

## Digitalization in local authorities and local governments: Bibliometric analysis

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## Digitalization in local authorities and local governments: Bibliometric analysis

### Abstract:

This study explores the evolution of research on the digital transformation of local authorities and open governments. We limited ourselves to articles indexed in Scopus, published between 2013 and 2022, specifically dealing with the digitalization of local public services.

After a rigorous filtering process, 85 articles were selected for our analysis, using the Vosviewer software. The significant increase in the number of publications reflects the growing interest of the scientific community in this subject, driven by socio-economic and health challenges that compel local authorities to innovate and improve the efficiency of their services.

By analyzing a large corpus of scientific publications indexed in Scopus, we aim to identify major trends, key players, and challenges encountered in this field.

Thanks to a rigorous methodological approach, including keyword co-occurrence analysis and the evaluation of publication impact, this research offers a comprehensive overview of scientific advancements. The results highlight the main research themes, such as the improvement of public services, citizen participation, data management, and digital governance. They also allow for the identification of the most active players in this field, whether they are researchers, institutions, or countries.

The Sustainability Switzerland Journal has established itself as an essential reference, with numerous publications and recognized scientific impact. The United Kingdom, Malaysia, and Germany are at the forefront of research in this field.

This study contributes to a better understanding of the challenges of digitalization in local authorities and to informing political and administrative decisions. It also opens new research perspectives, particularly on issues of digital governance, digital inclusion, and public policy evaluation.

**Keywords:** digitalization, digital transition, information system, local authorities, local government.

**JEL Classification:** H12

**Paper type:** Theoretical research

### Résumé :

Cette étude explore l'évolution de la recherche sur la transformation numérique des collectivités territoriales et les gouvernements ouverts. Nous nous sommes limités aux articles indexés dans Scopus, publiés entre 2013 et 2022, et traitant spécifiquement de la digitalisation des services publics locaux.

Après un filtrage rigoureux, 85 articles ont été sélectionnés pour notre analyse, à l'aide du logiciel Vosviewer. L'augmentation significative du nombre de publications témoigne de l'intérêt croissant de la communauté scientifique pour ce sujet, motivé par les défis socio-économiques et sanitaires qui poussent les autorités locales à innover et à améliorer l'efficacité de leurs services.

En analysant un large corpus de publications scientifiques indexées dans Scopus, nous visons à identifier les tendances majeures, les acteurs clés et les défis rencontrés dans ce domaine.

Grâce à une approche méthodologique rigoureuse, notamment l'analyse de co-occurrence des mots-clés et l'évaluation de l'impact des publications, cette recherche offre une vision synthétique des avancées scientifiques. Les résultats mettent en évidence les principaux thèmes de recherche, tels que l'amélioration des services publics, la participation citoyenne, la gestion des données et la gouvernance numérique. Ils permettent également d'identifier les acteurs les plus actifs dans ce domaine, qu'il s'agisse de chercheurs, d'institutions ou de pays.

Le Sustainability Switzerland Journal s'est imposé comme une référence incontournable, avec de nombreuses publications et un impact scientifique reconnu. Le Royaume-Uni, la Malaisie et l'Allemagne sont sur la pointe de la recherche dans ce domaine.

Cette étude contribue à mieux comprendre les enjeux de la digitalisation des collectivités territoriales et à éclairer les décisions politiques et administratives. Elle ouvre également de nouvelles perspectives de recherche, notamment sur les questions de gouvernance numérique, d'inclusion numérique et d'évaluation des politiques publiques.

**Mots-clés :** digitalisation, transition numérique, système d'information, collectivités locales, gouvernement local.

**Classification JEL :** H12

**Type de l'article :** Article théorique

## 1. Introduction

The global shift towards decentralization and the implementation of new public management strategies have significantly transformed public administration since the 1980s (BARTOLI and Chomienne, 2011; Côté, 2006) and (Amar, A., & Berthier, L., 2008). As a result, public services have undergone major upheaval, particularly at the local government level. In the face of these changes, digitalization has emerged as an essential solution. This new situation offers local authorities' new opportunities, but also poses new challenges.

In fact, decentralization has transferred numerous competencies and new prerogatives to local authorities. At the same time, it has put enormous pressure on local authorities. On the one hand, local authorities become directly responsible for the quality and efficiency of local public services. On the other hand, the financial autonomy they enjoy obliges them to seek innovative solutions to optimize their resources through digitalization. Digitalization also represents a response to the culture of results and the notion of performance evaluation introduced by new public management.

As a result, decentralization and new public management have created a new context that encourages local authorities to innovate and improve the management of public services in order to enhance their performance. Digitalization seems the obvious solution to these challenges. This reality is putting increased pressure on local authorities, who are constantly on the lookout for the best digitalization strategies. Bibliometric analysis remains the best tool for building a holistic vision of the digitalization of local authorities. This vision enables us to learn comprehensively about the trends, strategies, orientations, practices, and interests of researchers in this field. To do this, bibliometric analysis relies on a variety of indicators, some of which we specify: citation metrics, bibliographic metrics, and keyword metrics. The citation measures that concern authors are the total number of citations, the normalized citation index, the average age of citations, and the citation density and H-index, as presented by Hirsch (2005). Authors such as Egghe and Rousseau (2006), Waltman and van Eck (2010) have modified our understanding and use of this measure, particularly the total number of citations, which, despite its seemingly basic nature, plays a crucial role in co-occurrence analysis.

Journal-specific citation measures represent the following indicators: impact factor, citeScore, SNIP (source normalized impact per paper), and SJR (SCImage Journal Rank). Measures relating to bibliography cover bibliographic linkage and bibliographic data. Finally, measures associated with keywords. These measures cover simple co-occurrence frequency, association strength, similarity measure, centrality index, and many others.

This analysis reveals the underlying semantic links between concepts in the scientific literature. By studying terms that frequently appear together, researchers can identify specific research themes and thus understand the relationships that unite them. In bibliometric, this approach makes it possible to analyze the evolution of terminology within a field, document similarity, and citation context. In fact, citation document similarity gives us deeper semantic links than those suggested by titles and abstracts (Bornmann et al., 2018).

The applications and prospects of co-occurrence analysis are manifold. In the field of digital libraries, this technique enables the retrieval of co-occurring documents in real time (Buzydlowski et al., 2002). However, like any approach, co-occurrence analysis has potential biases (Delcourt, 1992).

## 2. Background to the study

A scarcity of resources drove a profound socio-economic mutation, which in turn triggered a series of changes. These developments have forced governments to rethink their public service

management models, calling into question the foundations of the welfare state. Budgetary pressures, increased demand for public services, the need to adapt to a constantly changing environment, the desire to improve service quality, and demands for accountability have all prompted governments to seek new sources of inspiration. These changes have affected the various public institutions, particularly local authorities, which are the front-line institutions for meeting citizens' needs. They must innovate to adapt to these changes as they find themselves at the center of a complex and constantly changing ecosystem.

Under the influence of managerial theories and the perceived successes of the private sector, the first movement to borrow managerial tools from the private sector, known as New Public Management, began in 1980. Subsequently, another wave gained momentum in the public sector, which included Lean Six Sigma, 5S, Ishikawa, also known as cause-effect diagrams, Pareto diagrams, dashboards, and PDOC, also known as quality management. However, as the complexity of public sector issues continues to rise, the increased demand for collaboration, the exploitation of megadata, and the need for transparency have made the use of digital tools an obligation. In fact, these tools and methods, initially designed to improve the efficiency and quality of public services, have found new impetus thanks to digitalization.

Local authorities, being the primary institutions responsible for addressing citizens' needs, have embraced digitization.

- Enhance public services through the dematerialization of administrative procedures to improve process efficiency, and the creation of portals to promote online services.

- Optimize internal management through electronic document management, interdepartmental collaboration and performance monitoring.

- Strengthen links with citizens by promoting citizen participation through online consultation platforms, personalized communication and transparency of public action.

Digitization enables local authorities to save considerable time and increase efficiency, improve service quality, strengthen local democracy, promote regional attractiveness and reduce their digital footprint.

It's true these approaches designed to improve efficiency and quality of public services, combined with the advent of digitalization, have created a new paradigm forming a springboard for local authorities. However, this paradigm is not without its challenges. Hence the usefulness of bibliometric analysis in identifying research trends, assessing the impact of research, discovering new avenues of research, comparing approaches, identifying best practices and identifying the right digitalization strategies.

### **3. Main theories**

The digitization of local authorities is a complex process and a multifactorial phenomenon. Thus, various theories from different fields can intervene in this phenomenon and offer a conceptual framework that can facilitate understanding of the issues, challenges, and opportunities inherent in this digital transformation. One of these theories is the concept of public action. The latter stresses the importance of effective governance for the success of the digitization process (P Lascoumes, L Simard, 2011). Thus, poor governance blurs the strategic vision and hampers the success of any digital transformation.

The second theory, innovation theory, emphasizes the importance of fostering an environment conducive to experimentation and learning. It encourages the emergence of agile approaches within local authorities. The growing demands of citizens are forcing local authorities to engage in innovation through digitization (Hong and al., 2022).

This theory (TAM) highlights the factors that influence the acceptance Network theory it underscores the significance of the connections between local authorities and the diverse stakeholders in promoting communication and collaboration. By providing collaborative digital platforms, digitization represents a springboard for network theory.

Fred Davis proposed the theory of technological acceptance in 1986, and use of technologies. Two factors dictate its adoption: perceived usefulness and perceived ease of use. The theory of organizational change management can both support and complement this theory. Although several authors have approached this theory in sometimes complementary ways, it is impossible to discuss change management without introducing Kurt Lewin's 1947 model, which is based on three phases: The Thaw phase involves preparing the organization for change by questioning the current situation, which aligns with the first factor in the theory of technology acceptance, perceived usefulness. The movement phase initiates change by introducing new practices and technologies. The second factor in technology acceptance theory, perceived ease of use, perfectly aligns and complements this phase. We would like to highlight several theories that complement the digitization of local authorities, including the organizational learning theory, which is particularly relevant given the rise of artificial intelligence. Similarly, G Esposito, A Terlizzi, M Guarino and N Crutzen, (2024) have highlighted the theory of digital governance in local authorities through digital administration.

#### **4. Literature review**

As open systems, states are in constant interaction with their internal and external environments. Globalization, as a driver of external change, often triggers internal transformations. These profoundly affect the functioning of state institutions by redefining the interactions between citizens and their institutions. Thus, the advent of the digital age has introduced a new paradigm of change, profoundly transforming the functioning of state institutions, particularly local authorities.

In order to demystify any semantic confusion, we clarify the difference between numeric and digital: two concepts on which digital transformation is based. The term numeric refers to the representation of visual, sound, or textual data in the form of sequences of 0 and 1 (binary data) capable of being processed, transferred, or stored on digital media. (Abaidi & Vernet, 2018). While Digital refers to all processes aimed at leveraging this numeric data to improve efficiency and performance. In other words, numeric technology is the raw material, and digital is the way we use it to improve processes (Janssens, 2018).

Digitalization is a strategic choice that is not free from the risk of failure. Despite colossal investments in digitization, studies reveal that nearly 70% of digital initiatives fail (Gaspar & Ternai, 2020), attributing these failures to inadequate organizational structures and resistance to change. Similarly, poorly adapted governance models contribute to the failure of digital transformation processes (Reuschl et al., 2022).

Bibliometric analysis has become a strategic tool to guide the digitization of local authorities. By revealing research trends, innovation indicators, and the impacts of digital transformation on public administration, it allows for the identification of the most relevant areas for improvement and innovation. It highlights the evolution of research on digital innovation, identifying the authors and key publications. Local authorities can thus draw inspiration from best practices and anticipate emerging trends (Zhang et al., 2017). The growing interest in measuring the effectiveness of digital initiatives, highlighted by the increasing number of studies on innovation indicators (Ferasso & Cherobim, 2017), demonstrates the need to rigorously evaluate the digital strategies implemented.

#### **5. Materials and Methods**

Literature reviews represent the essence of academic research. However, the sheer number of scientific journals available today makes this an arduous task. This process may seem achievable via bibliometric research. Researchers can efficiently analyze large quantities of

scientific literature using a range of bibliometric software such as VOSviewer, Leximancer, and R, along with comprehensive databases like Scopus, Web of Science, ScienceDirect, and many others.

As Ruhan İri, Emre Ünal (2024) demonstrate, bibliometric analysis offers a dynamic perspective on scientific progress by highlighting current and emerging trends. The power of this tool lies in its ability to identify central themes and booming niches. It is able to simplify the management of megacorporuses of data, optimizing time and resources (Hemmingsen et al., 2023), as it can identify research gaps guiding future investigations and resource allocation. In addition, bibliometric analysis promotes collaboration and interaction by highlighting cooperative networks between institutions and academics (Judijanto and AUTHOR\_ID, 2024). We have divided our bibliometric analysis into three complementary stages:

1. Precise definition of search terms: A careful search for relevant keywords, synonyms, and related terms, combined with Booleans (AND, OR, NOT), is essential to ensuring the relevance of results.
2. Filtering and refining results: In order to select the most relevant documents, we will apply rigorous selection criteria such as publication type (articles, journals, books), language, publication period, and authors' institutional affiliation.
3. We will export selected documents in a format compatible with bibliometric software for data extraction and analysis. The latter will enable us to carry out an in-depth analysis of the data, identifying co-occurrence networks, the most influential authors, emerging themes, and the impact of publications.

### **5.1 Specification of keywords and initial query**

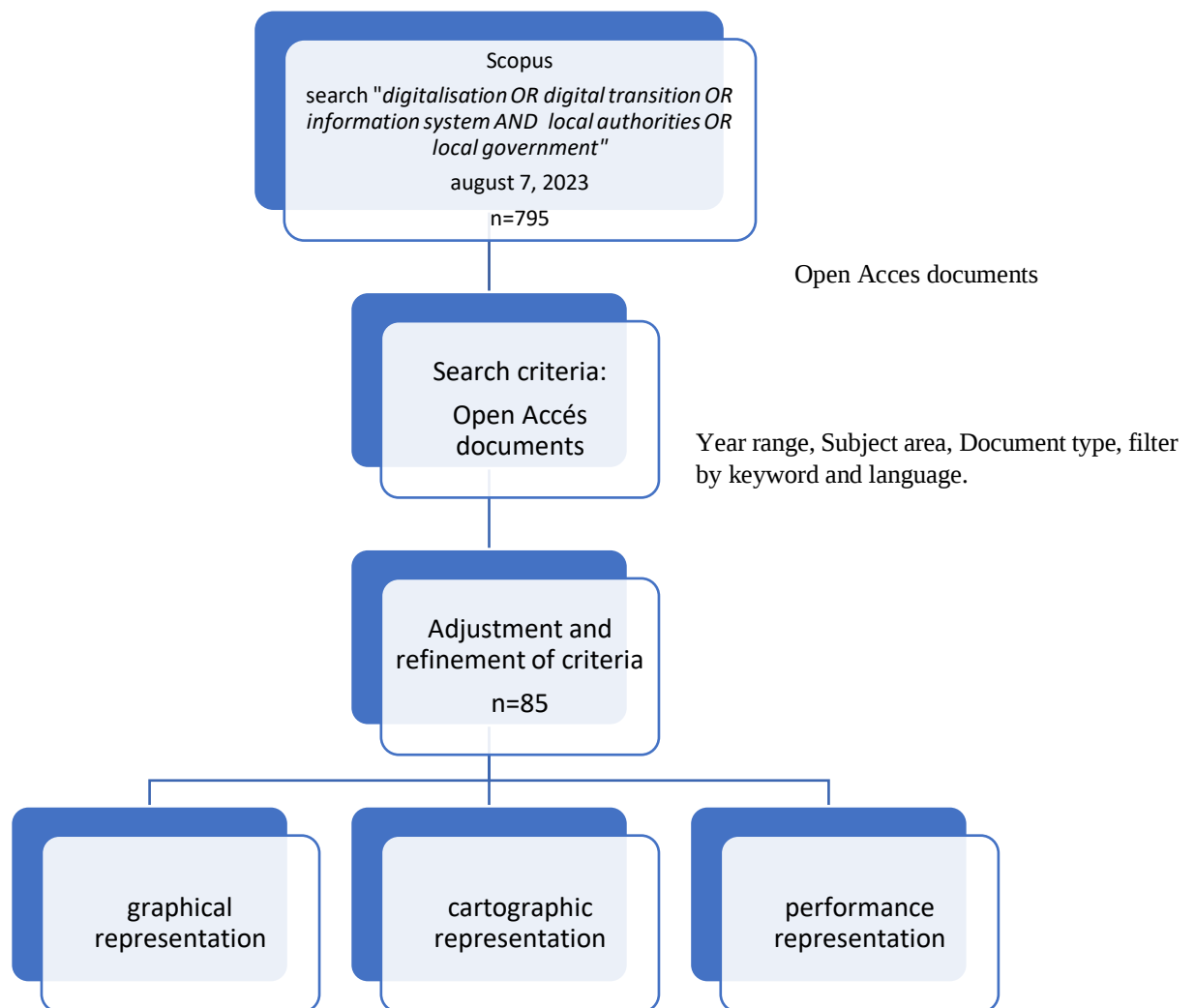
Our study is based on a bibliographical search carried out on the Scopus database in August 2023. We used the following keywords: 'digitalisation', 'digital transition', 'information system', 'local authorities' and 'local government'. The following Boolean query was used to combine these terms: *'digitalisation' OR 'digital transition' OR 'information system' AND 'local authorities' OR 'local government'*. This initial query generated a corpus of 795 documents.

### **5.2 Refining the corpus by filtering**

In order to refine our corpus, we adopted a funneling strategy (Abuhassna et al., 2022b). The following selection criteria were applied:

- Open access: We restricted our search to documents with open access (LIMIT-TO (OA, 'all')).
- Time period: We focused on the period 2013-2022 (LIMIT-TO (PUBYEAR, 2013-2022)).
- Disciplines: The articles selected come from the following fields: business (BUSI), engineering (COMP), economics (ECON), decision-making (DECI), social sciences (SOC) and environment (ENVI).
- Document type: We selected only articles (DOCTYPE, 'ar').
- Language: The search was limited to publications in English.

**Fig.1: Selection Process**



**Source: Authors**

### 5.3 Inclusion and exclusion criteria

Our study was based on the Scopus database, using the following keywords: (« digitalization » OR « digital transition » OR « information system » AND « local authorities » OR « local government»). We initially obtained 795 documents, which we refined by applying several filters, thus reducing our sample to 85 articles.

Thus, to ensure the rigor of our bibliometric analysis, we implemented rigorous inclusion and exclusion criteria. These criteria enabled us to precisely delimit the scope of our study and guarantee its reliability. We only included scientific articles published in English with open access between 2013 and 2022. Other types of documents, as well as those published in other languages or outside of this period, were excluded.

To refine our search, we focused on the metadata (titles, abstracts, keywords) of articles indexed in specialized databases in the social sciences, IT, business and decision sciences. In this way, we built up a relevant and targeted corpus of data, exclusively made up of articles dealing with specific topics related to digitalization in local authorities, such as digital governance, geographic information systems and online citizen participation.

The stages of our research were as follows:

TITLE-ABS-KEY("digitalization" OR "digital transition" OR "information system" AND "local authorities" OR "local government") AND ( LIMIT-TO ( OA, "all" ) ) AND ( LIMIT-TO ( PUBYEAR,2022) OR LIMIT-TO ( PUBYEAR,2021) OR LIMIT-TO ( PUBYEAR,2020) OR LIMIT-TO ( PUBYEAR,2019) OR LIMIT-TO ( PUBYEAR,2018) OR LIMIT-TO ( PUBYEAR,2017) OR LIMIT-TO ( PUBYEAR,2016) OR LIMIT-TO ( PUBYEAR,2015) OR LIMIT-TO ( PUBYEAR,2014) OR LIMIT-TO ( PUBYEAR,2013) ) AND ( LIMIT-TO ( SUBJAREA, "SOCI" ) OR LIMIT-TO ( SUBJAREA, "ENVI" ) OR LIMIT-TO ( SUBJAREA, "COMP" ) OR LIMIT-TO ( SUBJAREA, "BUSI" ) OR LIMIT-TO ( SUBJAREA, "DECI" ) OR LIMIT-TO ( SUBJAREA, "ECON" ) ) AND ( LIMIT-TO ( DOCTYPE, "ar" ) ) AND ( LIMIT-TO ( LANGUAGE, "English" ) ).

We subjected the articles resulting from this refinement process to a multidimensional analysis that combined graphic, cartographic, and performance approaches.

The graphical analysis highlighted changes in trends in scientific research over time, in terms of volume, geographical distribution, and areas of specialization.

This was done at the same time as a cartographic analysis that looked at how often keywords appeared together in the titles and abstracts of the articles (Scopus data exported in CSV format and processed by VOSviewer), This showed how the key concepts were related and how they explained each other.

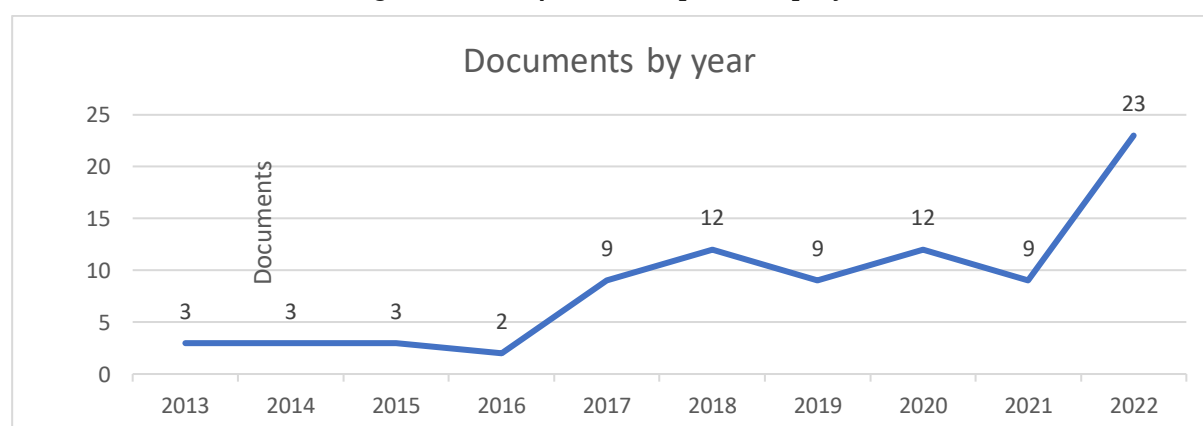
Finally, based on the Scopus data, we assessed the scientific impact of the articles by measuring their number of citations and calculating bibliometric indicators.

## 6. Thematic analysis

### 6.1 graphical analysis

The graphical analysis reveals a quantitative description of publications related to the digitalization of local authorities between 2013 and 2022. The period between 2013 and 2016 represents a startup phase, where the digitalization of local authorities was an emerging topic. An increase in publications since 2017 highlights the growing interest of the scientific community in this topic. However, COVID-19's disruption can explain the stability of publications between 2019 and 2021. However, the peak in publications in 2022 indicates a great interest among researchers in the digitalization of local authorities and the COVID-19 epidemic, which imposes a new context for the dematerialization of procedures in response to the requirement for social distancing.

**Fig. 2. Number of documents published per year**

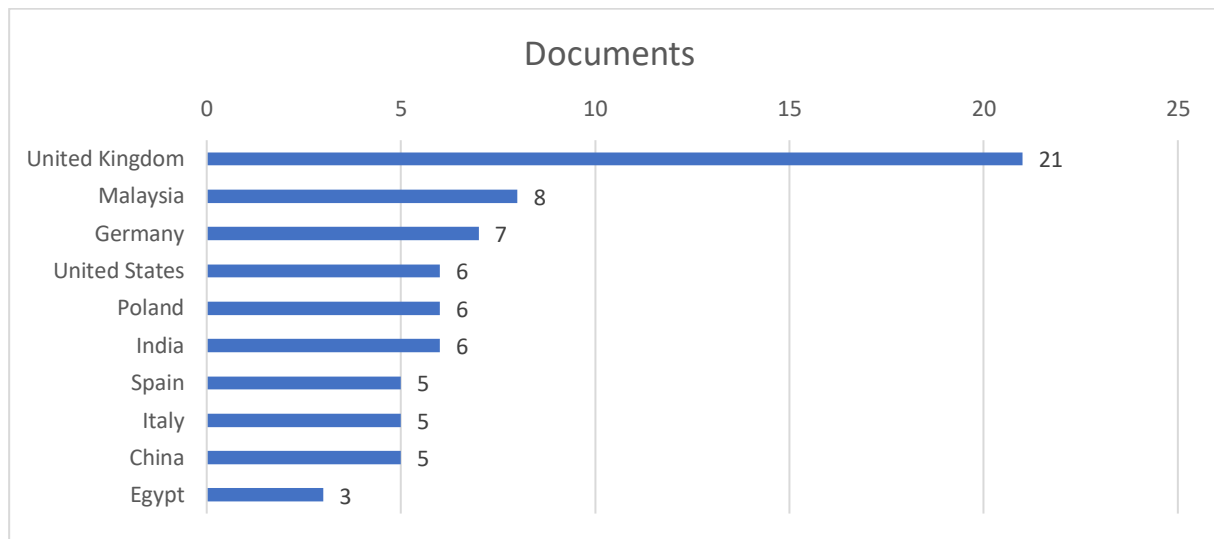


Source: Scopus.com, access in august 2023

These results highlight the growing importance of the digitalization of local authorities in the research landscape. They also emphasize the need to continue studies to deepen our

understanding of the issues, challenges, and opportunities related to this transformation.

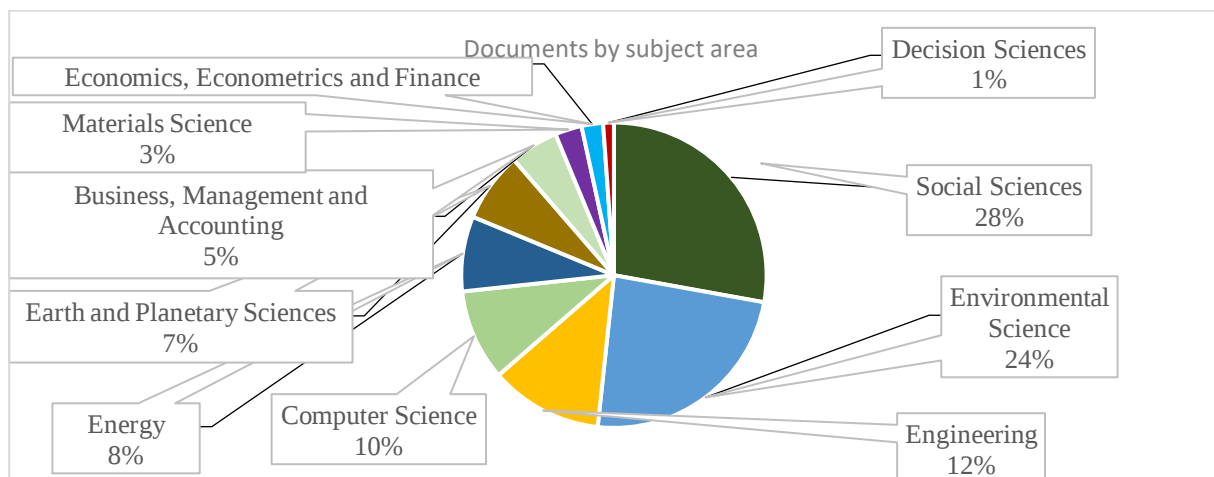
**Fig. 3. Documents by country or territory**



**Source: Authors, 2023.**

Positioned as the undisputed leader in this field, the United Kingdom dominates scientific production, followed by a group of European and Asian nations. Given the significant differences across the countries, this geographic distribution suggests growing international interest in the topic. Emerging nations such as China, India, and Malaysia are making a growing contribution to global research, and their recognized expertise and supportive research policies may explain the British leadership. Both national specializations and multinational cooperation are factors that may contribute to this production diversity.

**Fig.4. Publication representation by domain**



**Source: Authors**

The dominance of social sciences (28%) and environmental sciences (24%) attests to a clear interest from the scientific community in these fields. This suggests that social, economic, and environmental issues are at the heart of many research studies.

The fields of engineering (12%) and computer science (10%) are strongly represented in studies of digitalization and testify to the growing role of technology in scientific research.

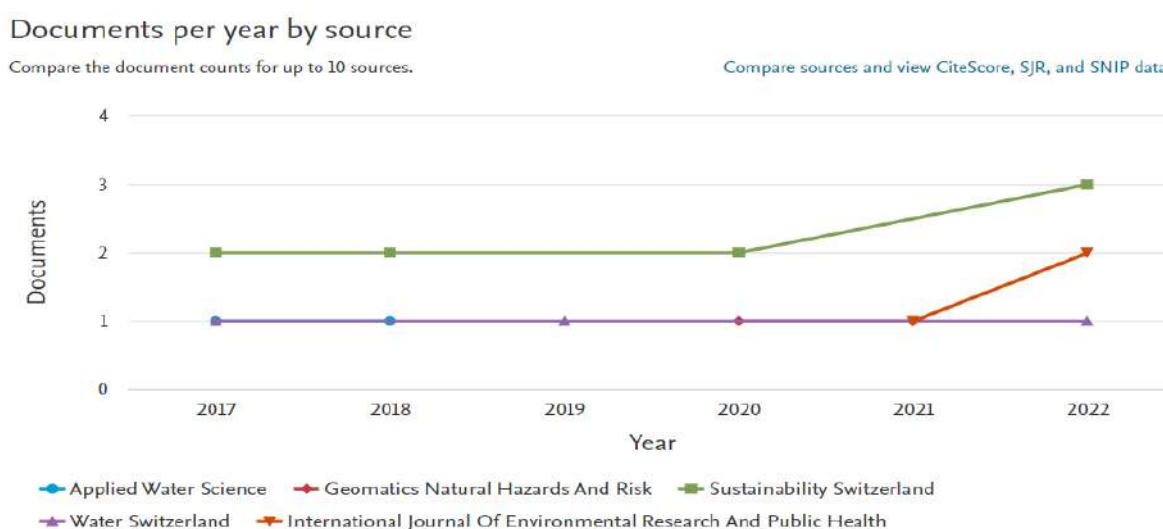
Other fields such as economics, management, materials, energy, earth sciences, and environmental sciences occupy less space.

This graph focuses on social sciences. This may explain the growing desire to understand social,

economic, and political phenomena, and their interactions with other fields. Similarly, the interest shown in environmental sciences reflects concerns about climate change. In the same vein, the presence of other fields such as engineering and computer science in environmental and social sciences underscores the need for interdisciplinary approaches to address contemporary major challenges.

This graph provides an overview of scientific production in various fields. He highlights the growing importance of social and environmental sciences, as well as the central role of technology in modern research. However, for a more in-depth analysis, it would be necessary to have additional data on the nature of the research conducted in each field, the most active countries and institutions, as well as the trends over time.

**Fig. 5. Documents per year by source**

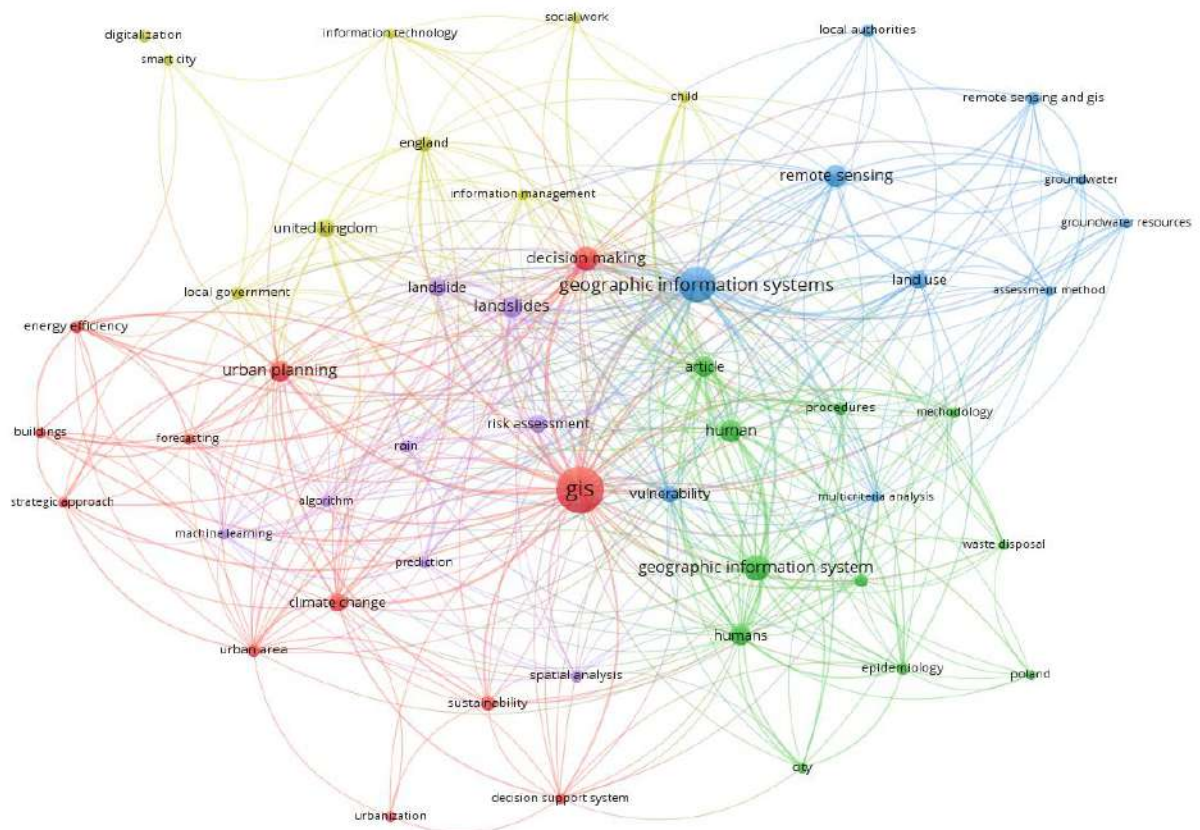


**Source: Scopus 2023**

This graph shows relative stability in the number of journal publications between 2017 and 2022. However, in 2022, the “International Journal of Environmental Research and Public Health” stands out for its significant growth. This suggests the emergence of new research issues that are particularly relevant in the current context, such as climate change and public health. External factors, such as significant events or changes in editorial policies, could also influence this increase. In order to deepen this analysis, it would be relevant to examine in greater detail the themes addressed in these journals, to study the geographical distribution of authors, and to assess the impact of their work through citation analysis. Such an approach would enable us to better understand the dynamics underlying the evolution of scientific production in this field and to identify emerging trends. For example, the journal “Sustainability Switzerland” stands out for its high number of citations, testifying to its influence in the field. It has recorded 9 publications in 2022 with a CiteScore Tracker of 5.8, representing 281,274 citations and 48,515 documents published between 2019 and 2022. As seen in the graph, the number of annual publications in five specialized journals pertaining to the environment and water sciences changed from 2017 to 2022. These publications are related to the outlets of the subject of the digitalization of local authorities. Until 2020, the publication rates of the five journals remained low. However, we observe a significant increase in publishing beginning in 2021, particularly in the International Journal of Environmental Research and Public Health, which in 2022 produced over three times as many articles. The COVID-19 pandemic's increased focus on the links between the environment and public health may account for this rise. Despite the fact that all journals experienced growth in 2022, their different histories

In summary, the graph reveals a complex dynamic in the field of environment and water sciences. While the general trend is upward, each journal follows its own trajectory, reflecting scientific, institutional, and societal developments.

**Fig.6. Co-occurrence bibliometric map of author keywords**



By selecting a threshold of 3 occurrences, we successfully created the bibliographic map object in Figure 5. Pour 924 words; 50 reached the threshold. This map displays word clusters arranged around poles, which create epistemic spaces related to the themes discussed. Their size reflects the frequency of their co-occurrence. Based on the visualized result, we selected the top 10 words in the following order:

The word gis was the most encountered word with 34 occurrences and 157 links, followed by the word geographic information systems with 22 occurrences and 132 links, and the word geographic information system with 12 occurrences and 58 links. Decision-making ranks fourth with 11 hits and 69 links. Urban planning comes next, with 9 hits and 40 links. We noted the presence of other words, such as remontensing with 10 occurrences and 40 links, local authorities with 4 occurrences and 9 links, local governments with 4 occurrences and 19 links, and the word digitization with 4 occurrences and 1 link (Abuhassna et al., 2023).

We note that geographic information system (whether singular, plural, or abbreviation) is the most frequently used word, avec 88 occurrences et 347 liens. Système de prise de décision ou d'aide à la décision comes in second place with 14 occurrences and 87 links. There are 6 hits and 34 links related to information management or information technology. Local government comes next with 4 hits and 19 links, followed by cities or smart cities with 6 hits and 23 links. We observe that 1,588 links connect 50 elements, forming 5 clusters around the keywords, with the word "gis" being the most significant.

A holistic reading of this map offers an interesting, synthetic view of the relationships between the various concepts involved in the digitization of local authorities. In this respect, we note that GIS (Geographic Information System) represents the core of the relationships. This underscores the significance of geography in the realm of local government digitization research. The close links between GIS and concepts such as remote sensing, spatial analysis, urban planning, and risk assessment indicate a strong use of geographic information systems for spatial analysis, urban planning, risk assessment, etc.

The map highlights several dimensions linked to digitization: Technical terms such as "digitalization", "information technology", "algorithms", and "machine learning" attest to the significance of digital technologies. Spatial: Remote sensing, GIS, and spatial analysis highlight the use of geospatial data. Local government, social work, and humans indicate that digitalization has social and human implications.

Environmental issues such as climate change and sustainability demonstrate the connection between digitization and environmental concerns. The terms urban planning, risk assessment, and decision-making illustrate the main applications of digitization in local authorities: urban planning, risk assessment, and decision support.

The research's focus on GIS integration and its implications suggests a close link between digitization and special data analysis. This can lead to a better understanding of territories, optimized resource management, and more informed decision-making.

Multidisciplinary approach: The co-occurrence of terms from various fields (IT, geography, social sciences, and environment) shows that the digitization of communities is a complex subject that requires an interdisciplinary approach. Environmental issues: The clear link between digitization and climate change underscores the role of digital technologies in managing climate-related risks and promoting sustainability. Focus on risks: the terms "risk assessment" and "vulnerability" indicate a growing interest in using digitization to assess and manage risks, particularly natural ones (landslides, floods). International dimension: The use of terms like "England," "United Kingdom," and "Poland" indicates that researchers are conducting their research on a global scale.

### **6.3 Performance analysis**

This is a descriptive analysis of various quantitative indicators (TP: Total Publication; TC: Total Citation, Most cited article).

**Tableau 1. Table 1. The 10 most productive journals on digitalization, digital transition or information systems (Abuhassna et al., 2022a).**

| Journal                                                           | TP    | TC     | Cite Score (2022) | Most cited article (2022)                                                                                                                                              | Times cited | Publisher                                             |
|-------------------------------------------------------------------|-------|--------|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------|
| Sustainability                                                    | 48515 | 281274 | 5.8               | Digital economy, technological innovation and high-quality economic development: Based on spatial effect and mediation effect                                          | 86          | Multidisciplinary Digital Publishing Institute (MDPI) |
| International Journal of Environmental Research and Public Health | 44775 | 241049 | 5.4               | Digital Economy Development, Industrial Structure Upgrading and Green Total Factor Productivity: Empirical Evidence from China's Cities                                | 111         | Multidisciplinary Digital Publishing Institute (MDPI) |
| Water (Switzerland)                                               | 13633 | 74947  | 5.5               | Review on Methylene Blue: Its Properties, Uses, Toxicity and Photodegradation                                                                                          | 228         | Multidisciplinary Digital Publishing Institute (MDPI) |
| Applied Water Science                                             | 903   | 8019   | 8.9               | Management of risks substances and sustainable development                                                                                                             | 73          | Springer Nature                                       |
| Geomatics, Natural Hazards and Risk                               | 519   | 3798   | 7.3               | Influence of DEM resolution on landslide simulation performance based on the Scoops3D model                                                                            | 23          | Taylor & Francis                                      |
| Geospatial health                                                 | 193   | 494    | 2.6               | Vaccine hesitancy in East Malaysia (Sabah): A survey of the national COVID-19 immunisation programme                                                                   | 8           | University of Naples Federico II                      |
| ISPRS International Journal of Geo-Information                    | 2724  | 16978  | 6.2               | Deep Learning-Assisted Smart Process Planning, Robotic Wireless Sensor Networks, and Geospatial Big Data Management Algorithms in the Internet of Manufacturing Things | 54          | Multidisciplinary Digital Publishing Institute (MDPI) |
| Planning Malaysia                                                 | 425   | 549    | 1.3               | local community perspective on responsible tourism and destination sustainability                                                                                      | 12          | Malaysian Institute of Planners                       |
| SN Applied Sciences                                               | 5076  | 27054  | 5.3               | Exploring machine learning: a scientometrics approach using bibliometrix and VOSviewer                                                                                 | 26          | Springer Nature                                       |
| Acta Logistica                                                    | 151   | 259    | 1.7               | supply chain performance evaluation models: a literature review                                                                                                        | 8           | 4S go, s.r.o                                          |

**Source: Authors**

As the graph shows, the number of annual publications in five specialized environmental and water science journals has evolved from 2017 to 2022. These publications are linked to local authorities' digital transition.

Until 2020, the publication rates of the five journals remained low. However, there was a significant increase in publications from 2021 onwards, particularly in the International Journal of Environmental Research and Public Health, which produced more than three times as many articles in 2022. The increased emphasis placed by the COVID-19 pandemic on the links between the environment and public health could explain this increase.

Despite the fact that all journals experienced growth in 2022, their different histories suggest that the factors influencing their scientific output are specific to each. For example, “Sustainability Switzerland” has published more over time, suggesting that the nation's concern for sustainable development is intensifying.

Among these journals, Sustainability Switzerland stands out for its high scientific impact, with a high CiteScore Tracker (5.8) and a significant number of citations. Its nine publications in 2022 demonstrate its influence in the field.

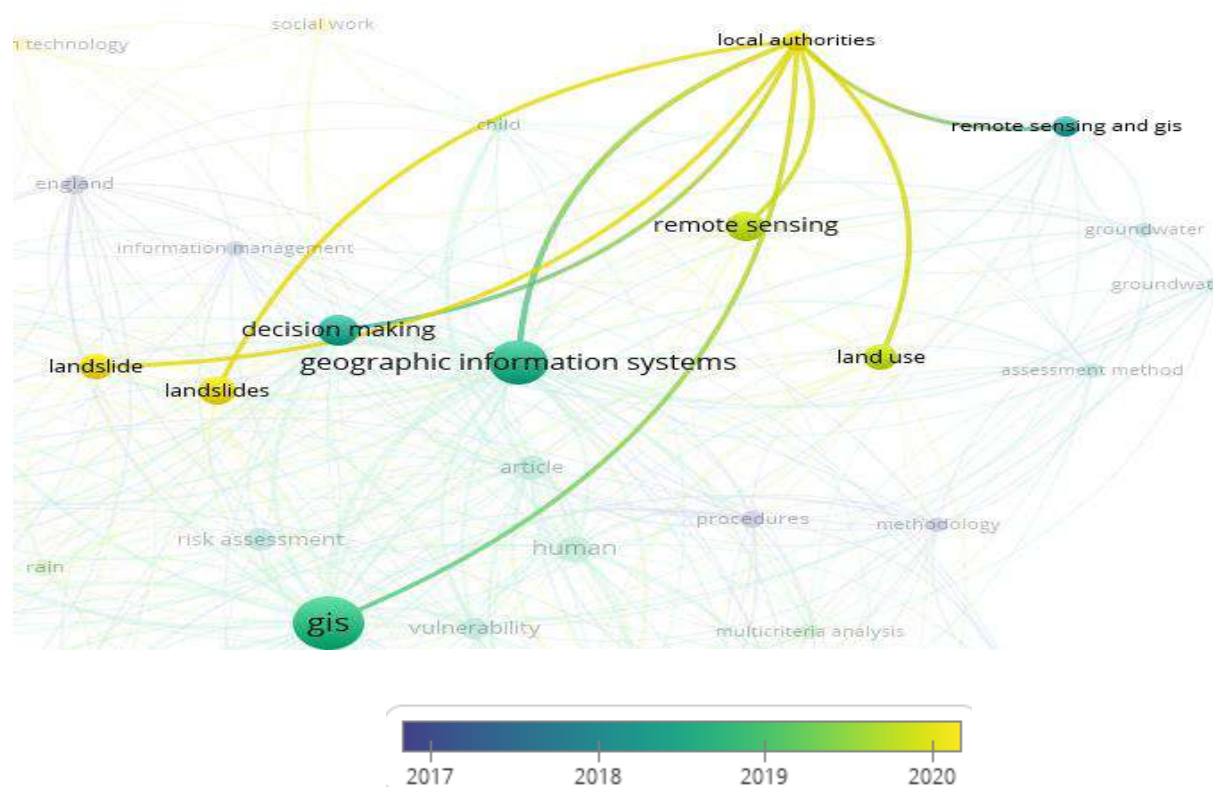
Explanatory factors : Several factors may explain the variations in the number of publications. Changing research priorities: Researchers are increasingly interested in certain themes, such as the links between environment and health.

Institutional factors: research funding policies, changes in editorial teams and changes in the journals themselves can also influence output.

To sum up, the graph reveals a complex dynamic in the field of environmental and water sciences. While the general trend is upward, each journal follows its own trajectory, reflecting scientific, institutional and societal developments.

## 7. Results

**Fig.7. node “local authorities” in the bibliography card related to the occurrence of all the utilities used by the authors.**



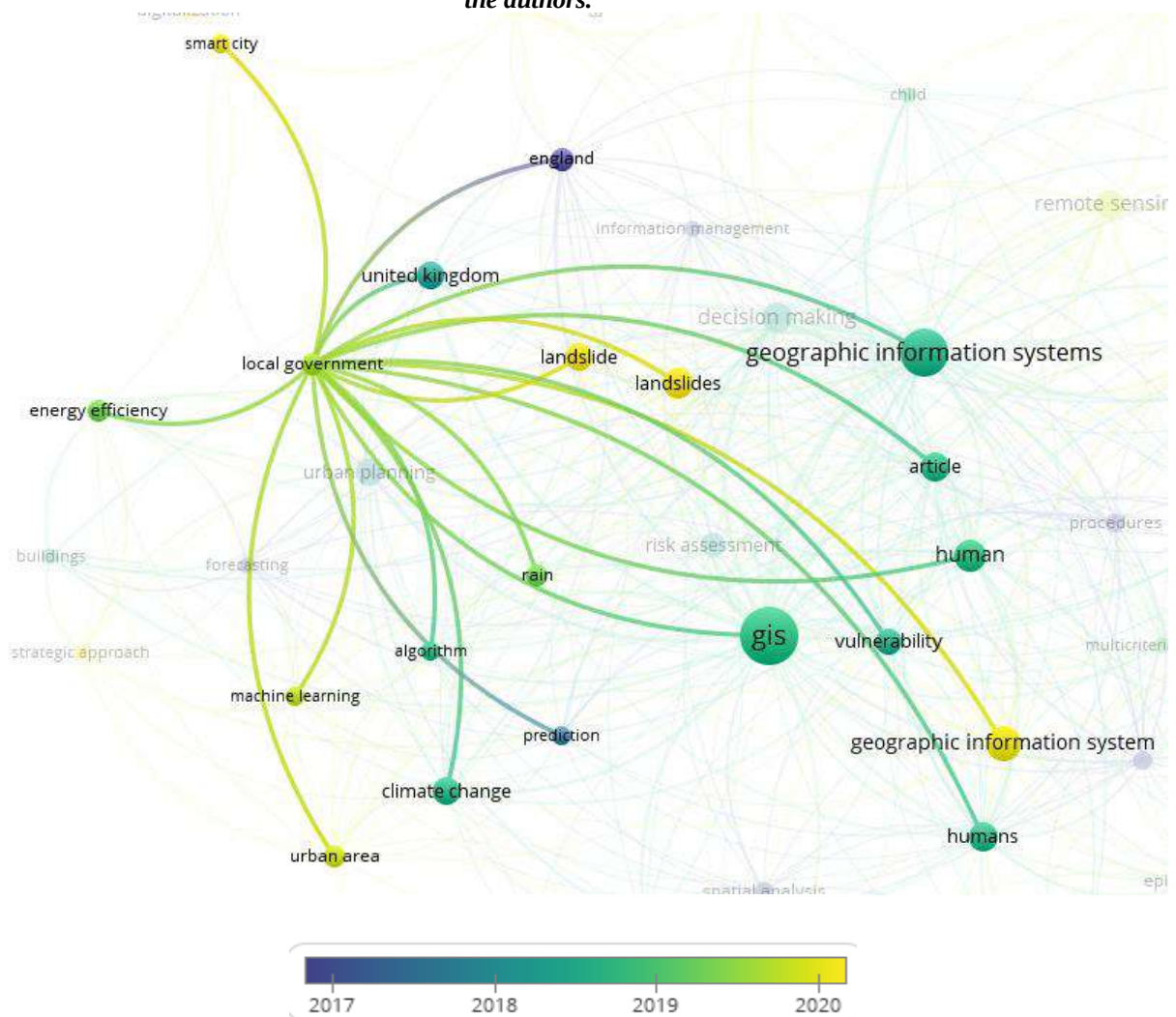
Source: Authors.

Let us try inspecting the main links of a few nodes representing keywords in the bibliometric map. We can see that there are 5 clusters around the keywords. Cluster 3 comprises 10 elements, including our main search keyword, local authorities. Cluster 4 comprises 9 elements, including the local government node. Most of these links, according to, overlay visualization, refer to writings published between the end of 2019 and 2020.

The importance of the branching of links from the node of local authorities to remote sensing and GIS indicates a strong use of technologies and geographic information systems by local authorities. Indeed, these tools play a promotional role in territorial management, the effectiveness of risk monitoring (such as landslides), and more informed decision-making. In addition, the links to decision making and information management indicate that digitalization is an essential lever for improving decision-making within local authorities. The role of information systems in the development of strategies and public policies is increasingly inevitable through the collection, processing, and analysis of large quantities of data.

Indirectly, the link between GIS, which is a key component in the functioning of local authorities, with land use, risk assessment, and vulnerability highlights the importance of digitalization for assessing risks related to land use, particularly natural ones such as landslides. Thus, GIS allows for mapping vulnerable areas and implementing appropriate preventive measures.

**Fig.8. node “local government” in the bibliography card related to the occurrence of all the utilities used by the authors.**



Source: Authors, 2023.

In the same way, through GIS, the links to Human, procedures, and methodology highlight the human dimension, emphasize that the success of the digital transition relies on the adaptation of procedures, and work methods within local administrations.

Local government digitization and GIS (Geographic Information Systems): The central node “local government” is strongly connected to “geographic information systems” and other terms related to spatial data management. This suggests that GIS plays a crucial role in the digitization of local government, enabling better management of territories and resources.

Main axes :

- Risk management and natural disasters: The terms “landslide”, “risk assessment”, “rain” and “vulnerability” are strongly connected. This indicates that digitization is being used to better understand and manage the risks associated with natural disasters, notably through the use of GIS-based predictive models.
- Urban planning and sustainable development: The terms “urban planning”, “energy efficiency”, “climate change” and “sustainable development” are linked. This suggests that digitization is being used to support more sustainable urban planning, by integrating environmental and social considerations.
- Use of information technology: The terms “machine learning”, “algorithm”, “data” and “information management” are present. This shows that communities are using cutting-edge technologies to analyze large amounts of data and make more informed decisions.
- Other observations :
- Multidisciplinary approach: The map shows that the digitization of local authorities or local government involves many disciplines, such as geography, IT, urban planning, the environment, etc.
- The place of citizens: The strong ramifications towards the “human” and “humans” nodes underline the fact that digitalization is at the service of citizens and considers their needs.
- Focus on spatial data: the presence of numerous terms related to GIS and spatial analysis shows that geographic data are at the heart of the digitization of local authorities.

In short, this concept map highlights the growing importance of digitization in the management of local authorities. GIS plays a central role, enabling a better understanding of territories, more efficient resource management and more informed decision-making. The applications of digitization are many and varied, ranging from natural risk management to sustainable urban planning.

## 8. Discussion

Societal changes and technological advances have driven the digital transformation of public administrations (Kabwe et al., 2024). This transformation has significantly transformed the way the public sector, particularly local government, operates. To improve the quality of their services and meet the public's demands, local governments are adopting digital tools.

This development is correlated with a significant increase in scientific publications on the subject, particularly since the Covid-19 pandemic. A panoply of digital solutions has embodied the digital transition within local authorities: the dematerialization of procedures, development of interactive communication platforms, and exploitation of artificial intelligence (Neupane, 2023). The creation of online portals and the use of artificial intelligence to build smart cities (Sopamena, 2024; Hota et al., 2024; Haldorai et al., 2024). These transformations rely on the deployment of integrated information systems.

The Internet of Things (IoT) plays a central role in this dynamic. It improves urban management by improving traffic flow, promoting selective waste collection, and increasing safety (Sharma et al., 2024; Ohene-Akoto et al., 2024; Hans et al., 2024). Geographic information systems (GIS) are also valuable tools for decision-making and improving services (Akmal, 2023). Local authorities are increasingly using websites to facilitate access to online services and strengthen participatory democracy. Finally, yet importantly, information system databases help to improve the internal and external performance of government agencies.

## 9. Conclusion

This bibliometric analysis provides an overview of research trends in the field of local authority digitalization. There is growing interest in the subject, particularly since the pandemic. The geographical and disciplinary diversity of research highlights the global and multidimensional scope of this phenomenon.

An analysis of co-occurring keywords reveals a particular focus on geographic information systems, decision-making, and technological tools for local authority management. After drawing up a portrait of the scientific knowledge on the contribution of authors in the last ten years on digital and the place of digital transition for the functioning of local authorities and local governments, and as mentioned at the beginning of this bibliometric analysis, we will try to draw lessons from this contribution on the following levels:

**Informed decision-making:** local authorities and governments can use the findings of this paper to make informed decisions regarding their digitalization strategies, in order to understand key areas of interest and emerging trends to benefit from successful practices.

**Resource allocation:** Local authorities can use this document to justify the most efficient allocation of resources to digitalization projects. In addition, by referring to the research findings, they can make a stronger case for funding technology investments and infrastructure upgrades.

**Identifying Collaboration Opportunities:** Analysis can reveal potential collaborators and experts in the field. Local governments can use this information to establish partnerships with research institutes or technology providers to enhance their digitalization efforts.

**Strategic planning:** information from bibliometric analysis can guide local governments in developing long-term strategic plans for digitalization. This can help identify priorities and set clear objectives for digital transformation efforts.

**Policy formulation:** policymakers can use the document to develop policies and regulations that support and regulate the digitalization efforts of local authorities. It provides evidence-based information that can help create effective policies.

**Benchmarking progress:** the document can serve as a reference for local authorities and governments, enabling them to assess their own progress in the context of digitalization. They can compare their initiatives with those of others, enabling a more comprehensive assessment of their efforts.

**Training and skills development:** Understanding the most relevant areas of research can help local authorities and governments design training programs for their employees. This can ensure that the workforce has the necessary skills to effectively implement digitalization projects.

**Citizen engagement:** the document can be used to inform and involve the public about the benefits and implications of digitalization in local governance. It provides a basis for transparent communication with citizens about the changes they can expect.

**Performance evaluation:** the results can help develop measures and indicators to assess the success of digitalization initiatives. Local authorities and governments can use these criteria to measure their performance and make any necessary adjustments.

Continuous improvement: regular updates and bibliometric analyses can be carried out to ensure that local governments remain aligned with the latest research and trends. This encourages continuous improvement and adaptation of their digitalization strategies.

International comparisons: local governments can use the document to compare their digitalization efforts with those of their international counterparts, promoting a global perspective on digital transformation in the public sector.

Data security and privacy: The analysis can highlight research related to data security and privacy in local government digitalization. This information can be used to strengthen data protection measures and ensure compliance with current regulations.

In conclusion, the bibliometric analysis in this article can offer practical advice to local authorities and governments to strengthen their digitalization efforts, from allocating resources and developing policies to promoting collaboration and ensuring successful implementation.

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