Journal of Infrastructure, Policy and Development 2024, 8(8), 4939.
https://doi.org/10.24294/jipd.v8i8.4939

Article

Geosocial networking for active citizen initiatives from a relational approach: A comparative case study in the Malaga region

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CITATION

Chamizo-Nieto FJ, Conejo-Arrabal F. (2024). Geosocial networking for active citizen initiatives from a relational approach: A comparative case study in the Malaga region. Journal of Infrastructure, Policy and Development. 8(8): 4939. https://doi.org/10.24294/jipd.v8i8.4939

ARTICLE INFO

Received: 1 March 2024
Accepted: 23 April 2024
Available online: 8 August 2024

Abstract: PPGIS platforms have been widely used to map social actors since the emergence of open access webGIS platforms. This identification of citizen initiatives is based on the physical location, but is rarely combined with social networking. This research seeks to close that gap by using the platIC web-based mapping tool for citizen initiatives, together with their interrelationships. Therefore, a methodical procedure has been defined to construct a geolocalised graph by identifying and categorising linked nodes. Method steps have been tested in three case studies in the Malaga region: Malaga city, Benalmadena, and Valle del Genal. They were selected for a comparative analysis in three different urban and socio-economic scenarios, namely: a tourist destination with a high density of Spanish population and floating city users; a sun-and-beach destination with a significant presence of resident foreign population; and a rural area suffering from depopulation, respectively. Mapping reveals a higher density of citizen initiatives in central urban areas and with social conflicts. Social graphs show a wider interconnection of nodes in rural areas, but isolated nodes are spread more widely there. Monitoring active citizen initiatives could serve as a basis for local administration to involve the citizenry in the management of current issues in the urban and rural context. Future research may promote new plugins to improve participatory process through webGIS platforms.

Keywords: PPGIS; citizen participation; associationism; associative networking; graph

1. Introduction

The location of citizen initiatives and their interrelation are based on the "social network theory" (Borgatti et al., 2009). It refers to those neighbourhood associations, movements, collectives, organisations, emerging platforms, and other stakeholders involved in local and city conflicts of interest. In the urban context, it focuses on social relations in the built environment, linking physical space to the virtual city. Not only are citizens linked with common physical locations of the city from this relational point of view, but they also have the opportunity to be involved in improving the design of public spaces to meet their needs and demands as users and even informant agents. This "networked urbanism" (Graham and Marvin, 2001) emerges as a way to address the lack of citizen participation in Urban Planning, as well as a means to include non-technical profiles—such as neighbourhood associations or social movements—in urban design. This way of approaching urbanism facilitates the formation of mixed groups, where technicians and citizens work together on urban regeneration projects (e.g., Nebot-Gómez de Salazar et al. (2023)).

Information and communications technology has thus driven citizen participation as a new decision-making tool. The development of the Geographic

Information System has underpinned the importance of relating the physical and virtual territory stated by Bridge (2002), through the emergence of webGIS platforms. These websites allow citizens to use mapping to locate geo-referenced content, as well as engaging users in collective actions. Thus, the Public Participation Geographic Information System (PPGIS) has emerged for mapping participatory processes (see **Table 1**). Such platforms let users upload, share, and map the content in question. Not only can information be shared, but the use of open-access webGIS platforms also allows people to come together around current issues. Nevertheless, citizen usability of PPGIS is not always successful due to its misuse known as "participationism" (LaCol, 2016), which makes users feel frustrated at not being part of a real participatory process.

Table 1. Studies on PPGIS platforms covered in recent literature (Source: Authors).

Name	Year	Main theme	Geolocalised element	Geometry	Study
LAB/717	2019	Citizen participation	Stakeholders	Point | Line	(Haro Márquez, 2023)
Patrimonio Herido	2021	Cultural heritage	Damaged assets	Point	(García González et al., 2022)
RockAtlas	2017		Participatory actions	Point	(Turillazzi et al., 2021)
Nouli Community	2016		Person or organisation	Point | Area	(Jan, 2018)
Masdan	2021	Environment	Damaged ecosystems	Point	(Narciso et al., 2021)
Smile	2019		Water quality	Point	(Toro Herrera et al., 2021)
Life IP-4 Natura	2018		Data of ecosystems	Area	(Mallinis et al., 2023)
CityAir	2015		Air quality	Point	(Grossberndt et al., 2020)
Proctor Creek Citizen Science Application			Ponds	Point	(Jelks et al., 2018)
Urbagene	2014		Biodiversity	Point	(Ingensand et al., 2015)
Ready	2013		Flood risks	Point | Line | Area	(Albano et al., 2015)
Yunnan-Vietnam Railway	2018	Landscape	Images of railway	Point	(Sang et al., 2021)
Plznito	2018	Urbanism	Urban problems	Point	(Kopackova and Libalova, 2019a, 2019b)
Visual Pollution	2017		Advertisement visual pollution	Point | Area	(Chmielewski et al., 2018)
Activa MLG	2019	Sport	Informal sport practices	Point | Line	(Cornax-Martín et al., 2020)

PPGIS is the most effective decision-making tool for urban projects between local government and citizens, as shown by Kopackova et al. (2019) by implementing a specific webGIS platform showing several non-traditional communication channels for collaborative work. Recent studies are based on new platforms designed according to the main theme and the role of users (see **Table 1**). The broad presence of platforms aligned with environmental issues is highlighted; the focus is on providing real time data on open-access reports (Albano et al., 2015; Mallinis et al., 2023) and on creating a collective database by means of citizen participation (e.g., Grossberndt et al. (2020); Toro Herrera et al. (2021)). As regards collaborative mapping, some platforms are designed to let users upload and stream thematic content, such as informal public spaces for sport activity (Cornax-Martín et al., 2020) or landscape photographs (Sang et al., 2021). Mention should be made of

the emergence of platforms for heritage management by means of the cultural mapping of stewardship stakeholders (Jan, 2018), endangered assets (García González et al., 2022), and international experiences in participatory process (Turillazzi et al., 2021). Other platforms also consider urban planning for citizenry mapping issues such as poor state of pavement and urban furniture (Kopackova and Libalova, 2019a, 2019b), and visual pollution (Chmielewski et al., 2018). Not only do these collaborative platforms allow citizens to play an active role in the city, but they also identify all stakeholders involved. Thus, the LAB/717 platform (Haro Márquez, 2023) is designed for mapping all agents taking part in participatory actions, together with the related sites and projects. Real information on socio-urban processes can consequently be provided.

These online platforms are mainly based on the mapped location of collectives and agents by means of the latitude and longitude coordinates of their headquarter address or the place where they operate. These local stakeholder dots also include information such as the contact details, their objectives or main goal, and projects completed or underway. This information is presented as attributes from an atomist approach without taking into account the relationship between points or nodes. This paper seeks to cover that gap by means of implementing an open-access webGIS platform designed to build geospatial graphs to promote synergies. Thus, the main purpose of this research is to strengthen the associative network of social movements, with the new aspect being the focus on their interlinks.

This paper presents a methodology to identify those active citizen initiatives and to map them together with their network of relationships using the platIC webGIS platform. Therefore, this methodological approach has been developed in three case studies with different features according to their urban development; however, all the selected municipalities are located in the Malaga region: Malaga (city), Benalmadena, and Valle del Genal. This helps to identify and categorise the active citizen initiatives in those locations, as well as the most closely linked node clusters. Testing case studies will show how the associative network operates in the territory; the aim is not only to pinpoint the nodes and interlinks, but also to promote new relationships and collaborations.

2. Materials and methods

2.1. Methodology

This research is based on identifying the associative network in the urban context. Therefore, the active citizen initiatives and their interlinks need to be identified. The objective is to construct a geolocalised graph composed of nodes and links that make up the social network of collectives (see **Figure 1**):

- Citizen initiative: A group of people who are united for a common goal which promotes and improves community life. It can be formal or informal; the former is listed in a municipal register as a neighbourhood association, organisation, or foundation, and the latter operates on its own as a social movement, collective, and citizen platform not included in any official register.
- Link: A relationship between different initiatives for mutual support regarding demands, needs, or actions, as well as for carrying out common activities and

projects, or for sharing knowledge or experiences.

- Network: A set of linked nodes around a specific initiative.

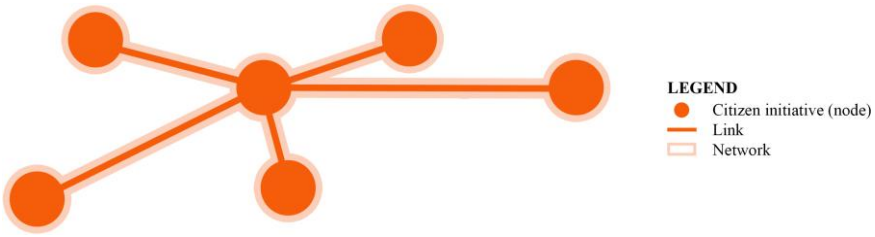

Figure 1. Diagram of a social network graph (Source: Authors).

The platIC webGIS platform was used to store every active citizen initiative. Latitude and longitude coordinates were used to geolocate where they act. Moreover, they all have been categorised according to relevant information: headquarter or location where each one operates through the city; public contact details by email or telephone number; brief description of their goals and needs; themes of interest and Sustainable Development Goals (SDG) with which every initiative aligns, inter alia. This information was gathered from interviews, online news items published in local newspapers, and even grey literature such as reports or government listings. Such sources provide unstructured data; all the information therefore needed to be categorised in a comprehensive and geolocated database with rows and columns. Once the information associated with each initiative had been collected, they were all uploaded to the platIC platform with the aim of facilitating: (1) decision-making by mixed groups including administrations and active citizen initiatives in the different areas where they operate, (2) networking between related initiatives, and (3) participatory processes through the call for existing and emerging initiatives. The methodological approach is designed in four steps to identify, categorise, and map the associative network as follows (see **Figure 2**):

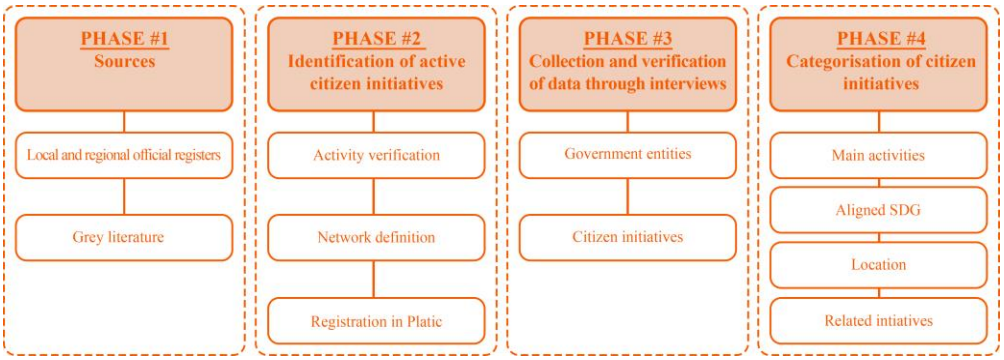

Figure 2. Methodological procedure to identify and categorise active citizen initiatives (Source: Authors).

- Phase #1: Sources. The objective of this first stage is to build a relational database with categorised information about existing citizen initiatives including the relationship between them. Two main data collection sources have been defined:
  1) Local and regional official registers. Access to administrative listings of regulated citizen initiatives reveals which ones are registered. The types of

formal collectives include being constituted as a neighbourhood association, group, social club, professional college, federation, foundation, and organisation.

2) Grey literature. Given that informal and non-regulated citizen initiatives are not officially listed, a content analysis of local newspapers, social networks, newsletters, and webpages is conducted to collect the social movements, citizen platforms, and collectives appearing in online sources and social media.

- Phase #2: Identification of active citizen initiatives. Once the initial database of existing citizen initiatives has been built, the active initiatives are filtered in this second stage. The verification process is necessary to update the administrative listings and for informal groups to be considered as follows:
  1) Activity verification. Accessing the social networks of the listed citizen initiatives allows their level of activity to be determined; those that actually operate are then filtered.
  2) Network definition. The relationship between citizen initiatives is based on the content analysis of the grey literature. This connection between nodes is not measured, but qualitatively defined by categorising four types of relations:
     - Common project: Both initiatives take part in the same project.
     - Mutual support: Each citizen initiative supports the activity of others, such as activity meetings or manifestos where the emphasis is on sharing.
     - Joined workspace: More than one initiative works together in the same coworking space where they meet and operate.
     - Shared knowledge: Two initiatives are run together and share information, knowledge, and experience.
  3) Registration in platIC. Once all the active citizen initiatives have been identified together with their qualitative data attributes collected from the grey literature, each initiative-node is uploaded and geolocated in the platIC webGIS platform.
- Phase #3: Collection and verification of data through interviews. Semi-structured interviews are here conducted to check data collection. The interviews start to show the value of geolocating a graph of citizen initiatives and how it promotes the interrelations. Moreover, any question or doubt is answered in order for respondents to know the research goal. Interviews last an average of 60 min and are preferably conducted face-to-face, but they can also be on line when not possible in person. They are all recorded with the aim of transcribing the responses in order to collect information provided by reporting agents and citizen initiatives. The former are government entities involved in the participation process and may reveal the presence of citizen initiatives over the city; the latter are the leaders or members of active citizen initiatives and can provide first-hand information about their activity and even unpublished data (e.g., related initiatives), as well as to verify data collected from the media.
- Phase #4: Categorisation of citizen initiatives. Based on the data collected in the previous phases, this last stage is conducted to categorise all the citizen

initiatives identified and broken down into the following topics: (1) main activities, (2) aligned SDG, (3) location where they operate, and (4) related initiatives. The first two ones provide information about their main focus—accessibility, social rights, diversity, cultural heritage, and sustainable transport, among other themes. The second serves to categorise citizen initiatives according to global objectives. Their operational location establishes whether they are run in cultural spaces, headquarters, or in public or virtual spaces. The last area is required to prepare a graph, as it provides information on the links between citizen initiatives. In addition to these four categories, other information is collected such as contact details, social networks, brief description and request being made.

2.2. Case studies

This methodology has been tested in three municipalities of the region of Malaga: (1) Malaga (city), (2) Benalmadena, and (3) Valle del Genal (see **Figure 3**). These case studies represent the following three distinct urban and socio-economic scenarios, respectively: (1) a municipality with predominantly Spanish population, (2) a municipality with a large presence of foreign residents in the population, and (3) a group of rural municipalities where the population is in decline. All of their local economies are tourist related as follows:

- Case study #1: Malaga. The city of Malaga is an emerging tourist destination with a total population of more than a half a million inhabitants in 2021 (Ayuntamiento de Málaga, 2021a), along with a significant number of floating city users all year round. The city centre and nearby neighbourhoods are experiencing "tourism gentrification" (Gotham, 2005); that has led to the emergence of protest and resistance movements demanding the right to the city (e.g., Chamizo-Nieto et al. (2023)). This tourism intensification is supported by three main features identified in port tourist destinations (Calle Vaquero, 2019): great accessibility by air and sea, due to a large number of low cost flights and cruise ships arriving; and a huge cultural and leisure offering thanks to tourism specialisation. Despite the SARS-CoV-2 (COVID-19) pandemic disrupting tourism in 2020, the figures show an upward trend from 2021 in the number of air and cruise passenger on the previous year, up 71.90% and 194.56%, respectively (Aeropuertos Españoles y Navegación Aérea, 2021; Puertos del Estado, 2021). Moreover, Malaga improved in terms of cultural quality up to third place in the 2021 national ranking (Observatorio de la Cultura, 2021).
- Case study #2: Benalmadena. Residents of different nationalities live in this municipality, especially Europeans, such as British, Scandinavian and French. Thus, this coastal municipality had a total of 61,821 inhabitants in 2021, with 26% of the population being foreign, particularly British, according to the Spanish Statistics Institute (Instituto Nacional de Estadística; Ministerio de Asuntos Económicos y Transformación Digital, 2021). The coexistence of several nationalities is a predominant feature in coastal areas due to tourism. This concentration of foreigners allows the formation of nationality groups as organised communities such as associations. That is not only the case in

Benalmadena, but also in other municipalities of the coastal axis called the Costa del Sol, especially along the western coast of the Malaga region. The touristification phenomena also spread in those municipalities, which have suffered the loss of local community due to "commercial gentrification" (Vollmer, 2019) in the public space.

- Case study #3: Valle del Genal. The third case study is a group of 15 municipalities: Igualeja, Pujerra, Parauta, Cartajima, Juzcar, Farajan, Alpandeire, Ataje, Benadalid, Benalauria, Algatocin, Benarraba, Gaucin, Jubrique, and Genalguacil. They are together known as Valle del Genal where about 7000 people lived in 2021 (Ministerio de Asuntos Económicos y Transformación Digital, 2021). This area was selected for its population decline, with a significant presence of older people (Asencio-Juncal et al., 2022). This area is located in an inland area of the Malaga region, unlike the two coastal case studies presented above. The decline in population is a threat to the safeguarding of its material and intangible cultural heritage, and is impacting the development of its territory. The analysis of the associative network may serve as basis to pinpoint the challenges and needs that citizen initiatives are meeting, as well as future strategies to be implemented to create local economies and increase the population.

This research focuses on the municipalities of the three case studies selected (see **Figure 3**). The district is the territorial unit to analyse the whole municipalities of Malaga (N = 11) and Benalmadena (N = 2). As the Valle del Genal municipalities are very small in area and population, there is no administrative subdivision in districts; consequently, the municipality is considered as the territorial unit of analysis in this case study (N = 15). In all cases, the year 2021 is taken as the analysis date. Cases studies present differences according to the extension, urban area, and population. These data have been disaggregated by the defined territorial unit of analysis (see **Table 2**), showing differences between and within municipalities. The city of Malaga has a total population of 579,984 inhabitants. Benalmadena has a population of 61,821, while Valle del Genal has 6947 residents. This represents about 10% and 1% of the population of Malaga, respectively. These three case studies also show differences in total and urban area. The urban area of Malaga is 16.09% of the total area of the municipality. Although the total area of Benalmadena is lower than that of Malaga, the former has a larger urban area with almost half of the municipality. The case of Valle del Genal is the largest in total area but the smallest in urban area, since more than 97% of the territory is rural. These differences in terms of population, and total and urban area allow us to know how the associative network is spread over more or less densified and rural environments.

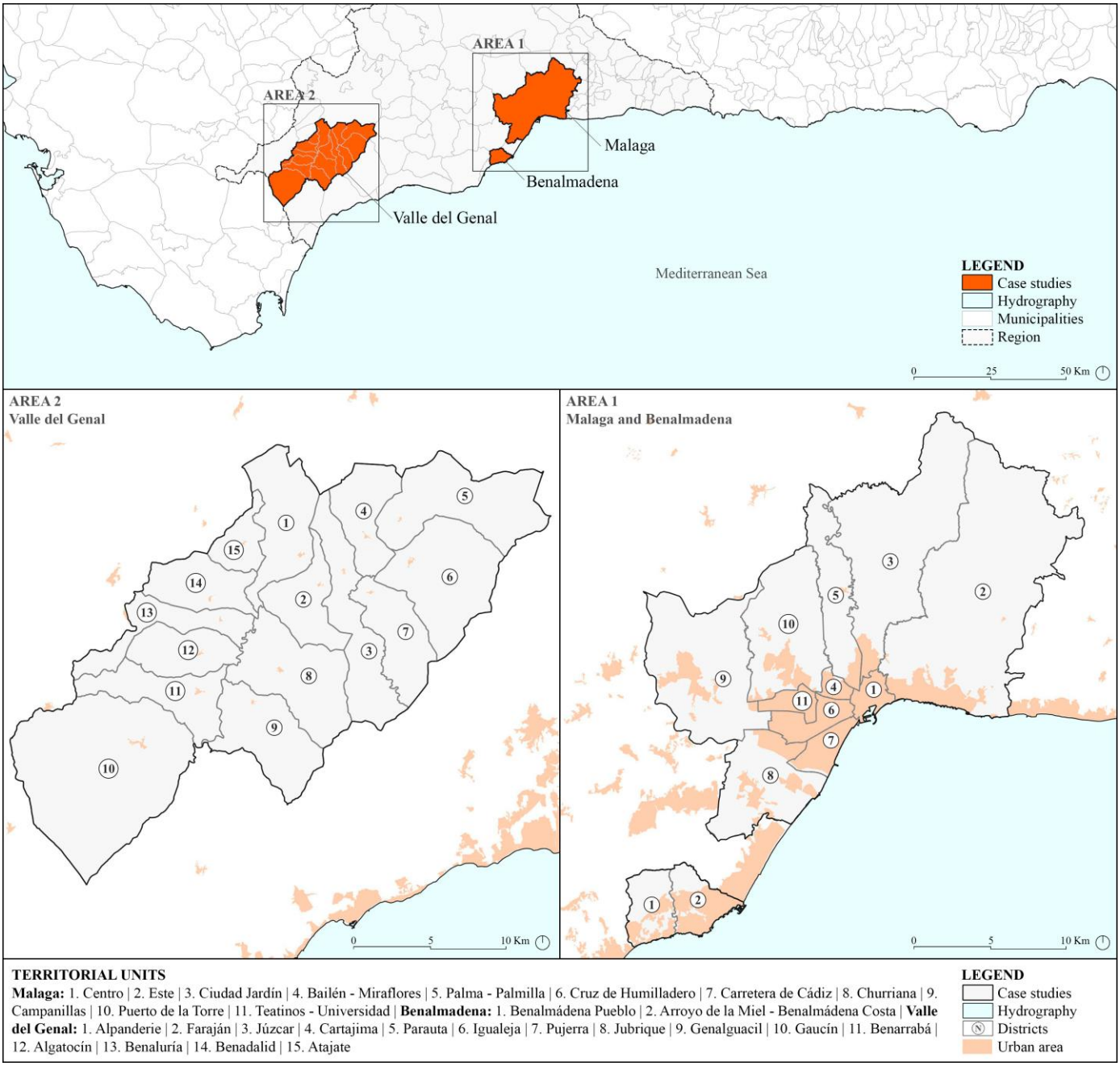

Figure 3. Case studies and territorial unit of analysis in 2021 (Sources: Cartographic base (Instituto de Estadística y Cartografía de Andalucía [IECA], 2021), Territorial units (Ayuntamiento de Málaga, 2021b; IECA, 2021)).

Table 2. Data on total and urban area, and population in Malaga, Benalmadena, and Valle del Genal in 2021 (Sources: Population (Ayuntamiento de Málaga, 2021a; Ministerio de Asuntos Económicos y Transformación Digital, 2021), Total and urban area (Ayuntamiento de Málaga, 2021b; IECA, 2021)).

Case study	Territorial unit*		Population (2021)	Total area (km^2)	Urban area (%)
	Ref.	Name			
Malaga	M01	Centro	81,449	7.16	77.74
	M02	Este	55,861	127.66	7.46
	M03	Ciudad Jardín	36,862	76.29	3.64
	M04	Bailén—Miraflores	61,569	3.06	88.74
	M05	Palma—Palmilla	30,972	25.46	8.20
	M06	Cruz de Humilladero	85,907	9.38	99.90
	M07	Carretera de Cádiz	115,788	8.09	91.19
	M08	Churriana	20,908	34.37	24.39
	M09	Campanillas	19,391	58.51	9.33
	M10	Puerto de la Torre	31,992	42.48	12.94
	M11	Teatinos—Universidad	39,286	5.43	99.30
Benalmadena	B01	Benalmádena Pueblo	10,912	13.72	31.43
	B02	Arroyo de la Miel—Benalmadena Costa	50,909	13.16	67.89
Valle del Genal	V01	Alpandeire	261	3.12	2.88
	V02	Faraján	250	2.04	2.75
	V03	Júzcar	235	3.37	1.67
	V04	Cartajima	259	2.15	3.52
	V05	Parauta	251	4.44	1.16
	V06	Igualeja	740	4.39	2.92
	V07	Pujerra	298	2.44	2.29
	V08	Jubrique	553	3.93	2.54
	V09	Genalguacil	391	3.19	1.75
	V10	Gaucín	1595	9.82	2.94
	V11	Benarrabá	438	2.49	5.11
	V12	Algatocín	825	1.97	3.44
	V13	Benaluría	436	1.97	2.31
	V14	Benadalid	236	2.07	2.91
	V15	Atajate	179	1.09	4.50

* The selected territorial unit to analyse the case studies of Malaga and Benalmadena is the district. Nevertheless, the Valle del Genal sample is the total of its municipalities as there is no smaller administrative than the municipality.

3. Results and discussion

A total of 110, 71, and 70 active citizen initiatives were identified for the municipalities of Malaga, Benalmadena, and Valle del Genal, respectively (see **Table 3**). Several official registers, such as the municipal data of association and entities in the case of Malaga (Ayuntamiento de Málaga, 2022), the foreign associations listing and the association guide of Benalmadena (Ayuntamiento de Benalmádena, 2017), and the available official registers of the municipalities from

Table 3. Citizen initiatives classified according to the group entity type and number of links per territorial units (Source: Authors).

Case study (*N*)	Territorial unit		Active citizen initiatives (no.)				Links (no.)
	Ref.	Name	Regulated	Informal[1]	Unrecordable[2]	Total	
Malaga (110)	M01	Centro	22	23	18	63	224
	M02	Este	4	4	2	10	40
	M03	Ciudad Jardín	0	0	0	0	0
	M04	Bailén—Miraflores	2	1	0	3	2
	M05	Palma—Palmilla	2	1	0	3	3
	M06	Cruz de Humilladero	5	2	1	8	11
	M07	Carretera de Cádiz	6	3	3	12	43
	M08	Churriana	1	1	0	2	7
	M09	Campanillas	0	0	0	0	0
	M10	Puerto de la Torre	0	0	0	0	0
	M11	Teatinos—Universidad	4	2	3	9	24
Benalmadena (71)	B01	Benalmádena Pueblo	9	0	0	9	34
	B02	Arroyo de la Miel—Benalmadena Costa	54	8	0	62	387
Valle del Genal (70)	V01	Alpandeire	2	5	0	7	40
	V02	Faraján	2	1	0	3	28
	V03	Júzcar	2	0	0	2	16
	V04	Cartajima	2	0	0	2	28
	V05	Parauta	1	2	0	3	16
	V06	Igualeja	2	1	0	3	28
	V07	Pujerra	2	4	0	6	16
	V08	Jubrique	1	0	0	1	16
	V09	Genalguacil	2	5	0	7	28
	V10	Gaucín	3	5	0	8	29
	V11	Benarrabá	4	7	0	11	38
	V12	Algatocín	3	1	0	4	16
	V13	Benaluría	5	1	0	6	28
	V14	Benadalid	2	1	0	3	16
	V15	Atajate	2	2	0	4	16

[1]Informal citizen initiatives are those that can be constituted as a regulated entity and therefore appear in the administrative register of associations and local entities.
[2]Unrecordable initiatives are those that cannot be constituted as a regulated entity because of their type of activity; these include companies or cooperatives. Therefore, they cannot be listed in administrative registers as associations or federation.

Valle del Genal (e.g., Ayuntamiento de Benarrabá (2022); Ayuntamiento de Genalguacil (2022)), were therefore consulted. Moreover, in the last two cases it was necessary to access other official sources, such as the Andalusian Institute for Women (Consejería de Inclusión Social, Juventud, Familias e Igualdad, 2022), the Malaga regional subsidised associations listing (Diputación Provincial de Málaga, 2022), and the Andalusian associations register (Consejería de Inclusión Social, Juventud, Familias e Igualdad, 2022). As regards the grey literature, local

newspapers stand out as a source of information about citizen initiatives in Malaga and Benalmadena; those papers include La Opinión de Málaga, Málaga hoy, and Diario SUR in Malaga, and El Noticiero and Viva Benalmádena, respectively. Social networks are also highlighted as a source to identify not only regulated citizen initiatives, but also informal ones and with operations. Thus, the sum of regulated entities is greater than informal ones in the cases of Malaga and Benalmadena, but the same in the case of Valle del Genal (see **Table 3**). It should be noted that there are citizen initiatives which cannot be registered as an entity, such as cooperative, company or administrative organisation. That was only the case of Malaga, where the presence of such citizen initiatives stands at 27%. It could be explained in those municipalities with a high population density as is the case of Malaga. In contrast, there are fewer citizen initiatives in those municipalities with a low density, as can be seen in case of Valle del Genal. Therefore, the density of the population can be a driver mechanism behind the greater emergence of citizen initiatives.

Mapping active citizen initiatives in platIC makes it possible to compare their presence using density maps (see **Figure 4**). The spatial distribution of initiatives covers a wider area of the municipalities of Malaga and Benalmandena. That is due to a relationship between the node location in its central urban areas. The mixture of urban issues in the historic centre could be the explanation for the case of Malaga. Nevertheless, the concentration of initiatives of Benalmadena tallies with those areas with a high population density. In the case of Valle del Genal, the active nodes are mainly grouped as a cluster in all the urban areas of each municipality, shown as heat spots on **Figure 4**, whose influence extends to the edge of the rural environment.

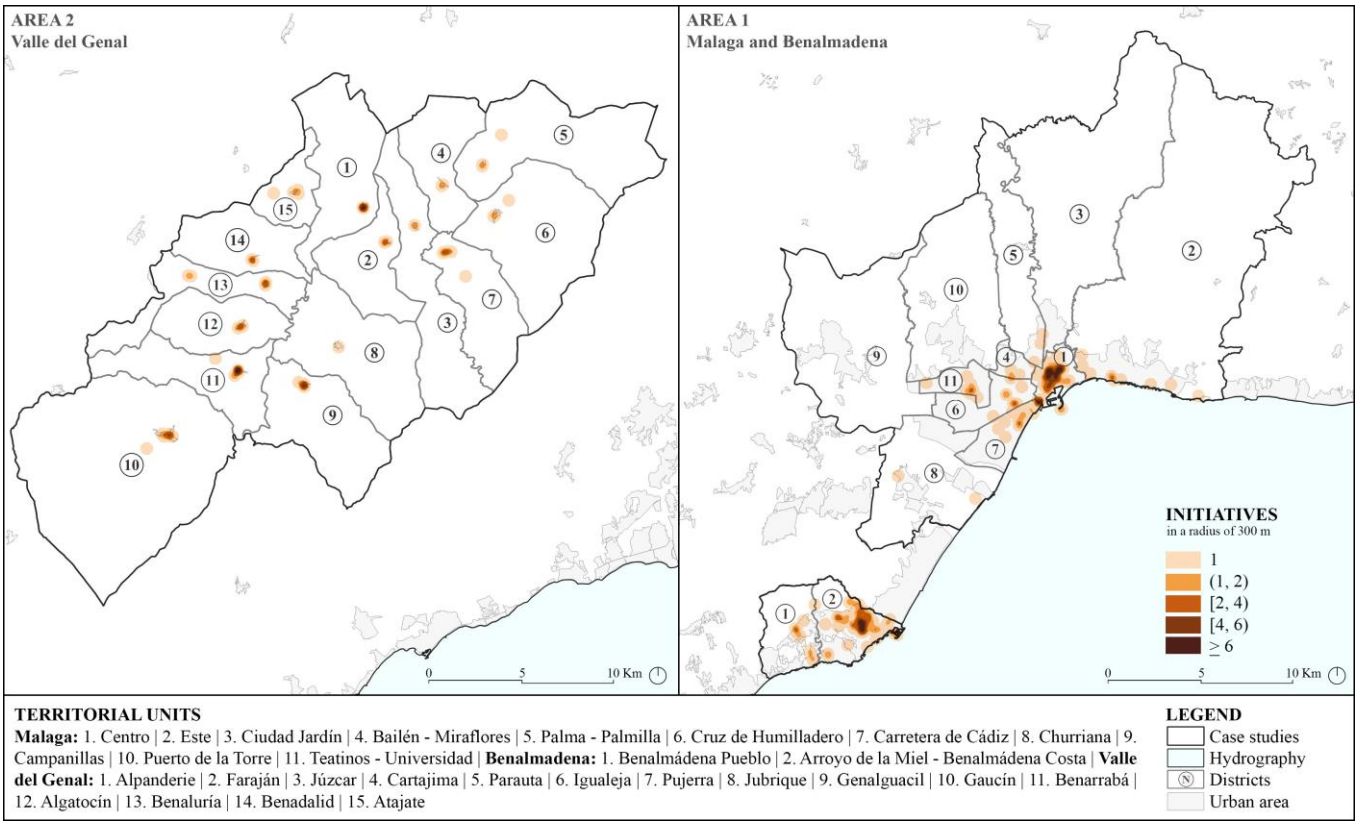

Figure 4. Heat map of active citizen initiatives (Source: Cátedra Tecnologías Emergentes para la Ciudadanía, 2018).

The methodology revealed that the content analysis of local newspapers and social media was also useful to learn about the relationship between citizen initiatives. Once citizen initiatives and their interconnections had been identified, nodes and links were mapped in the platIC webGIS platform (see **Figure 5**). This platform has a huge variety of topics, unlike previous platforms based on specific themes (see **Table 1**). Despite the similarities with the Laboratorio 717 platform (Haro Márquez, 2023), platIC focuses on the relationships between initiatives as a novel feature. Moreover, it offers the possibility of self-registration to create a collaborative map as other platforms do (e.g., Cornax-Martín et al. (2020); Sang et al. (2021)). Not only does platIC facilitate the management and monitoring of nodes according to previous webGIS platforms (e.g., García González et al. (2022); Narciso et al. (2021); Toro Herrera et al. (2021)), but it also enables the real-time status of the associative network to be given.

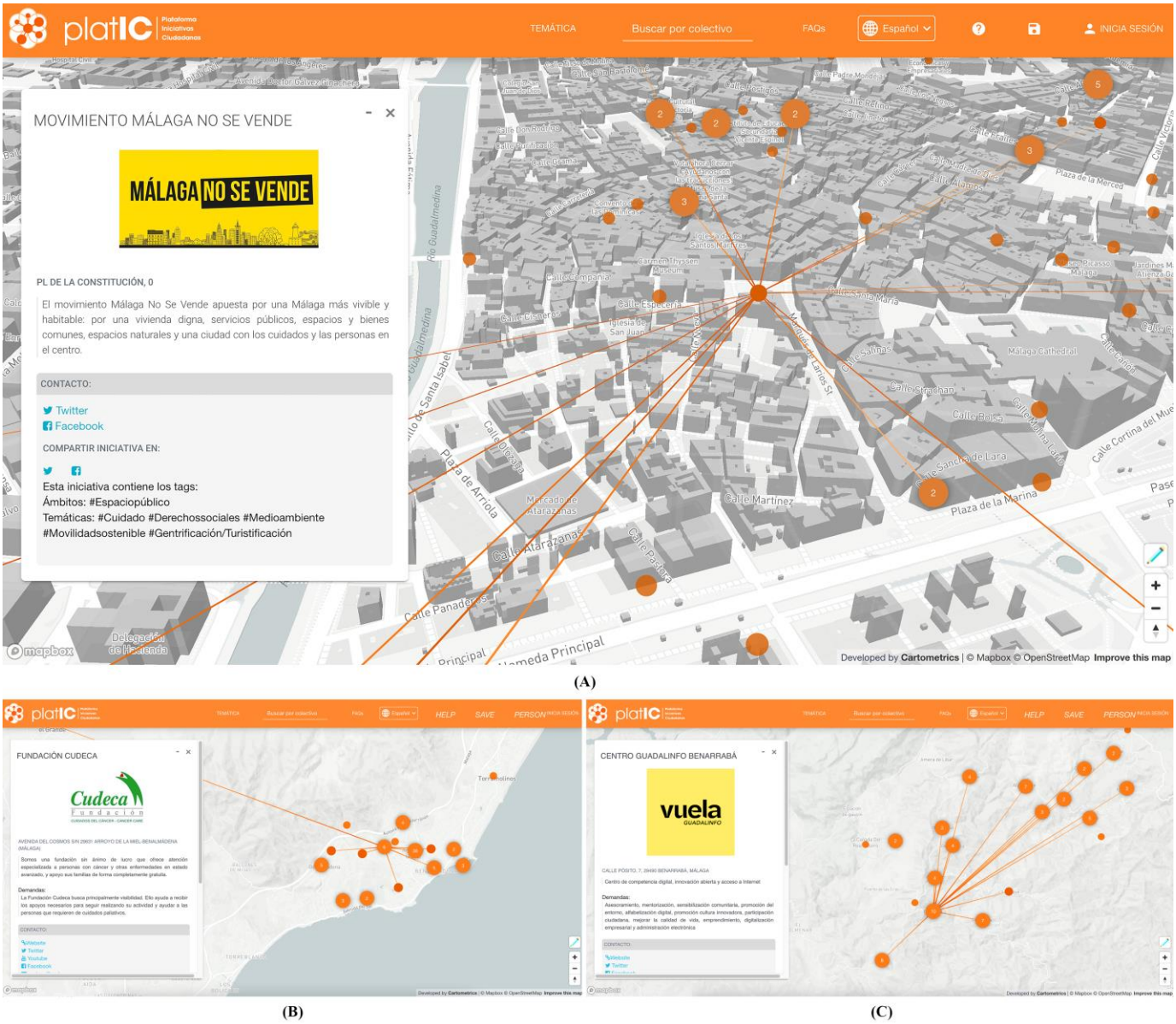

Figure 5. Geolocated graph of citizen initiatives through the platIC webGIS platform: **(A)** Malaga; **(B)** Benalmadena,; and **(C)** Valle del Genal (Source: Cátedra Tecnologías Emergentes para la Ciudadanía, 2018).

Figure 6 shows the spatial distribution of nodes and links by territorial units. The greater emergence of initiatives in those districts with a high population density and urban area, as in the case of Malaga, should be noted. In addition, the density of initiatives is related to socio-urban conflicts located in the urban centre as well as the number of links there, as can be seen in the cases of Malaga and Benalmadena. In this regard, social cohesion in medium-sized cities promotes the emergence of associations, but that is not the case in those peripheral districts with a low density. This also happens in areas where the population is in decline, such as the municipalities of Valle del Genal, but the cohesion between existing citizen initiatives is stronger as can be seen on the link density map.

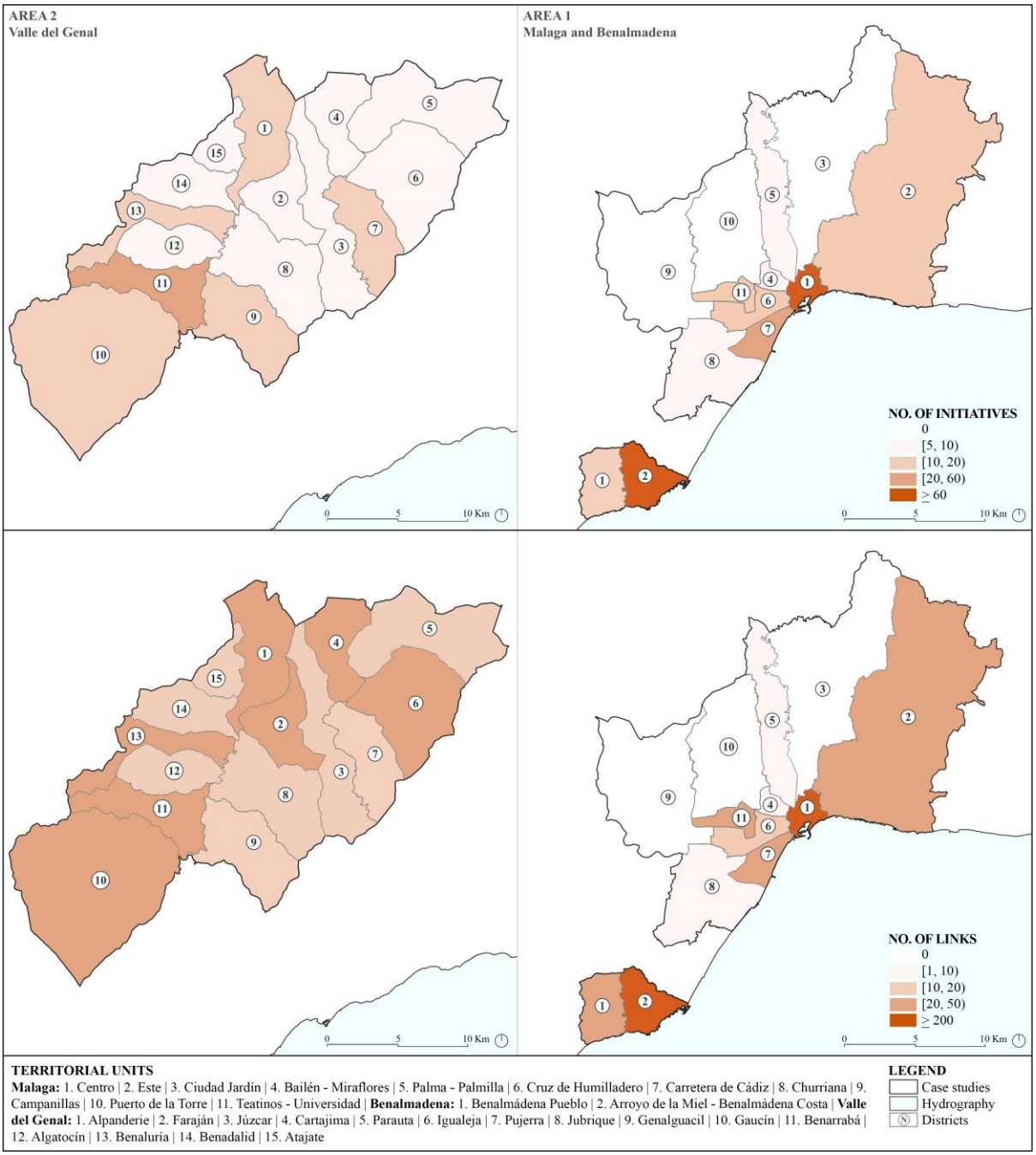

Figure 6. Density map of citizen initiatives and links (Sources: Cartographic base (Instituto de Estadística y Cartografía de Andalucía [IECA], 2021), Territorial units (Ayuntamiento de Málaga, 2021b; IECA, 2021)).

Differences can be seen according to (1) how many links there are per active citizen initiatives and (2) how many initiatives with the same number of relationships exist (see **Figure 7**). Mention should be made of the presence of citizen initiatives without links with other nodes being higher in Valle del Genal with more than 50% of mapped initiatives. Nevertheless, this number of isolated nodes decreases in the case of Benalmadena behind Malaga. On the contrary, it should be noted that this trend is reversed if we consider how many initiatives relate to another. Moreover, although there is a greater number of interrelated initiatives in the urban and denser areas of Malaga and Benalmadena, the highest relationship is found in the rural areas of Valle del Genal. It could be explained as follows: (1) the presence of citizen initiatives is lower in rural areas because the citizenry is collectivised into fewer groups, but they tend to be cohesive among themselves to work together; (2) there is a greater emergence of citizen initiatives in urban areas, but they are related to each other in smaller thematic networks according to the goals pursued.

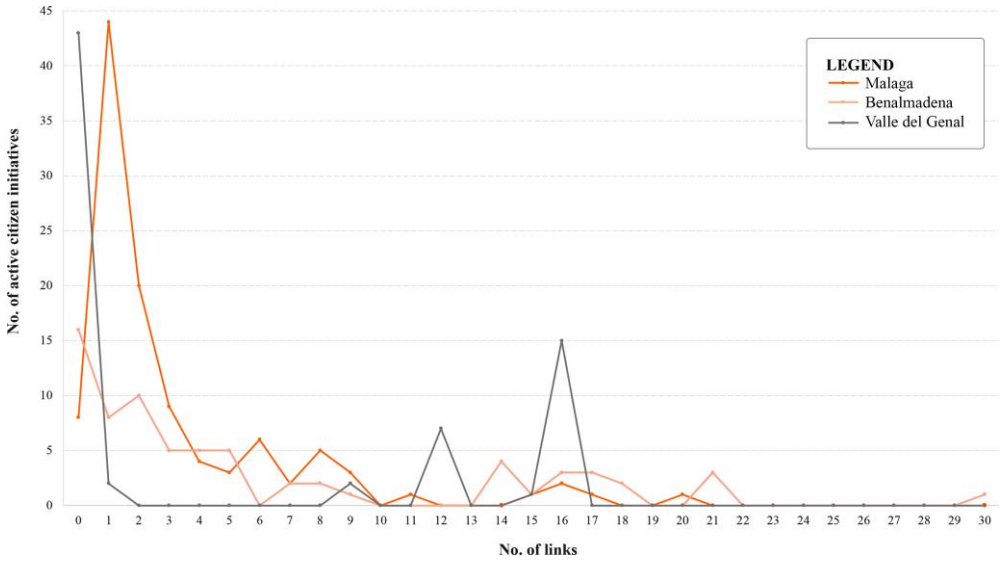

Figure 7. Relationship between the number of initiatives and their relationships with others (Source: Authors).

Several interviews were also conducted with reporting agents and citizen initiatives to identify new citizen initiatives with they are related. Moreover, content analysis of transcripts of the interviews was helpful in verifying and completing data collection. The total number of interviews was 9, 10, and 4 for the cases of Malaga, Benalmadena, and Valle del Genal, respectively. All the information collected was used to categorise active citizen initiatives regarding the location where they operate, the kind of organisation, and the area in which they work. Regarding the location from where they spread across the territory, most of them are run from headquarters (see **Table 4**). The use of cultural spaces as a place to meet is also noted, apart from the case of Valle del Genal, where the public space is considered a meeting point to come together. In some cases, especially for citizen platforms or collectives, the use of social networks is just the place where they organise, share information, and make decisions about strategies to address specific issues.

Table 4. Active citizen initiatives categorised by attributes: location, stakeholder, and topic (Source: Authors).

Attributes		**Active citizen initiatives (no.)**		
Type	**Name**	**Malaga**	**Benalmadena**	**Valle del Genal**
Lctn.[1]	Cultural centre	22	19	0
	Headquarter	69	25	55
	Online	7	3	1
	Public space	12	5	14
	Others	0	19	0
Stkh.[1]	Aggrupation	2	3	17
	Association	50	59	36
	Club	6	5	5
	Collective	9	0	2
	Corporation	2	0	0
	Federation	3	0	4
	Foundation	2	2	2
	Local government	11	0	0
	Organisation	2	0	2
	Platform	9	1	1
	Social movement	5	1	1
	University	9	0	0
Topic[2]	Accessibility	8	1	2
	Architecture	8	1	0
	Care	15	13	2
	Citizen participation	6	2	8
	Cult	1	3	0
	Culture	31	27	24
	Diversity	8	7	20
	Education	12	11	11
	Elderly people	3	10	6
	Environment	17	9	38
	Equality	6	14	17
	Health	6	9	8
	Intangible Cultural Heritage	16	14	41
	Integration	8	23	3
	Mediation	0	21	18
	Self-management	17	2	22
	Social policy	18	0	4
	Social rights	14	16	16
	Sport	3	12	5
	Sustainable mobility	6	3	3
	Tangible Cultural Heritage	4	4	6
	Tourism gentrification	61	9	0
	Urban art	4	1	2
	Urbanism	17	4	17

[1]Abbreviations: Lctn. = Location; Stkh. = Stakeholder.
[2]An active citizen initiative can cover more than one topic.

As regards the kind of organisation, the top one in each case study is the

association. The most variety of types is found in the case of Malaga, where university research groups and local government areas are even involved in the activist reality. Informal emerging groups, such as social movements and collectives, are also mainly operating in the case of Malaga. It could be explained by the dynamic nature of the cities and how the citizenry is more able to collectivise and call for urban solutions to meet local demands and needs. The wide presence of aggrupation in the case of Valle del Genal is also highlighted. This group of entities may be due to the need to work together in the rural environment to support each other as the presence of initiatives is lower in those locations.

The areas with which citizen initiatives are involved are very varied, with a total of 24 topics identified. Tourism gentrification is most popular and current issue among citizen initiatives in the case of Malaga, which also extends—albeit to a lesser extent—in the sun-and-beach destination of the municipality of Benalmadena. This is also noticeable in current platforms regarding the safeguarding of heritage (García González et al., 2022; Jan, 2018) and environmental issues (Grossberndt et al., 2020; Jelks et al., 2018; Toro Herrera et al., 2021). Other themes shared in both cities are the strategies for safeguarding cultural and intangible values in the urban context, as well as the implementation of integration programmes for social rights. Nevertheless, the issues are different in the case of Valle del Genal, with the environment topping the list. In this regard, few research studies are based on environmental platforms for the preservation of the territory against pollution and human impacts (Albano et al., 2015; Ingensand et al., 2015; Narciso et al., 2021). In the rural context, citizens are concerned about the dissemination of intangible cultural heritage assets, as well as the need to create industry for the local economy.

4. Conclusion

The implementation of collaborative platforms for citizen participation has been possible using GIS. The relational approach in the design has combined social networking with physical location as a novelty. Thus, the paltIC webGIS platform has served as a collaborative map for the promotion of synergies between active citizen initiatives. The relational approach through geolocalised social graphs provides information not only on how many initiatives have been identified, but also on how they are interconnected. This knowledge is crucial for meeting citizen initiatives with similar or shared goals, and fostering collaborations for common projects. The findings of the analysis have shown that urban areas have a higher number of nodes in the central areas, but the cohesion between them is stronger in rural ones according to the number of links per initiative. Nevertheless, this research is not extent of several limitations that should be assessed: the collection of initiatives in large cities requires technical support to identify and verify data over time; the access to official entities listings in rural areas is limited; and the implication of local government is crucial for the promotion of collaborative work with the citizenry. Thus, future research may develop plugins to improve and create features for participatory processes, validate the data collection with fieldwork, and complete the spatial analysis of graph through the social network theory approach.

Author contributions: Conceptualization, FJCN; methodology, FJCN; software, FJCN; validation, FCA and FJCN; formal analysis, FCA and FJCN; investigation, FCA and FJCN; resources, FCA and FJCN; data curation, FCA and FJCN; writing—original draft preparation, FJCN; writing—review and editing, FCA; visualization, FCA; supervision, FJCN; project administration, FJCN; funding acquisition, FJCN. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by (1) ERDF funds (UMA20-FEDERJA-131), (2) R+D+i project of the Ministry for Science and Innovation in Spain (PID2020-116850RB-I00), and (3) the research project "Analysis and applicability of reactivation strategies for depopulated historic centres of medium-sized cities: The case of Velez-Malaga" supported by ERDF funds (Research projects applied to research groups, Research and Transfer Plan of the University of Malaga—Research group PAID-HUM-969). The first author is supported by the University of Malaga (A.3.1. Posdoctoral bridge contract, Postdoctoral Fellowship—Research and Transfer Plan). The second author is supported by the Spanish Ministry of Universities through a PhD grant (FPU21/04662).

Acknowledgments: The authors would like to thank Salvador Salgado-Alcaraz and Rubén Pérez-Belmonte for their technical support in the data collection of the Benalmadena and Valle del Genal case studies, respectively.

Conflict of interest: The authors declare no conflict of interest.

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