND Ecuador] for the second case and [AND "Verona"] for the third case. It was confirmed that the search limitations collected the required cases. The documents found were exported by selecting "excel CVS" and "titles, abstracts, keywords and year". The extraction was made on March 21, 2022, obtaining 328 articles added to the three cases. This information was processed using the VosViewer software, the bibliometric mapping of information [16], pointing out co-occurrence, all keywords, and with a minimum number of co-occurrences of 3. Bibliometric data was also extracted from this database that shows the evolution of research on KS in the three cases and the areas of knowledge to which it belongs the scientific

production. Conclusions are drawn from the review of the two phases of the progress and gaps found in the construction of the KS and its spaces (Fig. 1).

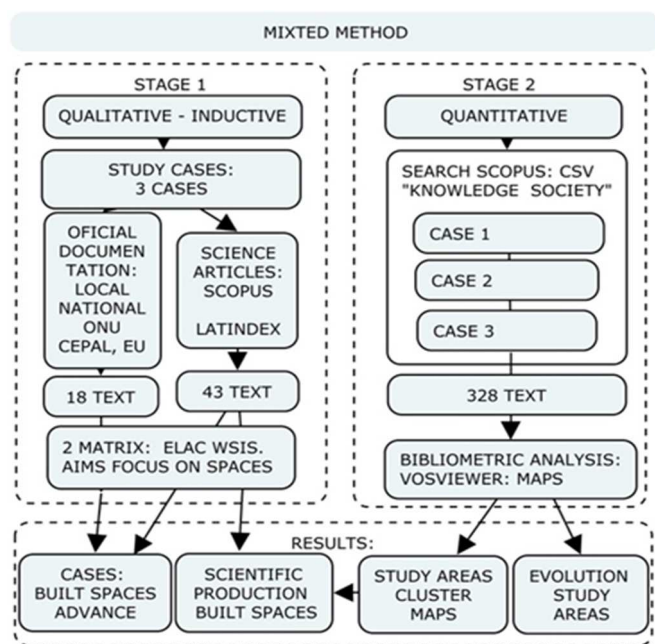


Fig. 1 Methodology.

III. RESULTS AND DISCUSSION

The results of the state-of-art are presented in three parts: of the selected cases, of the characteristics of scientific research on the cases, and of bibliometric analysis:

A. Case studies and their Progress According to Regional Indexes

Following the areas and objectives of the eLac, we find that the digital infrastructure (DI) in Urcuquí is deficient, with 9.7% coverage, of which 8.3% is in the urban area, and there is no sharing of information network between operators [17]. Concerning transformation and digital economy (DE), it was found that in Urcuquí there are small businesses that the TDLP 2014-2015 update intends to support, together with technology transfer that allows a higher level of efficiency and added value in agricultural production. Yachay (YKC) includes a 300m² entrepreneurship center called Innopolis, belonging nowadays to Senescyt. There are no articles or official documentation that gives more information about it. Concerning the third area, the inclusion of digital skills (ID), rural areas do not have access; info-centers have been located in the parish capitals, that is, computer rooms with free internet access, with one Info-center per parish [4].

In the case of Loja, concerning DI, there is very limited access, corresponding to 16.89% of the population [11]. Concerning DE, local universities (UTPL and UNL) have created business acceleration and incubation centers such as Prendho and INNOVA-T, which contribute to socioeconomic growth with research and technological development that arises from the academy. Concerning ID, the local government has created spaces such as the Craft Training Telecentre, the Global Employment Exchange and the Virtual Teaching Platform, which are complemented by the network of Info-centers implemented by the Ministry of

Telecommunications. According to indicators in these areas, Ecuador is below the regional average, with 45.5% of households with internet access, with an average of 9.9 years of study of the PEA over 15 years, with 0.47 % GDP in R&D by 2020, according to statistics from Cepalstat and eLac 2018 [18]. In 2014, it would have been above the average in investment in Research, Technology, and Innovation, with 1.88%, according to INEC, national statistics, and Cespstat.

In the case of Verona and in accordance with principles C1, C2, C6, and C7 of the Tunisia pact (WSIS), the ministerial decrees of law n. 179-2012 art. 25 that promote sustainable growth, technological development, and innovative start-ups (Governo Italiano, 2012) and the ministerial decree n. 145-2013 art. 5-6 that favors the internationalization digitization of SMEs and facilitates the stay in Italy of innovative start-ups. The evidence of articles on spaces of knowledge in Italy, Veneto, and Verona is limited. The largest number was found in topics of incubators and innovative start-ups [19], [20]. El Veneto is below the European average in a range of 74 to 80% of people who use the internet on a daily basis, 48 to 57% of people who regularly participate in social networks, 47 to 58% use internet banking, with a similar situation in other indicators [21].

In Ecuador, the policies aimed at strengthening the knowledge society (KS) are found in the 2008 constitution (art. 385-387), in the creation of the Ministry of Telecommunications and the Information and Knowledge Society (MINTEL) in 2010, and in the National Secretariat of Higher Education, Science Technology and Innovation (SENESCYT). In addition to various policies, plans, and projects such as (i) process of evaluation and accreditation of universities, (ii) postgraduate scholarship program, (iii) 57-millennium educational units, (iv) 854 Info-centers [22], (iv) the four universities distributed throughout the national territory, among which is Yachay Tech University, part of the Yachay project, (v) territorial planning from the national to the local level, to change the production matrix. These actions have been stopped with the changes of government and the reported corruption, with a low level of continuity, such as the white paper on the Information and Knowledge Society in 2018, the white paper on Lines of Research, development and Innovation and Knowledge transfer in 2019 and expansion of DI continued by MINTEL and SENESCYT.

The Italian National Recovery and Resilience Plan relies on the Cohesion and Development Fund as part of a sustainable and digital revolution. The national resilience plan is consistent with the Next Generation EU's six pillars and WSIS principles. There are no studies at the urban level or knowledge spaces, but there are articles on sustainable governance and Smart City policies on urban innovation in Italy [23]. Nor were articles detected on the digital transition that Verona is facing and that affects the development of knowledge spaces, such as the current resilience plan.

The new legal and industrial policy framework with an innovative Italian approach, called Decree Crescita 2.0, like DL n. 76/2013, the no. 99/2013 and no. 3/2015, known as Investment Compact, has been essential for the benefit of innovative entrepreneurship and for the formation of research clusters. The Italia Start-up Hub program facilitates the exchange of the residence permit obtained by study for a residence permit for self-employment to open an innovative

start-up. They also have different advantages and tax exemptions as public financing programs that benefit start-up projects investment of up to 80% with a maximum of 1.5 million euros, giving preference to female and youth entrepreneurship.

B. Scientific Production and Spaces of Knowledge

Concerning scientific production, we have that from the first Yachay Knowledge City (YKC) case; there are only two articles in the Scopus database: one on the intersections between the infrastructures and the expectations of the YKC Plan and another related to urban utopias. About the knowledge society in Ecuador, 14 articles were found as a topic treated in "summary, title or keywords", the same ones that refer to cybersecurity, internet development, and virtual reality, among others, and only one covers the territorial or spatial issue, in this case referring to the territoriality of innovation and knowledge [24]. In regional databases, we find one that also refers to Yachay as a utopia, which causes social homogeneity/exclusion. And finally, three fourth-level theses have served to reach official documentation. There are very few studies dealing with YKC.

In the second case, Loja, the bibliography is limited. The Scopus database mainly identifies studies on universities and educational innovation [25]–[27]. In regional impact databases such as SCIELO Latindex, documents that address KS from a business innovation approach linked to entrepreneurship and the incubation of technology companies are identified. Studies of cultural industries are also identified with sectors based on knowledge and creativity [28]. In the official documentation regarding planning for the medium and long term, the contracting of studies and implementing a smart city project for the Loja canton are mentioned [11].

In the third case, articles related to knowledge spaces in Verona or Veneto, such as innovation clusters, science parks, or innovation centers, are limited. They do not analyze the interaction with the territorial dynamics of the area where they are implanted and their impacts on the KS. It is verified that the 31 articles of this case study the influence of the external environment on innovative performance at the company level, examine the impact of the expansion of the University System on the innovation of the local industry, or diagnose the level of knowledge and diffusion of the industry 4.0 paradigm of Italian SMEs [29], [30].

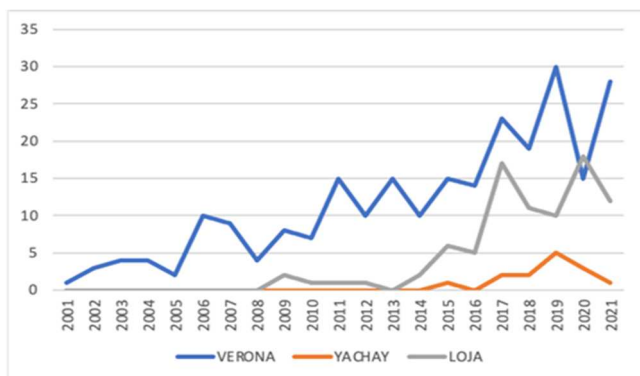


Fig. 2 Years of publication of articles. Source: Data taken from Scopus

For the three cases, the articles come mostly from social science journals (37%, 27% and 22%, respectively), followed

by computer science (22%, 44% and 18%), business, management, and accounting. Although the scientific literature is scarce in the urban area, it was found that the literature on various areas of the knowledge society tends to increase, with cyclical falls and rises (see Fig. 2).

C. Data Bibliometric Analysis

The bibliometric analysis is carried out by extending the search to the knowledge society, without considering whether the construction of spaces is analyzed, but limiting it to the Scopus base, obtaining a total of 353 articles. In the case of Yachay, there are 15 articles, well below even the studies of the Loja case, with 88 articles, and in the case of Verona 250 articles were found.

Yachay's bibliometric map shows us that the articles form thematic clusters in the areas of education in which it stands out: curriculum, higher education, students, institutions, educational innovation, and digital libraries, among others. The second cluster is related to production and industries, with terms such as industrial experience, project-based learning, and constructive alignments. There are no clusters or words related to the urban theme or the construction of spaces (Fig 3).

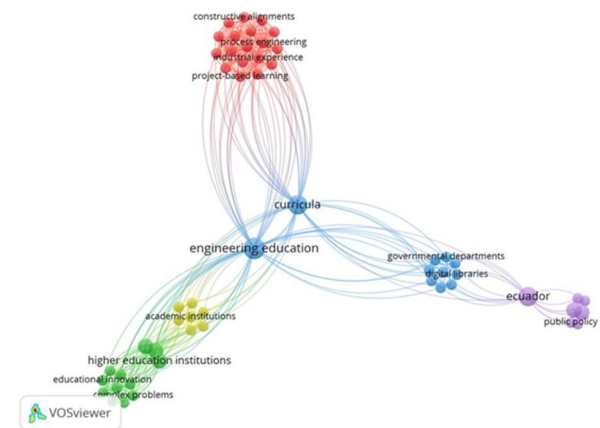


Fig. 3 Bibliometric map of KS of Yachay case. Source: Scopus database processed in Vosviewer

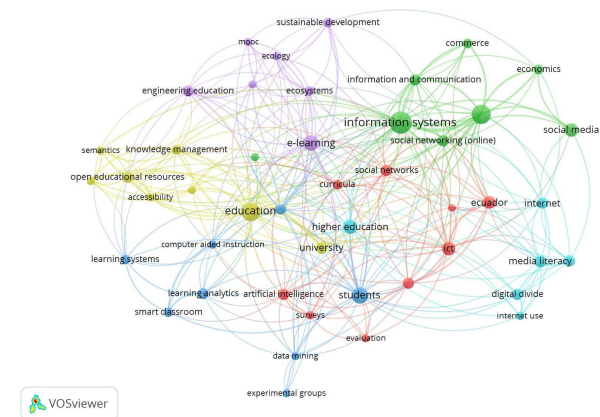


Fig. 4 Bibliometric map of KS of Loja case. Source: Scopus database processed in Vosviewer

In the case of Loja, topics related to education also stand out, such as: higher education, information systems, e-learning, and students (Fig 4). Between 2014 and 2017 the main theoretical areas are information systems, education,

university and from 2017 onwards other topics related to economy, use of information and communication and sustainability are added. In the bibliometric map of Verona there is no evidence of research on the construction of spaces. (Fig. 5), the theoretical areas identified were: innovation, knowledge management, information systems, human. According to the publication dates, the aforementioned areas are from the year 2016, while in the 2018-2020 period, the areas of quality of life, covid-19, social media, e-learning are verified to a lesser extent.

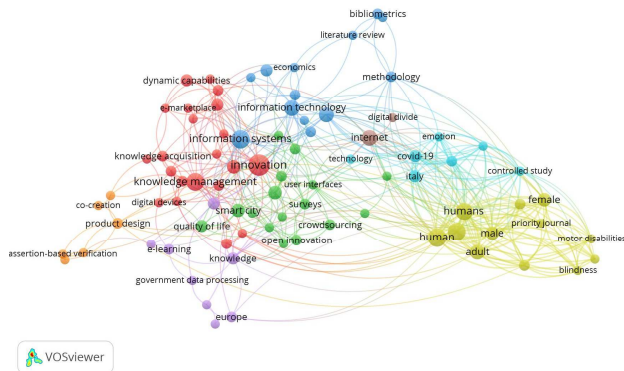


Fig. 5 Bibliometric map of KS of Verona case. Source: Scopus database processed in Vosviewer

D. Discussion

The construction of spaces around the knowledge society, whether they are districts, innovation clusters or scattered buildings of incubators, start up, etc. These building complexes bring new dynamics to the territories where they are implanted, however in many cases, such as the three cases studied, there are no studies that analyze the impact of these new infrastructures on the territories, being necessary that both in planning stages and in stages of functioning, the impact and relations that seek to give a better functioning to these districts and foresee good relations with the environment in which they are implanted are analyzed.

IV. CONCLUSION

There is an important development of official documentation, projects and resources invested aimed at strengthening the knowledge society in Ecuador and Veneto. These projects are linked to plans of the economic, productive, research and innovation type, with new urban and architectural spaces on the cities, however there are not studies of an urban nature that analyze the dynamics and impacts that these projects generate on the cities.

In the case of Ecuador, the local planning is subject to the National Plan; which, guided by the eLAC objectives, presents advances towards the knowledge society. In the case of Loja, there is no specific plan on the knowledge society, but actions within plans, programs and projects that focus on strengthening the digital economy and infrastructure, focused on SMEs and entrepreneurship. Thus, there are actions that contribute to objective 10 about changing the productive matrix towards knowledge and innovation.

The official documentation of Veneto and Verona responds to a clear and effective structure based on the RIS3 instrument that is related to the WSIS principles. The regions and

member countries of the European Union identify actions, objectives and investment priorities for research and innovation. Italy and Veneto have created from policies to projects aimed at strengthening the KS. However, there is limited scientific evidence from Veneto and Verona on urban studies related to the knowledge society.

The bibliometric study provides us with an extensive bibliography on the knowledge society in these cases, with clusters oriented to various areas of knowledge such as education, computing, science, among others, but without any cluster related to knowledge spaces.

In the case of Verona, although the POT identifies the Homogeneous Territorial Area “of logistics and innovation”, where the Europe Interport Quadrant is implemented, there are no studies related to knowledge districts. According to the mapping of the research system in Veneto there are research and innovation centers and the science park, which are scattered.

This work is part of a larger research project that seeks to identify and map knowledge spaces and see their relationship with the environment and cities in which they are inserted. Replicating this work in various countries shows us the importance given to global agreements made around the construction of a knowledge society and thereby contribute to understanding the role that the various cities and regions are shaping up to play in the new era looming.

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