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D2.1 – Stakeholders Map with profiles, social survey analysis, and defined roles

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Executive summary

This report offers a comprehensive analysis of the socio-economic and political-legal contexts at the three RETIME pilot sites (Lisbon, Žilina, and Tartu). This analysis draws on data from multi-format surveys targeting building occupants and key local stakeholders, such as representatives of local associations and government offices. It identifies social perceptions of various risks at both district and building levels among residents, public authorities, and other key local stakeholders.

This stakeholder analysis focuses on different factors, including education, age, gender, wage distribution, socio-economic conditions, country of origin, income levels, climate concerns, and technology literacy. This survey integrates results from both on-site surveys and semi-automated remote surveys undertaken during the first 8 months of the project execution, providing a comprehensive understanding of the local contexts.

This report lays the basis for a people-centred approach for developing tailored RETIME solutions, offering insights into the needs, perspectives, barriers, social perceptions of risks, and roles of various stakeholders across the three RETIME pilot sites.

D2.1 aims to inform vulnerable groups, building users, owners, and managers within these three pilot areas, as well as policy and decision-makers, environmental practitioners, industrial stakeholders, SMEs, and members of other EU sister projects.

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List of acronyms and abbreviations

ATM	Automated Teller Machine
BERT	Bidirectional Encoder Representations from Transformers
BGRI	Base Reference Geographical Information
CA	Consortium Agreement
CAOP	Carta Administrativa Oficial de Portugal (Official Administrative Charter of Portugal)
CDE	Communication, Dissemination, Exploitation
CEDA	Centre of Design for All
CES/OSIRIS	Risk Observatory of the Centre for Social Studies
CML	Câmara Municipal de Lisboa (Lisbon City Council)
EC	European Commission
EPAL	Empresa Portuguesa das Águas Livres (Portuguese Company of Águas Livres)
EPI	European Energy Poverty Index
EU	European Union
GABIP	Gabinetes de Apoio aos Bairros de Intervenção Prioritária (Support Offices for Neighbourhoods of Priority Intervention)
IBS	Institute of Baltic Studies
INE	Instituto Nacional de Estatística (Portuguese National Statistics Institute)
ISTAR	Information Sciences, Technologies and Architecture Research Centre
LDA	Latent Dirichlet Allocation
LSA	Latent Semantic Analysis
ML	Machine Learning
NACE	Nomenclature of Economic Activities
NEB	New European Bauhaus
NGO	Non-Governmental Organisation
NLP	Natural Language Processing
NUTS	Nomenclature of Territorial Units for Statistics
PALOP	Países Africanos de Língua Oficial Portuguesa (Portuguese-speaking African countries)
PCA	Principal Components Analysis
PIM	Power-Interest Matrix
SEOF	Stakeholder Engagement Options Framework
SRC	Slovak Red Cross
SME	Small and Medium Enterprise
SoVI	Social Vulnerability Index
SV	Social Vulnerability
TF-IDF	Term Frequency-Inverse Document Frequency
WWTP	Wastewater Treatment Plant
ŽSK	Žilina Self-Governing Region

1. Introduction

This report presents the analysis of the socio-economic and political-legal contexts of the RETIME pilot sites in Lisbon, Žilina, and Tartu. It also outlines the methodological framework for sociological research and the analysis of social risk perceptions, combining traditional approaches like statistical data analysis, questionnaires, and focus groups with cutting-edge analytical tools and public digital datasets. This analysis thus employs a mixed-method research approach, including diverse social surveys and multi-format data sources to provide real-time insights on stakeholder mapping.

The report is organised into seven sections. Following the Introduction, *Section 2* provides a brief overview of RETIME pilot sites and the main features of their respective urban districts, focusing on architectural, cultural, political-legal and socio-economic characteristics.

Section 3 identifies key stakeholders, including local organisations and public authorities, and maps their roles and engagement using the Power-Interest Matrix (PIM).

Section 4 outlines topics and objectives of the on-site social surveys and off-line questionnaires conducted across the three pilot sites along with the preliminary results. These social surveys aim to assess social perceptions of challenges and various climate-related risks among residents, public authorities, and other key stakeholders, while also evaluating levels of climate concerns and technology literacy.

Section 5 expands beyond traditional on-site survey to describe semi-automated remote surveys of selected digital platforms related to the pilot sites, at national, city, and neighboured level.

Section 6 introduces a survey framework aimed at evaluating social vulnerability across RETIME pilot sites. This framework helps characterise community exposure levels and provides insights into their capacity to respond to and recover from disasters during the post-disaster period.

The conclusions in *Section 7* underscore key insights derived from the collected data, emphasising the expected impact and significance of this stakeholder analysis in guiding the development of effective, forward-looking RETIME solutions, fostering more participatory approaches to build environment management and urban planning policies.

1.1. Main topics and RETIME interrelated deliverables

This report relates to the following RETIME topics and deliverables (Figure 1):

- *Background analysis of RETIME pilot sites* and *climate literacy*, as outlined in *D1.1. Report on urban vulnerability and risk assessment (multi-risk resilience) methodologies and tools*, related to preliminary hazard analysis and serving as basis for identifying climate literacy among local key stakeholders.
- *Regulatory Framework, Policies, and Initiatives* relevant to RETIME pilot sites, detailed in *D1.2. Report on existing long-term resilience visions and adaptation solutions in the pilot areas*.
- *Ethical Principles Compliance* as identified in *D7.2. Quality Plan*, with a focus on diversity, inclusion, gender mainstreaming, and intersectionality in RETIME stakeholder engagement processes.
- *Privacy and Participant Rights*, as defined in *D7.4. Data Management Plan*, covering the collection, processing, and communication of personal or sensitive information.

Methods defined in the deliverable D2.1 will be applied throughout the project, specifically for inequalities identification (WP1/T1.4), stakeholder engagement and co-design activities (WP2/T2.2 and T2.3), vulnerability mapping (WP3/T3.1 and T3.3), as well as communication and dissemination activities (WP6/T6.1 and T6.3).

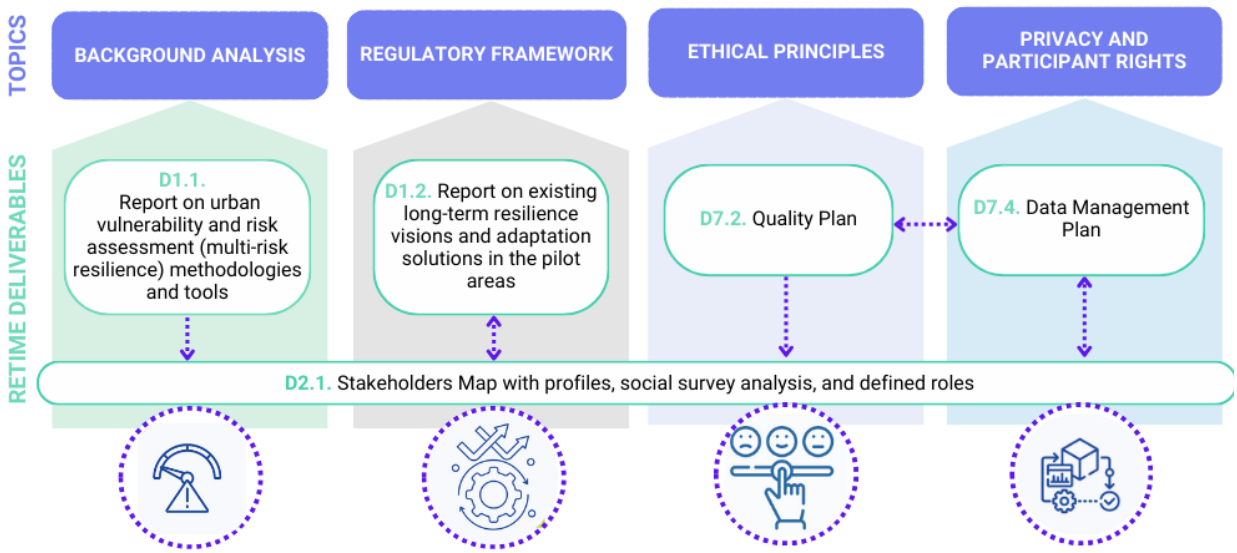


Figure 1. Main topics of this report (D2.1) and RETIME interrelated deliverables.

1.2. Challenges and limitations

Overall, the main challenges of this study include the restricted time frame of the analysis, the heterogeneity of the pilot areas, and the complex dimensions associated with the topic under analysis. This social survey will be supplemented by additional stakeholder engagement activities running until M42 (October 2027).

Within this backdrop, a potential comparative analysis is also limited by data asymmetries and the distinct characteristics of the three RETIME pilot sites. Regarding the statistical analysis, the data granularity varies across the pilot sites. In Lisbon, specifically in the *Bairro da Boavista*, socio-demographic data were collected at the neighbourhood level. In contrast, for the Tartu pilot site, such data was available only at the city level. Meanwhile, in Žilina, the granularity differed by data type: some socio-demographic data was available at the district level, while other types were only available at the city level.

The primary aim of this study – to establish a real-time stakeholder framework for the future development of RETIME solutions and services – is constrained by the dynamic nature of the selected urban districts and the challenges posed by socio-economic factors within the limited timeframe of analysis.

Despite these limitations, this analysis contributes to provide a transdisciplinary framework that covers various scientific fields to develop efficient physical and digital solutions focused on users' needs and vulnerabilities. Although this project incorporates strong technical components, it avoids a purely technocratic approach. In the project RETIME, participatory processes and governance strategies are prioritised to foster collaboration among the public and private stakeholders.

This goal is pursued through a comprehensive stakeholder-based framework drawn from social sciences disciplines, including *sociology* (values, norms, behaviours), *economics* (socio-professional and family structures), *psychology* (psychosocial perceptions), and *human geography* (spatial distribution and territory use), to incorporate the unique social, economic, and cultural characteristics of each pilot site. Specifically, by analysing the socioeconomic contexts and mapping stakeholders at each pilot site, this study focuses on the perceptions, vulnerabilities, and weaknesses of different groups, for mitigating risks and reducing disaster vulnerability.

The on-site and off-site stakeholder activities, tailored specifically for each pilot site and described in the deliverable D2.1, represent an initial step toward empowering local communities and diverse interest groups to express their needs and aspirations. These activities aim to foster trust in the project RETIME and encourage active participation.

2. RETIME pilot areas at a glance

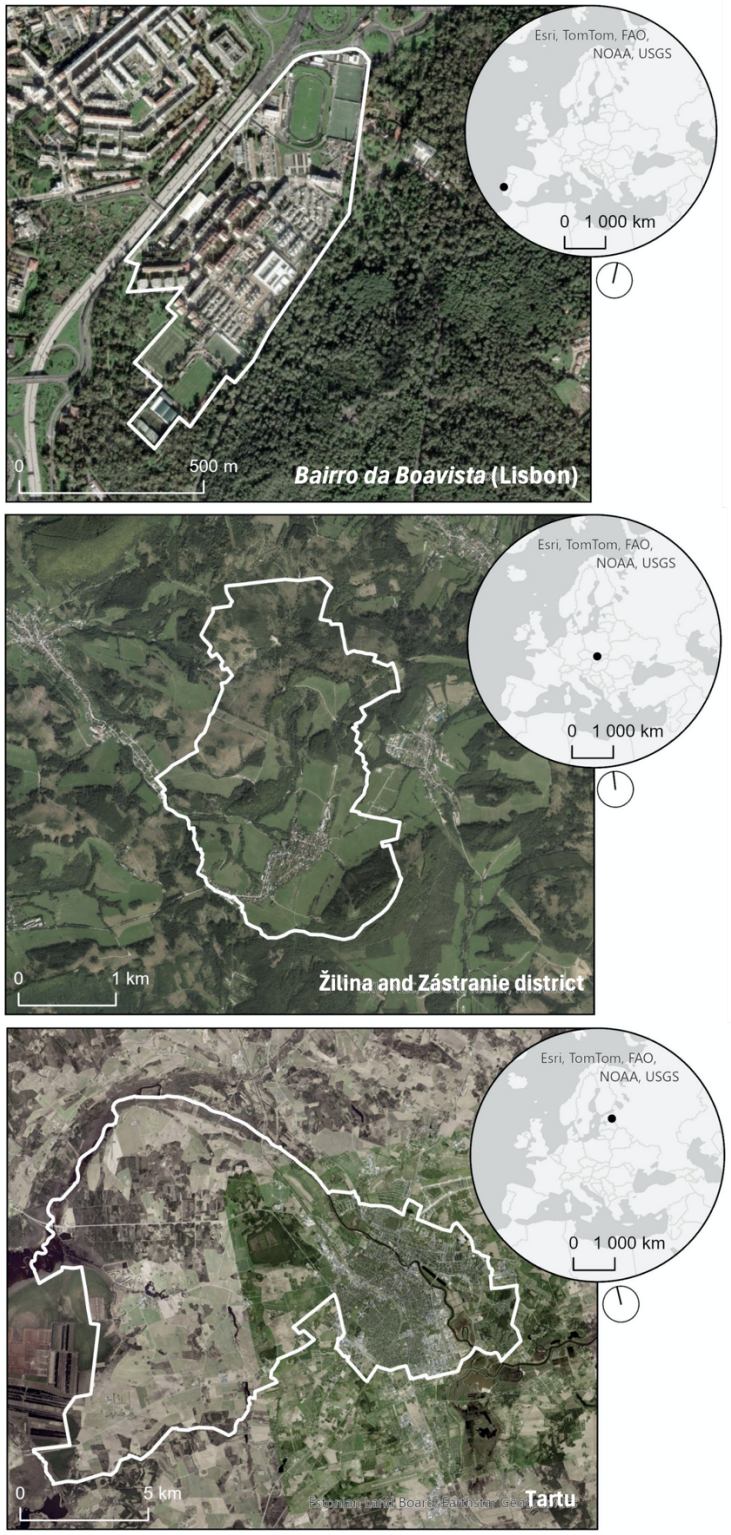


Figure 2. Maps of RETIME pilot sites (source: World Imagery, 2024).

Section 2.1 offers an overview of the three areas analysed (Figure 2), detailing their selection as pilot sites for this project. *Section 2.2* delves into the key aspects of each case study, providing insights crucial for shaping future urban resilience and mitigation-adaptation initiatives.

2.1. RETIME pilot sites

Bairro da Boavista: Meaning *Neighbourhood with a Good view*, it is primarily a municipally owned area located in the north-western outskirts of Lisbon, the capital of Portugal, along the slopes of Monsanto Mountain and bordering the municipality of Amadora (Figure 2, *top*). Amadora and Lisbon are both part of the Lisbon Metropolitain Area (AML), which comprises 18 districts. The AML has 2 870 208 inhabitants (Census data of 2021) and covers an area of 3 000 Km^2. With approximately 1,900 residents, the *Bairro da Boavista* is situated near the Monsanto Forest Park, which spans 1,000 hectares, as well as the Pina Manique Stadium and the Lisbon Regional Ring Road (CRIL- Circular Regional Interior de Lisboa). This neighbourhood was developed in response to population boom and housing crisis that affect the city the 1930s and 1940s. It was constructed under the Portuguese Estado Novo dictatorship, a period that shaped the national urban development (Antunes, 2018; Costa Agarez, 2018). Since its founding, this neighbourhood has evolved through various construction phases, adapting to the capital's social, political, and economic changes.
This district was selected as a RETIME pilot site for its high population density within the municipal housing stock, diverse urban and architectural solutions despite economic constraints, and participation in other public programs (*Section 2.2.1*) or rehabilitation works planned within this district and in the city (e.g., a flood risk mitigation plan, 2016-2030).[1] Located in a peripheral area of Lisbon city, the district faces social vulnerabilities (e.g., high unemployment rate and low levels of formal education attainment), but benefits from strong community cohesion, a sense of belonging, and ties to its natural park surroundings.

Zástranie neighbourhood: The city of Žilina is divided into 19 city urban districts. The Social Services Centre Straník (SSC Straník – the pilot building for RETIME project) is in the urban district of Zástranie. This urban district is in the relatively remoted valley surrounded by hills, at the foothill of Straník Mountain, 8 km far from the city itself (Figure 2, *centre*). Zástranie is accessible

[1] The General Drainage Plan of the city (https://planodrenagem.lisboa.pt/), with an investment of 133 million euros, aims to redirect rainwater to the Tagus River by replacing reservoirs with inter-basin transfers. This will involve constructing two collector tunnels: Monsanto-Santa Apolónia and Chelas-Beato.

from the Žilina city via the regional road no. 2070, built after World War II, and from the village of Teplička nad Váhom.

The other urban districts situated in the closest proximity are those of Zádubnie and Brodno. Considering the number of inhabitants, which is approximately 925 (based on the population statistics of the Žilina city, 2023), Zástranie belongs to the smallest city neighbourhoods/districts. Formerly being an independent municipality, Zástranie became a part of the Žilina city in 1980. Due to its historical development, it is mostly characterised by individual housing construction. Apart from single family houses and SSC Straník, there is a church and a football stadium; the most of other services are provided down in the Žilina city.

This district was chosen as a RETIME pilot site because Slovakia ranks 24th out of 28 European countries on the European Energy Poverty Index (EPI), indicating it performs poorly compared to other European nations in addressing energy poverty.[2] The chosen hotspot is particularly vulnerable to multiple hazards, which are increasing in both magnitude and frequency due to climate change. These challenges are compounded by social vulnerabilities, including populations with special needs, and structural vulnerabilities, such as buildings of special interest.

Tartu historic city centre: Tartu is the second most populous city in Estonia after the capital Tallinn. As a residential neighbourhood, Tartu city centre is the 5th most populous neighbourhood of Tartu (around 7% of Tartu's population, totalling around 6,900 people residing there). Tartu city centre is one of Tartu's 18 neighbourhoods. It is located along the Emajõgi river (Figure 3, *bottom*), and it is logistically reachable through major roads and due to its advanced public transportation system, with smart ticketing and real-time tracking.

This district was selected as a RETIME pilot site because it exemplifies how a forward-thinking approach to urban planning can create a model for eco-friendly living, serving as an inspiration for other communities. While Estonia and Tartu historic city centre have been working to improve its energy efficiency and accessibility, there are still challenges in ensuring that all citizens have access to affordable and adequate energy services.

[2] The domestic energy expenses are the highest in the European Union. Based on Eurostat data (2019), 7.8% of the Slovak population is unable to keep home adequately warm (EU average is 7%). This number increased significantly since 2010 (4.4%). The situation is worse in some social groups: 10.8 % of single parents with dependent children and 14 % of single persons and pensioners are exposed to the same problem. The share of people living in dwellings with a leaking roof, damp walls, etc. is quite even across the population (5%). However, there is a higher share of single people (7%) and single people with dependent children (over 8%) living in these conditions (https://www.euractiv.com/section/energy-environment/news/half-of-slovaks-could-struggle-to-pay-energy-bills/)

2.2. Architectural and cultural features

2.2.1. Bairro da Boavista

The development of the social neighbourhood *Bairro da Boavista* reflects key phases in Portuguese national history, spanning from the dictatorial Estado Novo regime to the democratic consolidation following the April 1974 Revolution. Built for families with limited economic resources, the neighbourhood's construction was the first response in the late 1930s to eradicate shanty towns and clear space for road infrastructure development in the city. With the revolution of 25 April, the neighbourhood saw a process of mass occupation of houses, without any organisation or criteria, by people from the neighbourhood itself who were living in overcrowded contexts, and by families from abroad, namely returnees from the former Portuguese colonies, accentuating the social and urban disorganisation of the area.

The construction of this neighbourhood took place in several phases. In the first phase (1940), this settlement included 488 single-family houses in wood and fibre cement, a chapel, and other several public equipment, including primary schools, a social centre, a nursery, a kindergarten, the market, and the public washhouse. These houses were then demolished. Meant to be for temporary use under Removable Houses Program (Law nº 28912, 1938), these buildings were designed for immigrants living clandestinely in Lisbon urban areas that needed to be relocated. *Bairro da Boavista* had grown up progressively during three main phases: i) 220 houses in 2 quarters (1945-1960); ii) 38 masonry lodging houses (1961-1970), 520 single-family houses in masonry (1970) that were partially demolished in 2016; and iii) 13 lots with 230 units (1980-1984). In 1988, until 1999 with the PER (*Programa Especial de Realojamento*, meaning Special Rehousing Programme), a total of 819 dwellings were built, allowing the *Bairro Velho da Boavista* to be demolished. As a result, the number of homes increased from 488 to approximately 1,500. In the 1990s the police station, the sports pavilion was built, and the opening to the public of the Municipal Swimming Pool and the first pharmacy in the neighbourhood were installed. In 2009, the City Council designated the *Boavista* neighbourhood as an *'Eco-Bairro'*, launching initiatives to transform it into a model for environmental sustainability, social development, and urban innovation. *Eco-Bairro* program is included in 'Coopetir', an environmental sustainability project, which entails a collaborative methodology, potentially applicable to other neighbourhoods in Lisbon. This district was also included in the Programme BIP-ZIP-Neighbourhoods and Areas of Priority Intervention in 2011 as one of the 67 districts indicated as 'priority intervention' areas requiring improvement of the infrastructure, education, employment, health, culture, and overall community well-being.

At the end of the 1980s, the CML - Câmara Municipal de Lisboa (Lisbon City Council) signed the 'Medium-Term Intervention Programme', which completed the construction of housing aimed at eradicating shacks, promoting the rehousing of several families. In May 1997, the CML created

the municipal company Gebalis, with the mission of managing the maintenance and modernisation of the municipal neighbourhoods, associating social integration and resident participation in its actions, and from that date onwards developing various neighbourhood recovery and rehabilitation projects.

2.2.2. Žilina and Zástranie neighbourhood

Žilina is the fourth largest city in the Slovak Republic, an administrative, cultural and economic centre of north-west Slovakia as well as the capital of the Žilina Self-Governing Region. The city covers the area of 80 km^2 and the number of inhabitants reaches approximately 80 000 (October 2024). Žilina is one of the most important transport nodes for national as well as European highway and railway transport network. It is also the seat of the Žilina University, founded in 1953, which is focused on technical and industrial fields of study like engineering, machinery, and IT technologies. The first official record of the city dates to 1208. The most precious historical monuments were built in the medieval times, e.g., the Budatín Castle or the Church of St. Stephen the King. The medieval heart of the city contains an urban landmark reservation, the core of which is Marian Square with its typical burghers' homes. Žilina has three major churches in the centre, built from the 14th to 18th centuries, which are among the dominant architectural features of the city. The second influential period in the cultural development of the city occurred in the first half of the 20th century and left a couple of famous constructions built in the most update styles of those times. Žilina is famous for the unique Neologic Synagogue, projected by Peter Behrens, that is closely connected with the Jewish residents. The Rosenfeld Palace, from the beginning of the 20th century, as well as the Art House Fatra represent secession style. Experts on architecture consider Žilina to be the centre of Slovak functionalism that inspired the architects of many city buildings or urban districts.

Given the vibrant cultural significance of Žilina, the urban district of Zástranie has played only a minor role in the area's history. The municipality was founded in 14th century and was owned by the nobility from the Old Castle. Zástranie was inhabited by farmers during most of its history, preoccupied with sheep breeding. The original settlement started to develop along the Snežnica Creek and its ground plan is partially apparent till nowadays in the oldest part of the urban district. From the second half of the 20th century on, originally wooden houses have been replaced by brick ones that slightly disrupted the original plan. The local church was built in 2000. In 1980, Zástranie was included among the urban districts; however, its remoted location has differentiated it from the other natural urban districts till nowadays.

The pilot building selected for RETIME was built in 1935 and originally hosted an elementary school. Since 1995, the Social Services Centre Straník, a residential facility for mentally disabled men, has operated there. The two-storey building, comprising 22 rooms, lacks insulation against heat and cold. Its last major renovation was in 2001, when a roof superstructure was added.

2.2.3. Tartu historic city centre

It is known for being Estonia's academic cradle due to the University of Tartu (the oldest university in the country), a Hanseatic merchant town, the heart for national independence movement and the birthplace of Estonia's Song Festival, Estonia's National Museum and Estonia's first national theatre (Vanemuine) among else (Tartu ajalugu).[3]

The city centre is an area with a specifically rich cultural, architectural, and natural atmosphere because Tartu city centre is deemed to be the place where the historic roots of the entire contemporary city of Tartu can be traced back to. Specifically, Tartu city centre can be characterised by the Town Hall along with its Square, the Ministry of Education, theaters, museums, shopping centres, the University of Tartu, the Old Town, the visually distinctive Toomemägi and the botanical gardens among else (Tartu City Government, Kesklinn). The historical presence and significance of the city centre is also conveyed through the Urban Protection area placed on the Old Town in Tartu city centre, specifically the neo-classical late 18th- and early 19th-century buildings and the remains from the medieval times (Kallast, 2021). Further, the city centre is known as the central location for creative industries in Tartu, supported by the rental pricing policy of the City of Tartu (Tartu Regiooni Energiaagentuur, 2021). The city centre has also developed smart city solutions, including energy-efficient buildings and smart lighting systems and includes green spaces.

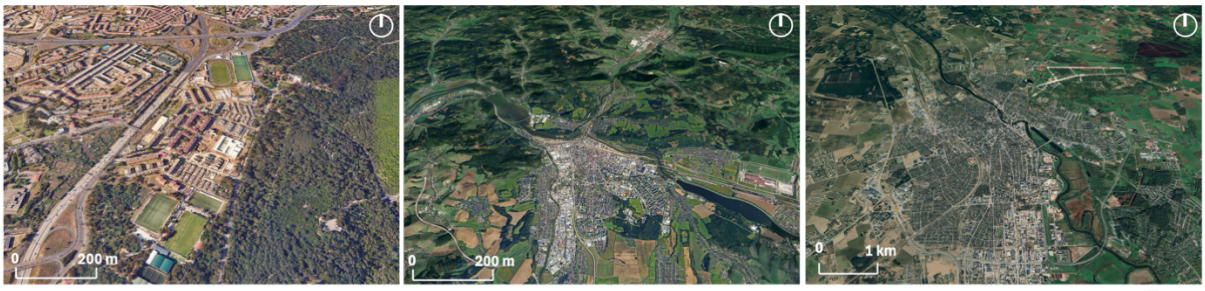


Figure 3. Aerial views of the RETIME pilot sites (source: Google Earth).

[3] https://tartu.ee/et/tartu-ajaloost [Accessed 30.10.2024]

2.3. Sociological characterisation of the population in RETIME pilot sites

2.3.1. Statistical data analysis

This study characterises the populations at the RETIME pilot sites, focusing on the sociographic and sociological dimensions of the neighbourhoods, and identifying factors that shape social identities. Table 1 outlines the main indicators for the sociological characterisation analysis, while the key elements of social risk perceptions will guide the organisation of focus group sessions on representations and social practices in the neighbourhoods throughout the project.

Table 1. Statistical data to sociological characterisation of population.

Socio-Demographic Profile	**Objective**
Population Trends: Changes in population size (absolute population and population density), geographical origins, and (im)migrations, including place of birth and nationality	Analyse resident population based on their geographical origins, nationality, and any ethnic groups. This analysis helps identify specific temporal movements, enhancing the understanding of neighbourhood occupancy dynamics.
Age structure and gender (age pyramid, functional groups, youth/adult and adult/youth ratios)	Understand the distributions, gender ratios, and potential aging indices (support for defining social support policies based on these distributions) social facilities, comfort conditions, and habitability.
Individuals and families (composition/size of the household and type of family)	Allow the analysis of occupational densities and housing typologies according to household composition and type.
Socio-economic status	**Objective**
Qualifications (education level, educational degree)	Literacy and education levels to 'assess' potential discrepancies and uniformities in terms of the analytical and interpretive capacity of the population. A useful element for defining educational policies targeted at different age and socio-professional groups, based on their abilities.
Employment and socio-professional composition	Employment status – employed/unemployed and activity rate – working profession/unemployed, sectors of activity, distribution by gender.
Socio-habitational status	**Objective**
Housing typology	Correlation with household composition and size, which can be complemented with housing conditions (existing infrastructure in the dwelling and its maintenance status).
Legal status (owner, rental, tenant)	This indicator can help understand residents' perceptions of the home and neighbourhood (belonging, integration, and level of rootedness).
Sociocultural profile	**Objective**
Cultural practices and representations	Assess involvement in groups and communities, such as cultural and sports organisations, religious associations, and neighbourhood or condominium activities.
Access to neighbourhood services and resources	Use of social facilities, services, and businesses in the neighbourhood, allowing for the identification of potential shortages, support, and subsidies that may exist.
Neighbourhood Networks and Sociability	Integration mechanisms based on the identification of family members and neighbours, allowing the establishment of an indicator of social integration or exclusion.

Based on the 2021 national population and housing censuses, along with other official databases, a quantitative analysis is conducted to assess social characteristics. This is complemented by data from online questionnaires, door-to-door surveys, and focus group discussions on each pilot site (*Section 4*). Statistical data analysis provides insight into key sociographic characteristics of the sample, such as length of residence in the neighbourhood, gender, age group, education level, employment status, housing legal status, and membership in local groups, clubs, or associations. This type of information from official statistical data sources, indicated at the urban level, is then integrated with more detailed data at the district level during the *ad hoc* social surveys.

2.3.2. Bairro da Boavista

The *Boavista* neighbourhood is a small socio-territorial area (Area: 5.6 km^2) that is often perceived as a working-class area. This perception largely arises from its historical background and socio-urban development. Key factors include its peripheral location and the population composition, issues that have not always been adequately addressed by public authorities, both in terms of current and emerging challenges. This analysis is based on a set of collected data and official reports from Lisbon City Council and Gebalis, and statistics from the Instituto Nacional de Estatística (INE, 2021, the National Statistics Institute of Portugal),[4] at both section and subsection level.

2.3.2.1. Age and gender dimension

In line with the demographic European trends, where populations are ageing, the *Boavista* neighbourhood features a relatively intergenerational balance, though this trend is not yet as pronounced. As shown in Figure 4, the population of elderly residents (65 years and older) is roughly symmetrical to that of children (0-14 years old). The youth-to-adult ratio is 31.8% (approximately 31 young people per 100 adults), closely matching elderly-to-adults ratio, which stands at 32.1 (approximately 32 elderly people per 100 adults).
Females make up approximately 53% of the neighbourhood's total population, outnumbering men overall. This gender imbalance is particularly pronounced in the 50-and-over age groups.

[4] https://censos.ine.pt/xportal/xmain?xpgid=censos21_main&xpid=CENSOS21&xlang=pt [Accessed 30.11.2024]

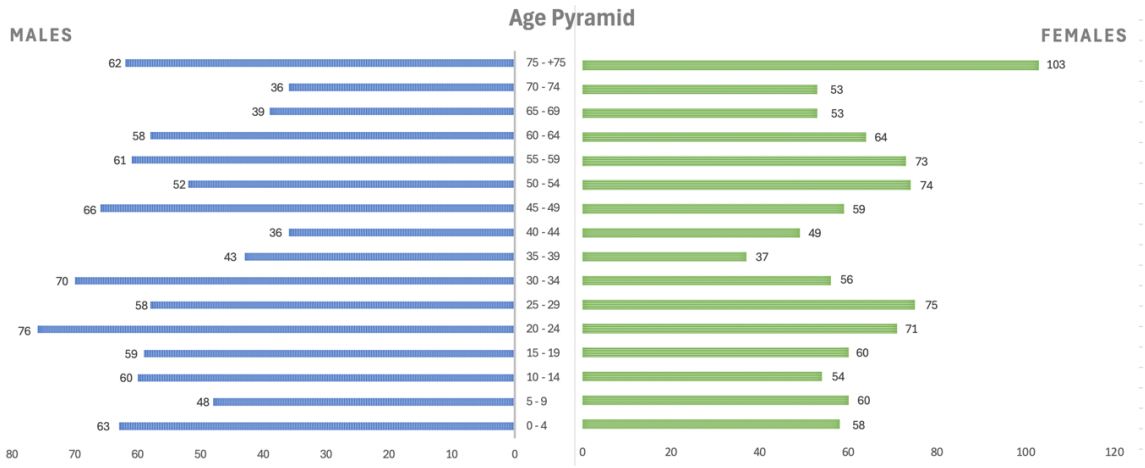


Figure 4. Age pyramid in the Bairro da Boavista, Lisbon, adapted from INE (2021).

2.3.2.2. Employment and Economic Activities

The activity rate stands at 33.9% meaning the non-activity rate is 66.1%, for a total of 1.886 respondents. When cross-referenced with the declaration on the nature of working conditions, the figures produce contrasting results. The calculated total decreases to 1,134 respondents, which could indicate a significant level of informal activity in the neighbourhood. A significant portion of the population is retired (32.6%), especially females accounting for 34.8% of this group. Additionally, unemployment is notable at 10.5%, including those seeking either their first job or a new one. Table 2 shows the labour status and economic activity in the district, while data at the district level is only available by economic sector (Table 3).

Table 2. Labour status in Bairro da Boavista, Lisbon (INE, 2021).

Labour condition	Gender			
	Males		Females	
	No.	%	No.	%
Employees	252	47.46	268	44.44
Unemployed 1st job	18	3.39	8	1.33
Unemployed new jobs	50	9.42	44	7.30
Students	46	8.66	45	7.46
Households	5	0.94	28	4.64
Retired people	160	30.13	210	34.83
Total	**531**	**100**	**603**	**100**

In *Bairro da Boavista*, the tertiary sector activities prevail, accounting for 83.6% of the employed population. Notably, females represent nearly 59% of the residents involved in tertiary sector activities. In contrast, the secondary sector is predominantly male, with males accounting for

84% and females just 16%, showing the greater involvement of females in tertiary activities and men in industrial work.

However, other sources (e.g., INE, 2021, information from CML, and newsletters) indicate that residents at the parish level are employed in sectors such as commerce and retail, education services, restaurants and hospitality, construction and maintenance, technology and professional services, and domestic and care services. The Benfica Parish Council, which includes the *Bairro da Boavista*, also offers certified training in areas like gardening, paving, and mechanics, further highlighting the presence of these professions within the community.

Table 3. Economic Activity in Bairro da Boavista, Lisbon (INE, 2021).

Activity Sector	Gender			
	Males		Females	
	No.	%	No.	%
Primary	3	1.19	0	0.00
Secondary	69	27.38	13	4.85
Tertiary	180	71.43	255	95.15
Total	**252**	**100**	**268**	**100**

It is important to highlight the difficulties in obtaining reliable information on the economic activities of the inhabitants in the neighbourhood. A significant portion of these activities appears to take place within the informal economy, operating outside official records, though this cannot be quantified.

2.3.2.3. Educational Attainment

The formal education level in *Bairro da Boavista*'s population is low, as shown in Table 4.

Table 4. Level of education in Bairro da Boavista, Lisbon (INE, 2021).

Level of Education	Gender			
	Males		Females	
	No.	%	No.	%
No formal education	166	18.71	234	23.42
1st Cycle of Basic Education (Primary)	272	30.67	323	32.33
2nd Cycle Basic Education (Lower Secondary)	153	17.25	156	15.62
3rd Cycle Basic Education (Upper Secondary)	178	20.07	141	14.11
Secondary or Post-Secondary Education	106	11.95	116	11.61
University education	12	1.35	29	2.90
Total	**887**	**100**	**999**	**100**

While this significantly impacts the economic opportunities and resources that the inhabitants can mobilise to maintain their comfort and quality of life, its influence extends beyond purely material considerations. Other resources, especially those tied to schooling and professional

training, are crucial for the future of the community and the well-being of the residents of this urban centre. In this area, the fact that around 21.2% of the population (males: 18.7% and females: 23.4%) do not declare any level of schooling is relevant and may indicate high rates of illiteracy. This trend is more pronounced among females, accounting for almost 59% of the total. On the other hand, although the overall number is relatively small, approximately 70% of those who declare having with higher education are females. Nearly 65% of the population have basic education, which is divided into three cycles. The largest proportion is in the first cycle, which accounts for 48.6% of the total of basic education.

2.3.2.4. Families and housing

As indicated in the data collected from Gebalis in 01.06.2024, the most common family type in the neighbourhood is the 'complex family',[5] representing 26.6% of households (Figure 5). This is followed by the single family at 20.9% and the single parent family at 19.4%. Nuclear Families with children make up 17.9%, while those without children represent 12.5%. The data also indicates an average household size of 4.28 people.

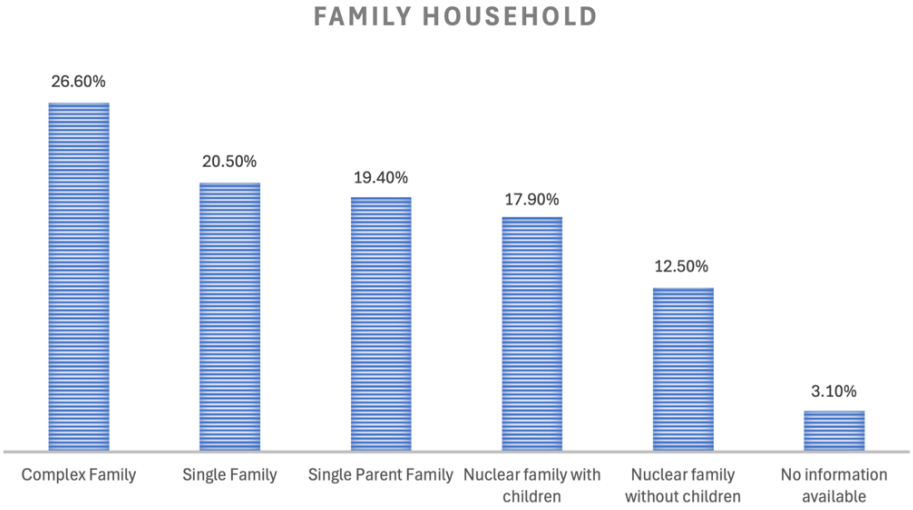


Figure 5. Family Household in Bairro da Boavista (Lisbon), adapted from INE (2021).

The 2021 Census data from INE does not offer a breakdown to assess the information, but it does highlight the distribution of households into three groups. Households with 1 to 2 people account for 49.2%, households with 3 to 4 people 31%, and households with 5 or more people represent 19.9%. Although the composition of families is not identified, an approximate

[5] Families with members of varying degrees of kinship, including nieces and nephews, aunts and uncles, brothers- and sisters-in-law, and godparents (the latter two refer to relationships created through marriage, specifically the parents of one partner and the parents of the other).

correlation can be made (requiring official confirmation) between households of 1 to 2 people and categories such as one-person families and single-parent families. This suggests the potential presence of isolated individuals in the neighbourhood, though further verification is needed to confirm this.

The housing typology is also an important indicator in the neighbourhood. The predominant housing type is the so-called 'classic family dwellings for habitual residence' with 3 or 4 rooms, classified as T2 or T3, making up 59.1% of the total. This classification reflects the interior layout, where a T2 includes a living room and two bedrooms. Studio and one-bedroom apartments follow at 34.1%, while T4s or larger account for 6.8%. Most dwellings, whether houses or flats, have areas ranging from 50 to 99 m^2, comprising 72% of the total. Smaller dwellings, up to 49 m^2, represent 16.2%, while those between 100 and 149 m^2 make up 10.3%. Regarding building characteristics, although 96.9% of buildings have five or more floors, 90.9% lack elevators, hindering accessibility for individuals with limited mobility.

The neighbourhood is predominantly rented, with the vast majority of which being municipal property managed by Gebalis, a public company created in 1992 for promoting local development through the promotion and management of real estate.[6] Under this legal framework, 94.5% are tenants, and only 3.3% are building owners, and about 2.1% fall into other categories. This is also relevant information for the intervention process, emphasizing the need for effective communication and active participation from residents. Engaging the community can help foster a sense of ownership and belonging for encouraging them to contribute to the upkeep of the neighbourhood's buildings and infrastructure, even though they do not own the properties.

This neighbourhood is home to approximately 160 individuals from communities originating in the PALOP - *Países Africanos de Língua Oficial Portuguesa* (Portuguese-speaking African countries), with a nearly equal gender distribution. Most residents lived outside Portugal before settling here, and 26 individuals hold foreign nationality. This demographic likely reflects the neighbourhood's settlement patterns during the post-25 April 1974 decolonisation period, particularly involving PALOP countries, with a notable presence of individuals from Cape Verde.

2.3.3. Žilina and Zástranie neighbourhood

Žilina, situated in northwestern Slovakia, is the country's fourth-largest city and a hub for the automotive industry. In recent years, both the city and its surrounding region have experienced notable growth in the tertiary and quaternary sectors. Žilina is also renowned as a university town and a popular tourist destination, celebrated for its rich historical and architectural heritage.

[6] https://gebalis.pt/ [Accessed 03.10.2024]

Zástranie, a suburb in the Žilina district, is located about 8 km from the city centre. It is a residential area with individual housing.
Data is presented for the city of Žilina and, where possible, for the Zástranie district, where the Staník senior house is located. Most data are provided by the Slovak Statistical Office at the municipal, county, or regional levels. An exception is labour-related data, which is also available at the city district level.

2.3.3.1. Age and gender dimension

According to the 2021 Census, Žilina had a total population of 82,656, comprising 48.5% males (40,136) and 51.4% females (42,520).[7] Figure 6 shows the age pyramid for the city of Žilina based on the open data (2024).

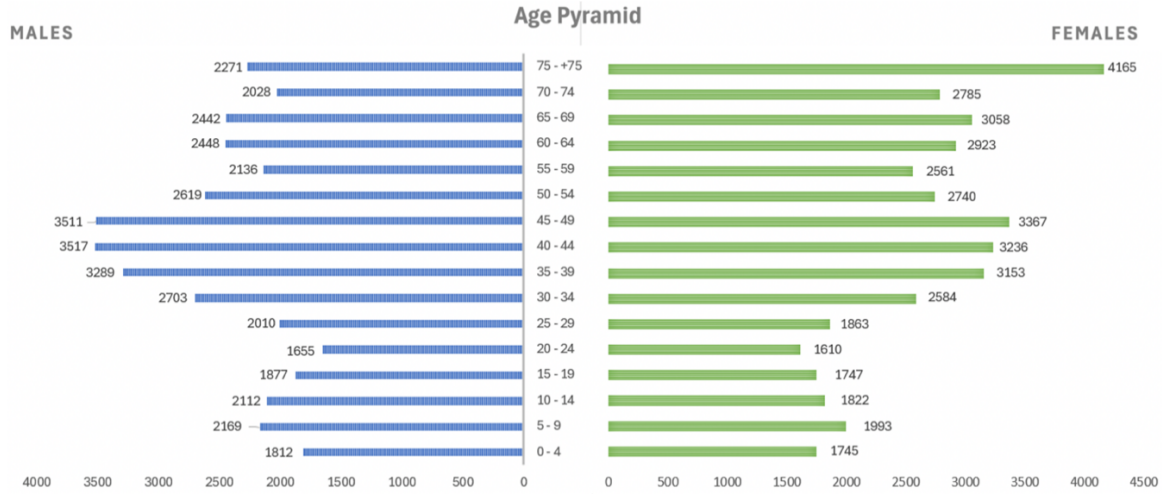


Figure 6. Age pyramid in the Žilina city in 2024, adapted from Statistics Slovakia.

For both genders, the pyramid is significantly skewed towards the mid age and elderly population. This highlights significant aging within the city's population, reflecting a *double aging* phenomenon at both the base and the apex of the age pyramid. The ratio of young people to adults is 22.6%, meaning approximately 23 young individuals for every 100 adults. Meanwhile, the elderly-to-adult ratio is 27.6%. The total number of males (38,599) and females (41,352) is similar. However, males slightly outnumber females in younger and middle-age groups, while females predominate in older age groups due to males' shorter life expectancy.

[7] https://egov.zilina.sk/ [Accessed 09.10.2024]

2.3.3.2. Employment and Economic Activities

Žilina's employment activity rate is 66.5%, with a non-activity rate of 33.4%. Table 5 shows the data of labour condition in Žilina and Zástranie neighbourhood (Census, 2021).[8] Population with current residence by sex, age groups (0 - 14, 15 - 64, 65+) and current economic activity as at 01.01.2021 in the municipality of Žilina is based on Census data.[9]

Table 5. Labour condition in Žilina and Zástranie neighbourhood (Census, 2021).

Labour condition (*city and urban district*)	**Gender**			
	Males		**Females**	
	No.	**%**	**No.**	**%**
Pre-productive age (0-14) (*Žilina*)	6,547	16	5,908	14
Pre-productive age (0-14) (*Zástranie*)	74	15	57	13
Productive age (15-64) (*Žilina*)	27,463	69	27,512	65
Productive age (15-64) (*Zástranie*)	354	72	301	68
Post-productive age (65+)(*Žilina*)	6,126	15	9,100	21
Post-productive age (65+)(*Zástranie*)	66	13	82	19
Total (*Žilina*)	**40,136**	**100**	**42,592**	**100**
Total (*Zástranie*)	**494**	**100**	**440**	**100**

In the pre-productive age group, the proportion of males and females is similar, with children under 14 representing 16% of males and 14% of females in Žilina, and 15% and 13%, respectively, in Zástranie. Among the productive age group, males account for 69% and females 65% in Žilina, while in Zástranie, males are 72% and females 68%. In the post-productive category, females dominate, representing 21% in Žilina compared to 15% for males, and 19% in Zástranie versus 13% for males.

Table 6 summarises the economic activities in Žilina and Zástranie by gender and age. In the productive age group, the proportion of employed males (46.98%) is significantly higher than that of females (36.08%). The proportion of working pensioners is relatively balanced, with females slightly outnumbering males (4.71% *vs* 4.05%). Unemployment is slightly higher among females (3.23%) than males (2.87%). Similarly, a higher proportion of females (1.96%) are on parental leave compared to males (0.14%). The representation of genders among secondary

[8] https://disem.scitanie.sk/SASVisualAnalytics/?reportUri=%2Freports%2Freports%2F646eeba3-60da-4c57-b7f5-36238249da57&sectionIndex=0&sso_guest=true&sas-welcome=false&language=en [Accessed 09.10.2024]

[9] https://disem.scitanie.sk/SASVisualAnalytics/?reportUri=%2Freports%2Freports%2Fdeb0ab62-08ac-4cd4-ba3c-1f1a1f0574e0&sectionIndex=0&sso_guest=true&sas-welcome=false&language=en [Accessed 09.10.2024]

school and university students is relatively balanced. In the pre-productive age group, school-age children account for 8.52% of the male population and 7.44% of the female population. A similar trend is observed among preschool children, where males represent 7.57% and females 6.53%. In the post-productive age group, females dominate, with 18.98% of them being retired. On the other hand, there are more working pensioners among males (3.47%) than females (2.83%). The overall data highlights differences in economic activity between males and females across all age categories, with females dominating the post-productive age group while males have a higher representation in productive activities.

Table 6. Economic activities in Žilina and Zástranie neighbourhood (Census, 2021).

Economic age group	Economic activity	Gender			
		Males		Females	
		No.	%	No.	%
Productive age (15-64)	Working (except pensioners)	18,588	46.98	14,742	36.08
	Working pensioners	1,602	4.05	1925	4.71
	Person on maternity leave	78	0.20	364	0.89
	Person on parental leave	55	0.14	799	1.96
	Unemployed	1,137	2.87	1,318	3.23
	Secondary school student	1,294	3.27	1,279	3.13
	College/university student	831	2.10	850	2.08
	Person at home	837	2.12	2,199	5.38
	Pensioner	1,593	4.03	2,081	5.09
	Capital gains beneficiary	75	0.19	55	0.13
	Primary school pupil	163	0,41	124	0.30
	Other	974	2.46	501	1.23
Pre-productive age (0-14)	Primary school pupil	3,369	8.52	3,042	7.44
	Pre-scholar	2,994	7.57	2,669	6.53
Post-productive age (65+)	Working pensioner	1,373	3.47	1,155	2.83
	Pensioner	4,592	11.61	7,757	18.98
	Capital gains beneficiary	2	0.01	1	0.00
	Other	7	0.02	3	0.01
Total		**39,564**	**100**	**40,864**	**100**

Figure 7 provides an overview of employment in the city of Žilina by economic activity sectors in 2023, classified by Nomenclature of Economic Activities (NACE Rev. 2 sectors). The total number of jobs across workplaces is 48,706.[10]

[10] https://datacube.statistics.sk/#!/view/en/vbd_urbanaudit/pr3701rr/v_pr3701rr_00_00_00_en [Accessed 09.10.2024]

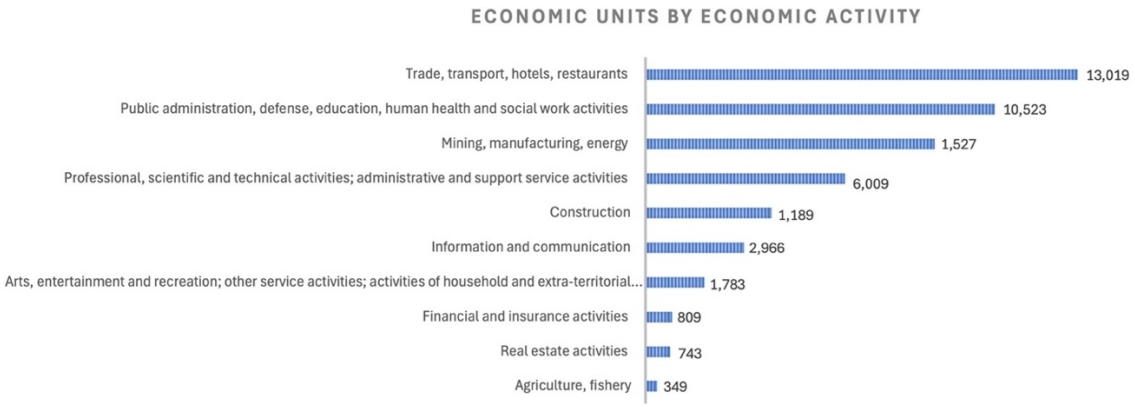


Figure 7. Units in Žilina's economic activity profile (2023), adapted from Statistics Slovakia.

The largest share of employment is in trade, transport, hotels, and restaurants (26.73%), followed by public administration, defence, education, healthcare, and social work (21.61%). Mining, manufacturing, and energy account for 17.87%, while professional, scientific, and technical activities, along with administrative support services, make up 12.34%. The remaining sectors, such as construction (7.80%), information and communication technologies (6.09%), and arts, entertainment, and recreation (3.66%), have smaller but still significant contributions to employment. The agriculture and fishery sector has the lowest representation, accounting for only (0.72%) of jobs, consistent with the urbanised nature of the city. This analysis highlights the diversity of employment in Žilina, with dominant sectors in services, industry, and public administration.

2.3.3.3. Educational Attainment

Table 7 provides an overview of the educational structure of the population in the city of Žilina by economic age groups and gender.[11] In the pre-productive age group, most children (11.87% of males and 9.93% of females) have no formal education, as they are just starting their educational journey. Approximately 4% of children in this category have completed the first cycle of basic education, with boys slightly outnumbering girls. In the productive age group, the most common level of education is secondary or post-secondary education (36.27% of males and 31.79% of females). University education indicates a higher level of education among females in this age group. Conversely, lower secondary education is attained by 4.66% of males and 4.42% of females, while the proportion of those with only the first cycle of basic education

[11] https://disem.scitanie.sk/SASVisualAnalytics/?reportUri=%2Freports%2Freports%2Fcb90bb27-0924-4336-b8f0-340f715c0df9&sectionIndex=0&sso_guest=true&sas-welcome=false&language=sk [Accessed 09.10.2024]

remains low. In the post-productive age group (8.64% of males and 13.66% of females), the most common level of education is secondary education but did not obtain a formal graduation certificate or diploma. University education is less common in this age group, with 5.31% of males slightly outnumbering 3.85% of females. The proportion of individuals with no formal education is very low and almost negligible in this category. The data reveal differences in educational attainment between genders and economic age groups. Women in the productive age group have a higher proportion of university graduates, while men are more likely to have secondary education.

Table 7. Level of education in the city of Žilina (Census, 2021).

Economic age group	**Level of Education**	**Gender**			
		Males		**Females**	
		No.	**%**	**No.**	**%**
Pre-productive age (0-14)	No formal education	4,765	11.87	4,223	9.93
	1st Cycle of Basic Education (Primary)	1,719	4.28	1,633	3.84
	2nd Cycle Basic Education (Lower Secondary)	0	0.00	2	0.00
	Undetected	63	0.16	50	0.12
Productive age (15-64)	No formal education	84	0.21	45	0.11
	1st Cycle of Basic Education (Primary)	313	0.78	236	0.56
	2nd Cycle Basic Education (Lower Secondary)	1,872	4.66	1,881	4.42
	3rd Cycle Basic Education (Upper Secondary)	287	0.72	255	0.60
	Secondary or Post-Secondary Education	14,556	36.27	13,515	31.79
	University education	8,563	21.33	10,485	24.66
	Undetected	1,750	4.36	1,065	2.50
	Confidential	38	0.09	30	0.07
Post-productive age (65+)	No formal education	7	0.02	5	0.01
	1st Cycle of Basic Education (Primary)	36	0.09	124	0.29
	2nd Cycle Basic Education (Lower Secondary)	210	0.52	1,000	2.35
	3rd Cycle Basic Education (Upper Secondary)	84	0.21	267	0.63
	Secondary or Post-Secondary Education	3,466	8.64	5,807	13.66
	University education	2,133	5.31	1,639	3.85
	Undetected	176	0.44	251	0.59
	Confidential	14	0.03	7	0.02
Total (Žilina)		**40, 136**	**100.00**	**42,520**	**100.00**

2.3.3.4. Families and housing

Table 8 provides an overview of the marital status of the population in the city of Žilina, per economic age groups and gender, as of 1 January 2021.[12]

Table 8. Population by sex, age, and marital status in Žilina (Census, 2021).

Economic age group	Marital status	Gender			
		Males		Females	
		No.	%	No.	%
Productive age (15-64)	Never married	12,495	31.13	9,744	22.92
	Married	11,924	29.71	13,213	31.07
	Divorced	2,644	6.59	3,641	8.56
	Widowed	195	0.49	843	1.98
	Unknown	205	0.51	71	0.17
Pre-productive age (0-14)	Never married	6,547	16.31	5,908	13.89
Post-productive age (65+)	Never married	228	0.57	593	1.39
	Married	4,588	11.43	3,666	8.62
	Divorced	578	1.44	1,177	2.77
	Widowed	719	1.79	3,659	8.61
	Unknown	13	0.03	5	0.01
Total		**40,136**	**100**	**42,520**	**100**

In the pre-productive age group, the entire population is categorised as never married. In the productive age group, the proportion of individuals who are married is significantly high, including 29.71% of males and 31.07% of females. Those who have never been married account for 31.13% of males and 22.92% of females. Divorced individuals make up 6.59% of males and 8.56% of females, with females having a slightly higher proportion in this category. The share of widowed individuals in this group is comparatively very low.

In the post-productive age group, widowed individuals are prevalent, representing 7.19% of males and 8.61% of females. Married males and females account for 11.43% and 8.62%, respectively. The proportion of individuals who have never been married is lower in this age group. The data show gender differences in marital status: females have a higher share of widows in older age groups, while males are more likely to remain married.

[12] https://disem.scitanie.sk/SASVisualAnalytics/?reportUri=%2Freports%2Freports%2Fb5c23df3-ded3-417c-b0b4-b249d5932ede&sectionIndex=0&sso_guest=true&sas-welcome=false&language=en [Accessed 09.10.2024]

In the city of Žilina, there are 7,602 family houses and 1,819 residential buildings.[13] Most houses (7,962) are owned by individuals. The social service centres in Žilina are owned by the Žilina Self-Governing Region, the town of Žilina, and the church (two legal entities and one NGO).

2.3.4. Tartu historic centre

This section focuses on the sociographic information on Tartu's historic centre, but when specific data for this area is unavailable, it includes city-wide data due to analytical similarities that do not affect the interpretation. This approach also supports the development of the social vulnerability index model (*Section 6*) that covers a broader area beyond the urban limits. This brief sociographic overview highlights certain idiosyncrasies unique to Tartu, though limited data availability constrains a more comprehensive analysis. Nevertheless, the city's overall socio-economic and cultural development levels support meaningful engagement with the project RETIME.

2.3.4.1. Age and gender dimension

Tartu's population has remained relatively stable over the past decade (2014–2023), with a trend of population growth since 2022. The total population is approximately 101,032, with females making up 53.3% (53,842) and males 46.7% (47,190) as of 2024 (Figure 8). The historic centre, like the city, has shown stable population numbers, though slight increases have led to higher population density. With around 6,948 residents, it also has most females (56.50%, or 3,927). Population density in the historic centre increased from 3,592 people per km^2 in 2020 to 3,860 people per km^2 in 2023, indicating residential growth in this urban area.[14] In terms of age groups in the historic centre, young people (0-19 years) make up about 22.00%, adults (19-64 years) account for 64.00%, and seniors (65+) represent 14%. The youth-to-adult ratio is 33.7% (roughly 34 young people per 100 adults), while the senior-to-adult ratio is 22.5% (about 22 seniors per 100 adults). The overall dependency ratio (youth and seniors to adults) is approximately 53.10%. While following European aging trends, Tartu's historic centre shows a less pronounced shift, with a notable presence of young populations, likely due to the educational facilities in the area

[13] 8,471 houses are supplied with water from the public system, 8,973 have a gas connection, 8,009 are connected to the sewerage system, and 7,373 houses are classified as renovated. The total number of dwellings in the city of Žilina is 37,024. Of these, 7,747 are in family houses and 27,836 in residential buildings. Council dwellings represent 1,085 units. The mean floor area of a dwelling is 80.17 m^2. Dwellings supplied with water from a common source account for 35,648 units, and 13,952 dwellings are heated with gas. https://www.scitanie.sk/en/my-municipality/SK031B517402 [Accessed 09.10.2024]
[14] https://juhtimislauad.stat.ee/en [Accessed 03.12.2024]

and their attendance by these age groups. In 2024, after Estonia, most people in Tartu County were born in non-EU countries, with Ukraine most common, followed by Russia, and Finland ranking fourth.

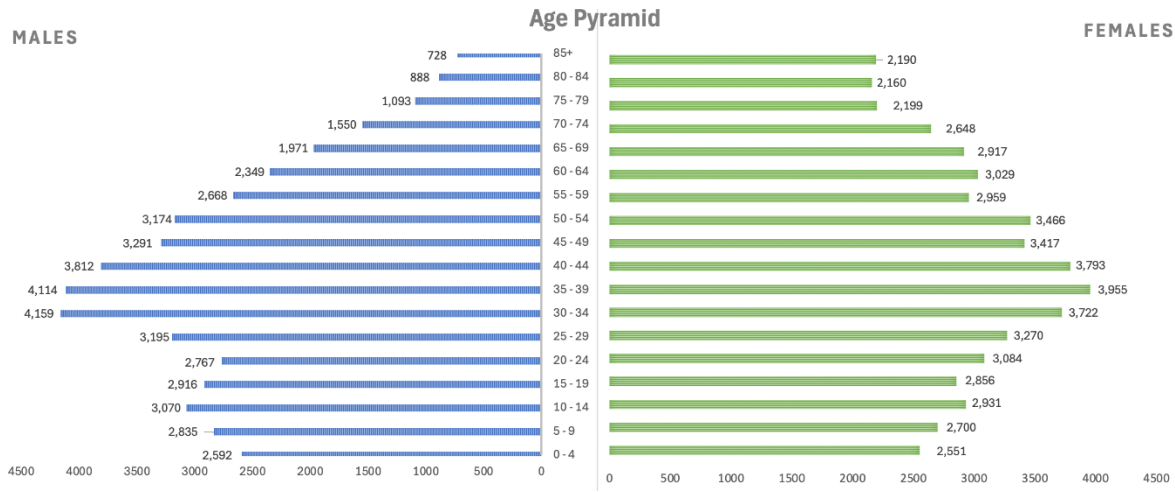


Figure 8. Age pyramid in Tartu (2024), adapted from Statistics Estonia.

2.3.4.2. Employment and Economic Activities

The employment rate in Tartu County is 72.7%. In the city of Tartu, the economy is focused on the tertiary and quaternary sectors, with a strong emphasis on scientific and technical professions, which rank second in terms of economic activity (Figure 9).

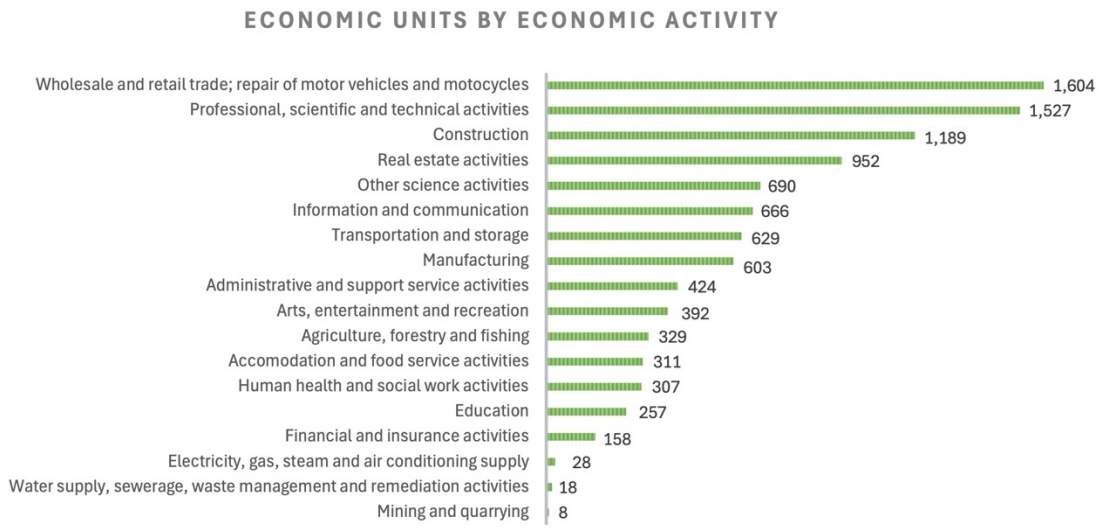


Figure 9. Units in Tartu's economic activity profile (2023), adapted from Statistics Estonia.

The primary and secondary sectors are smaller, with notable activities in construction, manufacturing and agriculture, forestry, and fishing. In 2021, 60.0% of individuals aged 15 and

over in Tartu were employed. The active-to-inactive ratio stands at 66%, indicating a high activity rate. Among the inactive population, 16% are children (0-14 years) and 18 are seniors (65+), some of whom remain professionally active. The majority of the unemployed (3,319 individuals) are aged 25-54, 61.3% of the total unemployed population. Additionally, 19,877 people are retired, with 91% receiving old-age pensions and 9% due to disability or other reasons. Although these data do not specifically refer to the historic centre, the similarities suggest a population with sufficient qualifications to participate in the planned activities, indicating potential for effective governance mechanisms to engage them in the project RETIME.

2.3.4.3. Educational Attainment

Literacy rates are very high in Tartu (Figure 10), most of Tartu's population has higher education or specialised secondary education (51%) or secondary or vocational education (38.5%). A minority have completed only basic education or lower levels of schooling (10.5%).[15] The distribution of education levels by gender on the national level shows a clear female dominance in higher education. Conversely, males outnumber females in lower education levels, with 16.1% and 50.2% in basic or lower education and secondary or vocational education, respectively, while females account for 8.1% and 39.1%. Although complete data on all schools in the historic centre is lacking, the available information indicates high attendance and use, both by residents and external commuters. Primary education is attended by 2,681 children, while over 15,000 students are enrolled in higher education.[16]

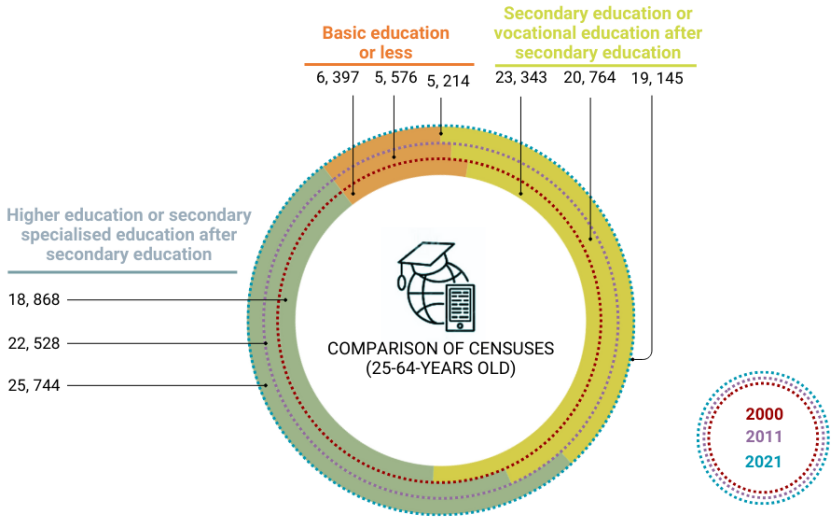


Figure 10. Population in Tartu by educational attainment (2000, 2011, 2021), adapted from Statistics Estonia.

[15] https://rahvaloendus.ee/en/results/education [Accessed 05.12.2024]
[16] https://tartu.ee/et/statistika [Accessed 05.12.2024]

2.3.4.4. Families and housing

The average household size in Tartu County is 2.5 people. Single-person households make up 33.6%, followed by families with children (31.7%), single mothers (14.5%), and households with five or more members (11.2%). A notable 59% of elderly retired females live alone (values referring to the total of Estonia in 2021).[17] Tartu, like other regions, has experienced migration, with significant communities from Russia (11%) and Ukraine (5%) in 2023. At the same time, the population density in the pilot area of Tartu has steadily increased since 2020.[18] As of 2021, in Tartu flat ownership or tenancy is more common than private house ownership or tenancy in Tartu. The most common legal status is flat ownership (53.1%), while the least common is private house tenancy (0.96%). In Tartu historic centre, ownership of buildings varies among private individuals, the city government, and the University of Tartu.

[17] https://rahvaloendus.ee/en/results/households-and-families [Accessed 05.12.2024]

[18] https://app.powerbi.com/view?r=eyJrIjoiZDczNDJjNzQtMmVhYy00ZDZiLTlmYmEtMGZjNTIyMjMzOTM0IiwidCI6ImJmMjEzMWEwLThmNjgtNDgxMy04NGVmLTJiZTQzNDdlZDM4ZSIsImMiOjh9 [Accessed 05.12.2024]

3. Stakeholder mapping

Section 3.1 provides a preliminary overview of local associations, social organisations, and public authorities in the three RETIME pilot sites, highlighting their roles, challenges, and collaborative potential, along with a summary of leadership structures, key decision-makers, and governance practices, focusing on role distribution and decision-making processes among these entities. Based on this preliminary stakeholder mapping, *Section 3.2* focuses on the exercise built within this project to develop effective engagement strategies.[19]

3.1. Institutions for Risk Mitigation and Social Engagement

RETIME pilot sites showcase strong inter-agencies collaboration and active involvement of numerous long-established local associations, some of which are shown in Figure 11. Information on governmental and non-governmental institutions across the three RETIME pilot sites related to social engagement and support, public health and security, urban planning, and information system is indicated in Annex A.

Lisbon: Lisbon City Council oversees urban governance, managing infrastructure and planning initiatives to enhance quality of life and sustainability. Partnering with entities such as Gebalis and local associations, it fosters social cohesion and inclusion through community-focused projects. In *Bairro da Boavista*, health care is supported by the Monsanto Health Unit, while the Benfica Parish Council ensures resident needs are integrated into local policies. Public security and emergency needs are addressed through collaboration with police, fire services, and civil protection.

Žilina: During the response phase, the City of Žilina, the District Office, the Regional District Office, and the Integrated Rescue System Coordination Centre serve as managing, organising, and coordinating authorities. Meanwhile, organisations such as the Slovak Red Cross, Voluntary Civil Protection, and the District Directorate of the Fire Department and Rescue Service operate as executive bodies. In the area of prevention, these entities collaborate on gathering and processing information, developing crisis documentation, and, importantly, educating and preparing the public.

Tartu: Tartu City Government, Tartu Rescue Department, Estonian Rescue Board, Estonian Defence Forces and Local Defence League (at national level) collaborate closely to ensure efficient response and management during emergencies as well building and public space

[19] The representatives of the three pilot partners (CML, ŽSK, and IBS) completed the exercise by using a step-by-step guide provided by ICONS in M05 (September 2024) and then validated.

management. Figure 11 shows the key local associations across the RETIME pilot sites and their target groups, which include vulnerable communities facing physical, mental, or economic challenges.



Figure 11. Local associations divided by key target groups in RETIME pilot sites.

3.2. Stakeholder mapping exercise

This stakeholder mapping process involves three RETIME Beneficiaries – two public authorities (CML and ŽSK) and one non-profit organisation (IBS) – in a self-mapping exercise using the Stakeholder Engagement Options Framework (SEOF) and the Power-Interest Matrix (PIM) (Phua, 2022). Annex B includes a practical guide for conducting stakeholder exercises.[20] The two exercises enable project partners to establish tailored approaches (and thus management strategies) for each stakeholder based on appropriate engagement levels. The results of this stakeholder exercise will be updated throughout the project RETIME to ensure continuous engagement. *Section 3.2.1* briefly outlines the theoretical framework of this activity. *Section 3.2.2* focuses on the spectrum and Influence-Interest Matrix with exercises for the RETIME pilot sites.

3.2.1. Theoretical framework

Stakeholder engagement is "an iterative process of actively soliciting the knowledge, experience, judgment and values of individuals selected to represent a broad range of direct interest in a particular issue, for: i) creating a shared understanding; ii) making relevant, transparent, and effective decisions" (Deverka et al., 2012, p5).[21]
The stakeholder mapping is based on the 'engagement ladder' developed by Arnstein (1969) and the Integration and implementation Science institute (I2S) Stakeholder Engagement Options Framework (Bammer, 2021), to cope with engagement in research for societal challenges. The New European Bauhaus (NEB) Compass, launched in 2021 by the European Commission, highlights community engagement as a core pillar of NEB guidelines, provide a guiding framework for NEB principles.
Ambition 1: *To consult.* In a participatory initiative, existing communication channels and stakeholder involvement are key components. Projects comply to this ambition when the participants are informed about the project and their progress. The flow of information tends to be predominantly unidirectional, from consortium Beneficiaries to participants. The first ambition corresponds to the *inform* and *consult* of the engagement spectrum.
Ambition 2: *To co-develop.* This ambition addresses participatory projects that involve stakeholders as essential collaborators in formulating the guidelines and goals of the project. The design concepts are collectively refined by both designers and stakeholders, and the latter

[20] The three pilot partners completed the exercise using a step-by-step guide, validated by ICONS in M05 (September 2024). It will be repeated in the project's third and fourth years (WP2/T2.3).

give active input to the problem-solving process. Information exchange is different from the first ambition since it is bi-directional, and solutions are co-created. The second ambition corresponds to *involve* and *collaborate* of the engagement spectrum.

Ambition 3: *To self-govern*. A participatory project should facilitate stakeholders' participation in addressing trade-offs with those holding decision-making, across every phase of the lifecycle of the project (including design, administration, execution, monitoring, and evaluation). The third ambition corresponds to the empower/support in the engagement spectrum.

RETIME's engagement activities follow a multi-level approach, operating locally in the three pilot sites and impacting the local environment. They involve various levels (e.g., private and public authorities) and are interdisciplinary, engaging stakeholders from diverse backgrounds.

3.2.2. The Stakeholder Engagement Options Framework

The framework proposed by Bammer (2021) highlights how to engage with stakeholder in research projects and entails five levels of participation (inform, consult, involve, collaborate, support).[22] Different levels are not mutually exclusive, as stakeholders may participate in activities ranging from public meetings to co-design sessions, where residents and developers collaborate on key requirements for a user-friendly interface.

In RETIME, the guidance spectrum for consortium partners and local stakeholders is divided into: ***Level 1 - Inform and Consult***: the aim is to identify the right way to engage stakeholders in understanding project objectives and aims, through identifying channels and ways to keep stakeholders motivated in joining the second level.[23] ***Level 2 - Involve, Collaborate, Support***: To better define target groups and end users of technologies and services, data from the social surveys and focus groups will be useful to define potential *user personas* (i.e., a profile that represents a subgroup of your the target audience) for different target groups of the project. Then specific co-creation tools and methods will be analysed and included in the 'Engagement Roadmap'. Training sessions for pilot partners on how to use and implement the roadmap will be organised and validation workshops with pilot and technical partners will be held to understand how much co-design activities can take to real implementation in the definition of product and services development.[24] This integrated approach tailors the theoretical framework (*Section 3.2.1*) to RETIME objectives (Table 9) while aligning with NEB principles.

[22] from the IAP2 (International Association for Public Participation) public participation spectrum (https://i2insights.org/2021/11/04/options-for-engagement/)

[23] This first level of engagement supports the stakeholder mapping in WP2/T2.1 and aligns with Communication and Dissemination activities (WP6/T6.1, T6.2, T6.3).

[24] The second level supports designing stakeholder engagement strategies (WP2/T2.2) with a roadmap based on co-design and co-creation for human-centred RETIME products and services.

Table 9. RETIME Stakeholder Engagement Options Framework based on Bammer (2021).

Level of engagement: ***Inform NEB 1***	
General Aim: "*Researchers provide stakeholders with balanced and objective information to assist them in understanding the research. Stakeholders are informed of the project and solutions; activities are related to communicate to them specific results."*	**Goals and outcomes in RETIME**: i) Generate interest; ii) Increase awareness on project outputs and outcomes; iii) Make aware communities in pilot areas about the project, progress, and solutions. ***Example:*** Co-design of communication campaigns.
Level of engagement: ***Consult NEB 1***	
General Aim: "*Researchers obtain stakeholder feedback on the research. Stakeholders provide feedback on alternatives or solutions; activities are dedicated to asking them for information and/or potential insights on specific outputs."*	**Goals and outcomes in RETIME**: i) Receive actionable feedback from communities on analysis, alternatives, or decisions. ***Example:*** Requirements and feedback for RETIME products and services development.
Level of engagement: ***Involve NEB 2***	
General Aim: "*Researchers work directly with stakeholders to ensure that stakeholder concerns and aspirations are consistently understood and considered in the research. Stakeholders are directly involved in the project. Activities implying specific decisions on project outputs are taken reflecting their ideas and concerns."*	**Goals and outcomes in RETIME**: i) Build consensus, co-design of elements of a broader solution. The communities are directly involved in the project. Project decisions reflect ideas and concerns of the communities. ***Example:*** Validation of requirements and co-design to define RETIME solution features.
Level of engagement: ***Collaborate NEB 2***	
General Aim: *"Researchers develop equal partnerships with stakeholders for undertaking the research. Stakeholders are a key partner in the design process. Activities are focused on co-generating ideas, co-creating and co-implementing solutions."*	**Goals and outcomes in RETIME:** i) Integrate stakeholder ideas into decision-making, with communities as key partners, ensuring citizen input is considered wherever possible. ***Example:*** Realisation of prototypes of final solutions involving stakeholder into decision-making processes.
Level of engagement: ***Empower NEB 3***	
General Aim: *"Researchers provide input as requested (...). Stakeholders are the final decision-makers; activities promote their active participation in the definition of exploitation and usage of project outputs or the decision on how to use project results."*	**Goals and outcomes in RETIME:** Empower stakeholders in decision-making and self-governance, with communities finalising project implementation. New local policies or shared solutions support co-valorisation and co-exploitation. ***Example:*** Public policy briefs.

Figures 12, 13, and 14 show the results of the stakeholder mapping exercise, highlighting the engagement levels and motivations for each stakeholder, as defined by the representatives from the RETIME Local Desk Members (CML, ŽSK, and IBS).

INSTITUTIONS & LOCAL STAKEHOLDERS *Bairro da Boavista* (Lisbon)	INFORM (NEB: 1)	CONSULT (NEB: 1)	INVOLVE (NEB: 2)	COLLABORATE (NEB: 2)	EMPOWER (NEB: 3)	MOTIVATIONS BEHIND DIFFERENT LEVELS OF ENGAGEMENT
Polícia de Segurança Pública (PSP) Public Security Police	✓					Representatives can join communication campaigns (2025–2028) to present RETIME solutions and attend the 2028 Steering Committee meeting
Câmara Municipal de Lisboa (CML) Lisbon Town Council	✓	✓	✓	✓	✗	Representatives will engage relevant departments and systems at all levels throughout the engagement process
Direcção Municipal de Manutenção e Conservação (DMMC) Municipal Directorate of Maintenance and Conservation	✓	✓	✓	✓	✗	Representatives will serve as a liaison to other municipal services
Serviço Municipal de Proteção Civil de Lisboa (SMPC) Lisbon Municipal Civil Protection Service	✓	✓	✓	✓	✗	SMPC will coordinate the city civil protection system, including the Lisbon Firefighters Regiment and the Municipal Police
Regimento de Sapadores Bombeiros de Lisboa (RSB) Lisbon Firefighters Regiment	✓	✓	✓	✓	✗	Lisbon Firefighters are the primary force addressing hazards in the city, including fires, floods, rescues, and building fire safety
Polícia Municipal de Lisboa (PM) Lisbon Municipal Police	✓	✓	✓	✓	✗	Municipal Police are an administrative force focused on security, overseeing construction, infrastructure repairs, street vending, traffic control, parking, and supporting City Council activities
Centro de Informação Urbana de Lisboa (CGIUL) Lisbon Urban Information Center	✓	✓	✓	✓	✗	Representatives from CGIUL will identify gaps, priorities, and other information for WP2, WP3, and WP4 activities through periodic bilateral meetings
(representative sample) Local inhabitants of Bairro da Boavista		✓				During the social surveys, participants will share their primary concerns, provide insights about their local area, and discuss the most likely hazard risks
Associação Recreativa Moradores e Amigos do Bairro da Boavista Recreational Association of Residents and Friends of the Boavista Neighbourhood	✓	✓	✓	✓		Participants will provide feedback and be updated on the project progress.They will share their input during the mock-up phase of RETIME solutions
Associação de Reformados, Pensionistas e Idosos Bairro da Boavista Association of Retirees and Elderly of Boavista Neighbourhood	✓	✓	✓	✓		Participants will provide feedback and be updated on the project progress.They will share their input during the mock-up phase of RETIME solutions
Associação de Jovens Seguros & Centro Social Polivalente Association of Safe Youth, Child Reception Center & Multi-purpose Social Center	✓	✓	✓	✓		Participants will provide feedback and be updated on the project progress.They will share their input during the mock-up phase of RETIME solutions
Clube Desportivo Lisboa Águias da Boavista Lisbon Eagles Sports Club & Social and Sports Club of Boavista Neighbourhood	✓	✓				They can collaborate with RETIME Beneficiaries to host an info-day during social and sports events, seeking feedback to improve information systems
Unidade de Saúde Familiar de Monsanto (USFM) Monsanto Health Unit	✓	✓				They can assist in identifying the health conditions of residents, including physical and mental disabilities, providing valuable information that can be integrated into the project
Paróquia de São José Religious Parish of Saint Joseph	✓					The future Religious Parish should be informed about the project, help raise community risk awareness, and be kept updated during emergencies
Junta de Freguesia de Benfica Benfica Parish Council	✓	✓	✓	✓		They can share project information through official and informal channels, and provide socio-economic data on the parish and neighbourhood and relevant activities
Gebalis	✓	✓	✓	✓	✗	They will provide information based on official survey campaigns. They decide the type and mode of implementation of RETIME solutions, and follow all progress of project periodically
Associação Eco-Bairros Eco-Districts Association	✓					They will receive updates on news, events, and project progress through official channels and communication strategies
Associação caboverdeana Cape Verdean Association of Lisbon	✓	✓	✓	✓		During the social surveys, participants will share their primary concerns, provide insights about their local area, and discuss the most likely hazard risks

Figure 12. Engagement level for key stakeholders in Bairro da Boavista (Lisbon).

INSTITUTIONS & LOCAL STAKEHOLDERS Žilina	INFORM (NEB: 1)	CONSULT (NEB: 1)	INVOLVE (NEB: 2)	COLLABORATE (NEB: 2)	EMPOWER (NEB: 3)	MOTIVATIONS BEHIND DIFFERENT LEVELS OF ENGAGEMENT
Association of Social Service Providers in the Slovak Republic			●			This umbrella organisation oversees social centers' needs but lacks details about this pilot site. It can assist with discussing project results and dissemination.
Unity of Pensioners in Slovakia	●					Diverse community of mostly active retirees, covering general topics (pension levels, and residential care is only a peripheral topic). The outputs of the project could be useful for them.
Slovak Association of Insurance Companies	●					They bring together property insurers, so the outcome of the project can be useful to them in terms of product development.
Various specialised social counselling centres of non-public providers operating in the Žilina City		●				They have experience of working with a range of physically and mentally disadvantaged groups. However, they do not focus on people in residential settings. The outputs of the project could be useful for them.
Harmony & Letokruhy & Synnómia Social Services Centres				●		They provide residential social services for disadvantaged groups and share the same facility prototype as SSC Straník, making them suitable for a focus group.
ÚSMEV SMILE - Facility for the elderly				●		They provide residential social services for pensioners. Representatives will participate to social surveys.
Diocesan Charity Žilina Social Services Centre				●	●	During the social surveys, participants will provide insights. Diocesan Charity Žilina is a very similar type of facility as SSC Straník.
Support Services Agency, Non-profit organisation				●		They support people with disabilities to live independently based on their needs and abilities, with decades of experience in Žilina. Their expertise is crucial for preparing an emergency plan
Department of the Chief Architect of the City of Žilina		●				The proposed changes of the building (building renovation passport) should be consulted to be in the proposed architectural standards for the given city neighbourhood.
Construction Office of the City of Žilina		●				Issues permits for building works, ensures compliance with the city's land-use plan, prepares the plan, utilises project results, and may provide data for climate risk analysis.
Association for the Support of People with Mental Disabilities in the Slovak Republic				●		They are very familiar with the needs of people with mental disabilities. Their knowledge could be crucial to the preparation of an emergency plan.
Centre of Design for All (CEDA)			●			As they specialise in designing buildings for all - inclusive design - we can involve them in designing solutions for building refurbishment.
Various organisations cooperating on cultural programmes for clients of SSC Straník	●					Group not relevant to the inputs of the project, but the outputs may be useful to them
District Office Žilina - Department of Crisis Management				●		They manage civil protection, order evacuations, draft public protection plans, provide emergency supplies, process risk analyses, and approve city-level plans. Their expertise is key for emergency planning and the Decision Support platform.
City of Žilina - Crisis Management and Security				●		They handle civil protection, crisis management, damage assessment, evacuation plans, and emergency supplies at the town level. Their expertise is vital for emergency planning and the Decision Support Platform.
Integrated Rescue System Coordination Centre - Žilina		●				They dispatch emergency services, record interventions, and contribute valuable knowledge for emergency planning and the Decision Support Platform.
Regional & Žilina District Directorate of the Fire and Rescue Corps			●			Their experience can be useful in the design and development of an emergency plan and Decision Support Platform.
Regional & Žilina District Directorate of the Police Corps			●			Their experiences can serve as a benchmark for evaluating RETIME proposed solutions.
Army of the Slovak Republic	●					They only intervene in emergency situations when other forces are not sufficient. They may be interested in how decision support platform works.
(representative sample) Local inhabitants		●				During the social surveys, participants will share their primary concerns, provide insights about their local area, and discuss the most likely hazard risks.
Family members of the clients of SSC Straník		●				They understand the nature and needs of their family member who are clients of the SSC Straník and can assess the appropriateness of proposed solutions from the client's perspective
Staff of SSC Straník (nursing, administrative, operational)					●	They will utilise the project results effectively, as they have th best understanding of the facility's customers' needs and can determine what they can manage and what exceeds their capabilities. They should play a key role in decision-making.

Figure 13. Engagement level for key stakeholders in Žilina.

INSTITUTIONS & LOCAL STAKEHOLDERS *Tartu*	INFORM (NEB: 1)	CONSULT (NEB: 1)	INVOLVE (NEB: 2)	COLLABORATE (NEB: 2)	EMPOWER (NEB: 3)	MOTIVATIONS BEHIND DIFFERENT LEVELS OF ENGAGEMENT
Housing associations					✕	Housing associations will be empowered by providing them with the technology developed in the project (e.g., hardware and IT solutions, the building plan). This will help them make decisions to increase their preparedness for natural disasters in the future and ensure a safer living environment.
Elderly citizens			✋			They can be involved in mapping out the risks of their current environment and they can contribute to understanding the vulnerabilities of their dwelling.
Ukrainian refugees	ℹ					They will be informed by the steps taken by the project and the outcomes of the technological developments.
Disabled citizens			✋			They can be involved in mapping out the risks of their current environment and they can contribute to understanding the vulnerabilities of their dwelling.
Low-income families and single parents			✋			They can be involved in mapping out the risks of their current environment and they can contribute to understanding the vulnerabilities of their dwelling.
Other vulnerable groups (e.g., other disadvantaged or displaced groups)	ℹ					They will be informed by the steps taken by the project and the outcomes of the technological developments.

Figure 14. Engagement level for key stakeholders in Tartu.

Based on this analysis, the Power-Interest Matrix (PIM) developed for each RETIME pilot site, along with the representatives from the RETIME Local Desk Members (CML, ŽSK, and IBS), defines each stakeholder's influence and interest in project activities. This matrix will be updated quarterly (Annex B, Exercise 2, Table 18).

In the *Bairro da Boavista*, the defined levels of engagement throughout the project cover the five NEBs, but they require central organisation and information coordination by the CML, due to the ownership and management responsibilities of these entities. Seven public entities will contribute to empowering stakeholders in decision-making and self-governance (NEB 3) for RETIME implementation activities.

In Žilina, a religious entity and a civil one (Diocesan Charity Žilina) along with the SKK Stranik staff will be the main stakeholders associated with NEB 3. In Tartu, the housing associations (identified in Annex A) will be linked to NEB 3 to increase preparedness for natural disasters or other future emergencies.

4. Social surveys

4.1. Methods and samples

The social surveys (online and in-presence focus groups and online questionnaires) were conducted across the three RETIME pilot sites, involving representatives from building owners and managers, parish officials, local associations (*Section 3.1*), and a sample of residents selected based on national statistical data, suggested by local associations (in *Bairro da Boavista* and in Žilina), or that participated in the oPEN Lab and SmartEnCity projects[25] (in Tartu). Before starting the open-ended discussions during in-presence focus groups, participants attended a brief presentation of the project and signed informed consent forms. The questionnaires were also completed by other participants, who were unable to attend the in-person sessions, via the online cloud-based platform (Qualtrics). After the questionnaires were completed, focus groups were conducted by members of the RETIME consortium (ISTAR-ISCTE, UNIZA, ŽSK, or IBS), followed by a debriefing session. The audio recordings of the discussions were automatically transcribed and then manually reviewed by the consortium members present at the sessions.

4.2. Main topics and related questions

Each focus group was conducted addressing the topics outlined in Table 10, while the questionnaires, tailored for key stakeholders, were designed to gather feedback perception of vulnerabilities of each neighbourhood and levels of climate and technological literacy.

Table 10. Focus group participants and social survey objectives across RETIME pilot sites.

Involved stakeholders	Main topics and related questions
Building owners or Building managers	***For public entities*** *Role and responsibilities:* Could you specify the staff resources, skills, training, and other assets that were available when initially began the activities undertaken by your organisation in this district, as well as those currently available? *Key Moments and Challenges:* How has this neighbourhood changed over time? What are the significant milestones in your work in the neighbourhood, including key achievements and challenges?

[25] http://smartencitynetwork.eu/ and https://openlab-project.eu/ [Accessed 30.12.2024]. The surveys under analysis focused on the residents' satisfaction with their neighbourhoods, improving living environments, environmental awareness, and the use of smart homes among other topics.

Involved stakeholders	Main topics and related questions
	Needs: What are the emerging and future needs of residents, and which groups are most vulnerable? Have these needs and groups changed over time? *Ongoing and Planned Projects:* What projects are currently in progress or planned, including their objectives, timelines, expected impact, and allocated resources? This includes social support actions, cultural, sporting, and environmental activities, as well as coordination with other public authorities. *Main vulnerabilities of the neighbourhood:* Experience and examples *Feedback on RETIME:* What is the expected impact of the RETIME project on the district across various areas, including urban, social, environmental, economic, political, and other relevant dimensions? ***For private stakeholders*** See questionnaires for sample of residents
Parish (or City) Councillors	*Current Service:* What services does the Parish Council currently provide in the neighbourhood, such as information systems, technical and administrative support, economic activity assistance, school programs, and subsidies? *Relationships with Local Institutions:* How do you collaborate with other neighbourhood institutions, including building owners, the Residents Association, and other local associations? *Neighbourhood Challenges and Solutions:* What are the primary issues facing the neighbourhood (and nearby areas) across various areas (urban infrastructure, social, environmental, economic, political, security) and what solutions do you propose? Who should be responsible for addressing these issues? *Potential RETIME impact:* What do you see as the main benefits of the RETIME project at district level or municipal level?
Local associations	*Neighbourhood Challenges and Risks*: What are the primary issues and critical aspects (e.g., building maintenance, lack of social facilities, social isolation) in the neighbourhood? What risks are present, and what initiatives or projects are in place to address them, especially concerning climate change and other dangers? *Positive Factors and Community Reception:* What are the main benefits identified in this research project and intervention? How do you anticipate the community will respond, and do you expect acceptance or resistance to the proposed actions? *Social Support and Measures:* What social support measures are currently available to neighbourhood residents? Are there specific resources for different groups, such as individuals or families? *Suggestions for Project Engagement:* Are there additional actions (e.g., information sessions, leaflets) that could help effectively implement and communicate the project to the community?
Sample of residents	*Personal experience on this district:* Length of residing in the district *Neighbourhood Challenges:* What are the primary issues and critical urban aspects (e.g., building maintenance, social facilities, isolation) affecting this neighbourhood, and what initiatives or projects are in place to address these issues? *Risks and Resilience:* What actions, if any, are currently being taken to prepare for and respond to climate change, extreme weather, or other geo-hazards or human-induced risks, and what measures could strengthen the urban resilience?

Involved stakeholders	Main topics and related questions
	Community Resources and Initiatives: Are there existing community resources or new initiatives that could effectively address these challenges, particularly related to climate awareness and disaster prevention? *Individual Contributions:* How can individual residents contribute to a more resilient, sustainable neighbourhood, and what positive factors support this intervention?

4.3. Preliminary insight gathered from focus groups

Tables 11 and 12 outline the general representations and perceptions of the *Bairro da Boavista*, discussed in the focus groups, while Table 13 highlights insights from focus groups with representatives of local associations (Boavista Neighbourhood Child Care Centre, Cape Verdean Association, Association ReTrocas[26]).

Table 11. Insight from focus groups involving public authorities in Bairro da Boavista (CML and Gebalis).

Representatives of Lisbon Town Council (CML) and building owner (Gebalis)	
Strengths	i) A social identity of the population in relation to the neighbourhood; ii) Key investments in the last 15 years improving residents' quality of life; iii) Promotion of building rehabilitation and rehousing; iv) Construction of new facilities (a school, church, and day-care).
Weaknesses	i) Isolation of the neighbourhood and its peripheral situation in the urban context; ii) Low-income populations; iii) Lack of healthiness and hygiene; iv) Deviant behaviours of some residents and security problems (e.g., drugs, traffic); v) No new residents from outside the area; vacant houses are occupied by relatives or neighbours.
Institutional partnerships	i) Partnerships and collaborations with the Lisbon Town Council and Gebalis; ii) Strong synergies with all institutions working in the neighbourhood; iii) Reference to good relations with the local population; iv) Participation in GABIP[27] meetings, where public entities (including the Lisbon City Councillor for Housing, Local

[26] ReTrocas - E9G is a project under the *Programa Escolhas* (*Choices Program*), integrated into the Instituto Português do Desporto e Juventude.

[27] GABIP (*Gabinetes de Apoio aos Bairros de Intervenção Prioritária*, Support Offices for Neighbourhoods of Priority Intervention) is a municipal initiative for local management and coordination, aimed at fostering co-governance in one or more neighbourhoods and Priority Intervention Zones of Lisbon. Its goal is to promote socio-territorial cohesion through the implementation of a local development strategy in these areas.

	Development, and Municipal Infrastructure), address neighbourhood issues; v) Importance of sports associations for supporting the youth of the neighbourhood; vi) Prevention and awareness-raising plans and projects carried out with the municipal civil protection; vii) Strong cooperation and networking with all associations and entities who work in the neighbourhood.
Feedback on RETIME	i) The importance of linking technological initiatives with social actions; ii) RETIME can contribute to neighbourhood improvement, namely create more conditions of thermic resilience in the buildings; iii) Leveraging RETIME as an opportunity to educate residents on recycling practices; iv) Developing digital building renovation passports.

Text in blue indicates the common themes with other key stakeholders (see Tables 12 and 13).

Table 12. Insight from focus groups involving public authorities in Bairro da Boavista (Benfica Parish Council).

Representatives of Benfica Parish Council	
Strengths	i) A social identity of the population in relation to the neighbourhood; ii) Significant public investment in the neighbourhood, including social facilities and services like a Parish Council, a police station, post office, a recently established Health Centre, sports facilities (pavilion and swimming pool); iii) Multiple active associations.
Weaknesses	i) Isolation of the neighbourhood and its peripheral situation in the urban context; ii) Building degradation and lack of structural conditions for thermal comfort and existence of humidity, accentuating risks with heat and cold waves; iii) Low-income populations; iv) Issues related to education and environmental awareness concerning hygiene, urban cleanliness, and the maintenance (or vandalism) of street furniture; v) Deviant behaviours among some residents and marginalisation; vi) Social closure, characterised by 'family continuity' in housing, implying a replacement of tenants, but within the same household, within the neighbourhood, resulting in limited mobility to and from the area; vii) Structural and architectural deficiencies in some social facilities within the neighbourhood, resulting in their underuse and residents' inability to recognise their value; viii) Social risks, including urban insecurity and ethnic tensions between gypsy and Cape Verdean communities; ix) Poor maintenance of the houses, combined with negligence and carelessness by the residents.
Institutional partnerships	i) Partnerships with the Lisbon City Council and Gebalis; ii) Relationships with neighbourhood associations; iii) Strong synergies with all institutions working in the neighbourhood and references to good relations with the local population; iv)

	Participation in GABIP[28] meetings, where public entities, including the Lisbon City Councillor for Housing, Local Development, and Municipal Infrastructure, convene to address neighbourhood issues; v) The importance of sports associations in supporting the youth of the neighbourhood; vi) Prevention and awareness-raising plans carried out with municipal civil protection.
Feedback on RETIME	i) Tackle energy poverty in the neighbourhood; ii) Improve safety conditions, particularly regarding fire risks; iii) Implement thermal-level improvements by installing materials that improve comfort and hygiene, such as external wall insulation; iv) RETIME can help enhance comfort and promote energy sustainability for people in their homes.

Text in blue indicates the common themes with other key stakeholders (see Tables 11 and 13).

Table 13. Insight from focus groups involving local associations in Bairro da Boavista.

Local Associations	
Strengths	i) A social identity of the population in relation to the neighbourhood; ii) They are proud of the neighbourhood, thus creating an important social and cultural identity; iii) Strong collaboration with the associations, recognising their importance and support in the life of the neighbourhood.
Weaknesses	i) Unemployment as an important social problem, with accentuated impact on youngers and women, and, on much of the cases, for long periods; ii) Deviant behaviours of some residents, contributing to the perception of the neighbourhood as problematic from the outsider; iii) Isolated living within the neighbourhood, with little to no connections to other urban areas of the parish and city; iv) Isolation of the neighbourhood and its peripheral situation in the urban context; v) Low-income populations.
Institutional partnerships	i) Strong synergies with all institutions which work in the neighbourhood; ii) The associations participate in GABIP meetings with the population and the authorities (Lisbon City Council, Gebalis and Benfica Parish); iii) Associations implementing joint projects in the neighbourhood, particularly focused on hygiene practices and participation in recycling initiatives; iv) Importance of a networking process.
Feedback on RETIME	i) RETIME can help enhance the quality of life in this urban space; ii) RETIME should collaborate with residents and associations; iii) Practical measures should take priority over theoretical studies.

Text in blue indicates the common themes with other key stakeholders (see Tables 11 and 12).

[28] GABIP (*Gabinetes de Apoio aos Bairros de Intervenção Prioritária*, Support Offices for Neighbourhoods of Priority Intervention) is a municipal initiative for local management and coordination, aimed at fostering co-governance in one or more neighbourhoods and Priority Intervention Zones of Lisbon. Its goal is to promote socio-territorial cohesion through the implementation of a local development strategy in these areas.

Common insights from stakeholders (blue text in Tables 11, 12, and 13) reveal a strong neighbourhood identity, alongside challenges like isolation, weak urban connectivity, low economic resources, and deviant behavior. Both public authorities and local associations stressed the importance of collaborative networking to foster community inclusion. Regarding RETIME, expectations include contributions through co-creation and co-participation efforts, with tailored governance mechanisms.

Due to organisational and time constraints, focus groups for Žilina and Tartu will be held in January 2025, using data and contacts from other projects (e.g., SmartEnCity in Tartu) while ensuring compliance with GDPR regulations.

4.3.1. Preliminary insight gathered from questionnaires

Figure 15 illustrates the main perceptions of the climate-related risks in the neighbourhoods of *Bairro da Boavista* and Žilina districts.[29]

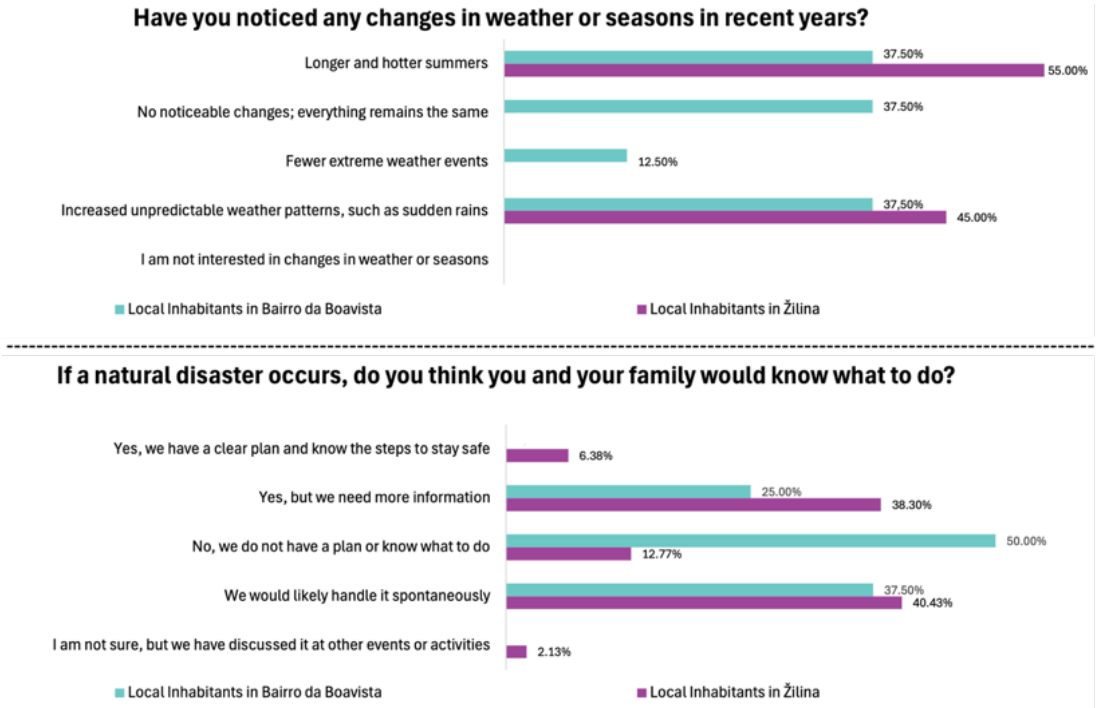


Figure 15. Level of preparedness for weather changes among residents in Bairro da Boavista and Žilina.

[29] Bánová, Bôrik, Brodno, Budatín, Bytčica, Hájik, Hliny, Mojšova Lúčka, Považský Chlmec, Rosinky, Solinky, Staré mesto, Strážov,Trnové, Vlčince,Vranie, Zádubnie, Zástranie, Závodie, Žilinská Lehota.

Regarding the perceptions for weather changes, residents in *Bairro da Boavista* are evenly divided: 37.5% noticed longer and hotter summers; 37.5% have observed more unpredictable weather patterns. A smaller group (12.5%) noticed a decline in extreme weather events. Regarding the preparedness of natural disasters, half of the respondents do not have a plan or know what to do, while 37.5% believe they would manage such events spontaneously. Only 25% declared they are prepared but acknowledge the need for more information, and none have a clear, established plan.

A majority in Žilina respondents (55%) observed longer and hotter summers, followed by 45% noticing increased unpredictable weather patterns. No respondents reported no changes or fewer extreme weather events. In Žilina, most respondents (40.43%) believe they would handle a disaster spontaneously, while 38.3% feel they need more information. A smaller percentage (12.77%) lack any plan, and 6.38% have a clear disaster response plan.

Figure 16 illustrates the percentage of responses from local authorities, associations, and residents in *Bairro da Boavista*, as well as the responses from residents in Žilina district, about the technological and climate-related literacy. In *Bairro da Boavista,* among local authorities and associations, 47.37% correctly identified critical infrastructure as "physical structures, facilities, networks, and assets essential for a community's social, economic, and public safety." Regarding the definition of a Digital Building Twin, most local authorities and associations (52.63%) in *Bairro da Boavista* described it correctly as a "detailed and dynamic digital representation of a physical building." However, only 12.50% of local inhabitants shared this understanding. Among local authorities, 36.84% defined disaster risk reduction as "preventing new and reducing existing disaster risk and managing residual risk." In contrast, 50% of local inhabitants recognised this as the correct definition.

Most participants from both groups understood energy poverty as the inability to afford sufficient energy for basic needs (57.89% of authorities, 62.5% of inhabitants).

In *Bairro da Boavista*, a majority of residents (62.5%) admitted they "don’t know" the meaning of critical infrastructure, compared to 15.79% of local authorities and associations. Similarly, 75% of residents were unaware of what a digital building twin is, compared to 15.79% of authorities and associations. Regarding disaster risk reduction, half of the local inhabitants admitted they "don’t know," compared to just 10.53% of local authorities. For energy poverty, 25% of inhabitants stated they "don’t know," while none of the authorities selected this response.

There is a noticeable gap in understanding between local inhabitants and authorities, with authorities demonstrating higher accuracy and confidence in identifying critical infrastructure. In *Bairro da Boavista,* a significant disparity exists, with authorities being far more informed, especially regarding digital building twins. The high level of uncertainty among local inhabitants emphasises the need for targeted education and communication on this technology. The

knowledge gap is even wider among local inhabitants concerning disaster risk reduction, highlighting the need for greater awareness. While energy poverty is generally understood, there are still notable misconceptions, indicating a need for more informational campaigns.

In Žilina, most of the local inhabitants (89.36%) identified 'critical infrastructure' as essential structures and networks crucial for community functioning. A small proportion (6.38%) misunderstood it as deteriorating facilities, while 4.26% were unsure. Most respondents (63.83%) recognised 'digital building twin' as a detailed digital representation of a building, while 21.28% viewed it as a purely virtual solution. However, 14.89% were uncertain. Regarding 'disaster risk reduction', most of the respondents of Žilina (82.98%) understood it as preventing and managing disaster risks. Smaller groups associated it with infrastructure construction (12.77%) or emergency response (2.13%). Most respondents of Žilina (82.98%) defined 'energy poverty' accurately as the inability to afford sufficient energy for basic needs. A minority associated it with other interpretations, such as unaffordable bills (8.51%) or living without electricity (4.26%).

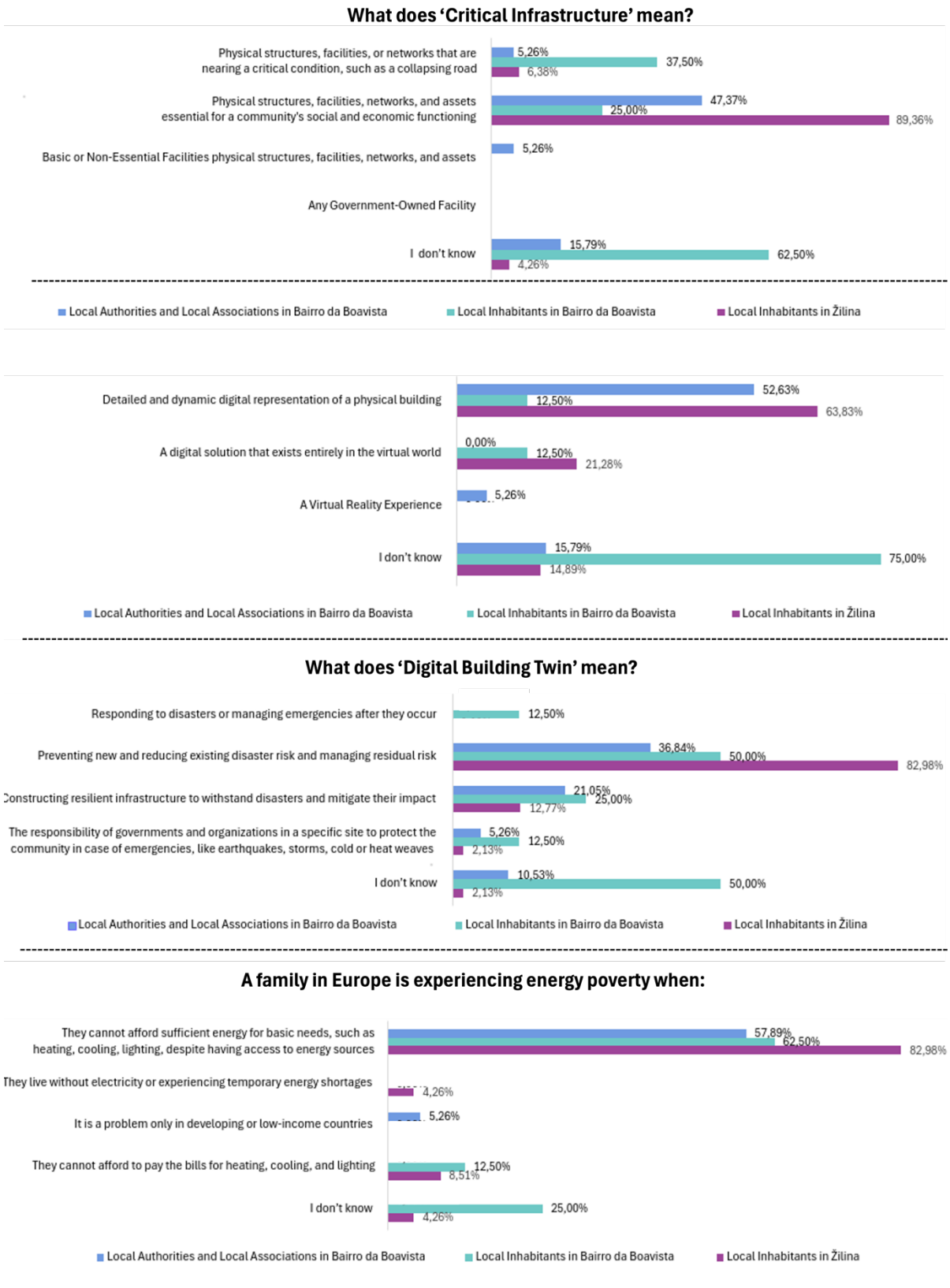


Figure 16. Technological and climate-related literacy in Bairro da Boavista and Žilina.

5. Blog, Online Newspapers, and Social Media Network Analysis

5.1. Online social analysis: research methodology and work phases

The RETIME analysis of blog, online newspapers and social media network aims to understand building stakeholders' perceptions around RETIME key issues such as building resilience, res RETIME ponses to both natural and human-induced disasters, and preferred renovation and adaptation solutions. Textual content from blogs and social networks are analysed applying natural language processing (NLP) techniques. These methods include creating word and n-gram histograms, performing topic modelling, and using TF-IDF (Term Frequency-Inverse Document Frequency) analysis to uncover significant themes and insights.

The workflow for categorising and assessing risk perception in social media platforms using NLP techniques is structured into three main steps: data collection, data processing, and comparative analysis (Figure 17). The data sources, listed and categorised by type, target audience, access, and content are identified and collected through a web scraping process. The extraction tool employs Python software libraries, specifically 'Selenium' and 'Beautiful Soup' to gather the text corpus in each collected website link. Once the corpus is gathered, it is stored in a DataFrame and translated into English using the Google Translate Python library.[30]

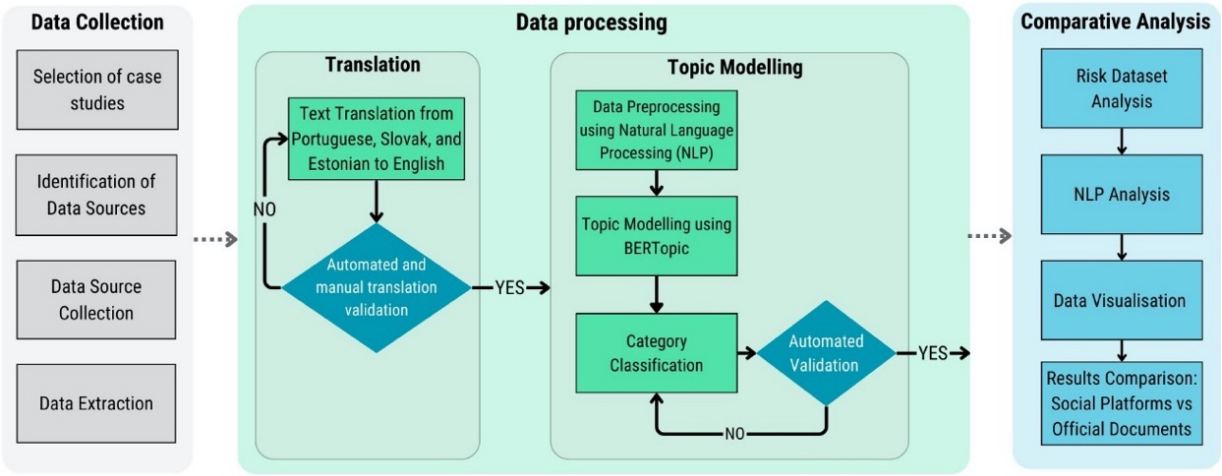


Figure 17. Workflow process of Blog and Social Media Network Analysis.

[30] The final output is a DataFrame, which is exported to an Excel file containing the link, the original corpus, and its English translation.

Table 14 and Figure 18 show the data sources analysed at the national, city, and neighbourhood levels, along with details on the corpus size and time intervals covered.

Table 14. Topics in the three RETIME pilot sites.

Pilot sites	No. of Websites	Extracted Corpus Size	Analysis Period
***Bairro da Boavista* (Lisbon)**	33	1 KB – 24 KB	2019-2024
Žilina District	31	1 KB – 7 KB	2021-2024
Tartu Historical Centre	25	1 KB – 6 KB	2023-2024

Tartu stands out as the pilot site with the fewest data sources available, highlighting a potential limitation in data coverage for this region.

All scraped links were verified against each domain's 'robots.txt' file to ensure compliance with legal guidelines. The corpus is then subjected to manual validation of the translations before proceeding to topic modelling, an unsupervised Machine Learning (ML) technique that identifies clusters of related words, or topics, within the text.[31]

The data processing is based on BERTopic, a topic modelling technique that leverages transformer-based models to extract topics from a variety of textual content. It is designed to overcome some of the limitations of traditional topic modelling methods, such as Latent Dirichlet Allocation (LDA) and Latent Semantic Analysis (LSA), by generating more semantically meaningful topics.[32] This bidirectional approach enables BERT to capture the nuanced meanings and relationships between words, making it highly effective for language representation.

The following processes are undertaken: i) *lemmatisation*, words are reduced to their base form, preventing variations of the same word from appearing separately (e.g., *risk, risks, risking* → *risk*).

ii) *n-gram handling*, identification of n-grams (unigrams, bigrams, trigrams) in the text. These are sequences of words that together convey more meaning than individually, followed by managing overlapping n-grams to prevent redundancy (e.g., *school, new school* → *new school*).

iii) NER (Named Entity Recognition), which identifies named entities within the text.

[31] https://www.ibm.com/topics/topic-modeling [Accessed 06.11.2024]

[32] BERTopic leverages BERT (Bidirectional Encoder Representations from Transformers) to capture the semantic context of words within sentences. BERT, a transformer-based model developed by Google, analyzes the surrounding words on both sides of a given word to understand its context. BERTopic uses the embeddings (vector representations) generated by BERT to cluster semantically similar words, enabling more contextually relevant and coherent topic identification.

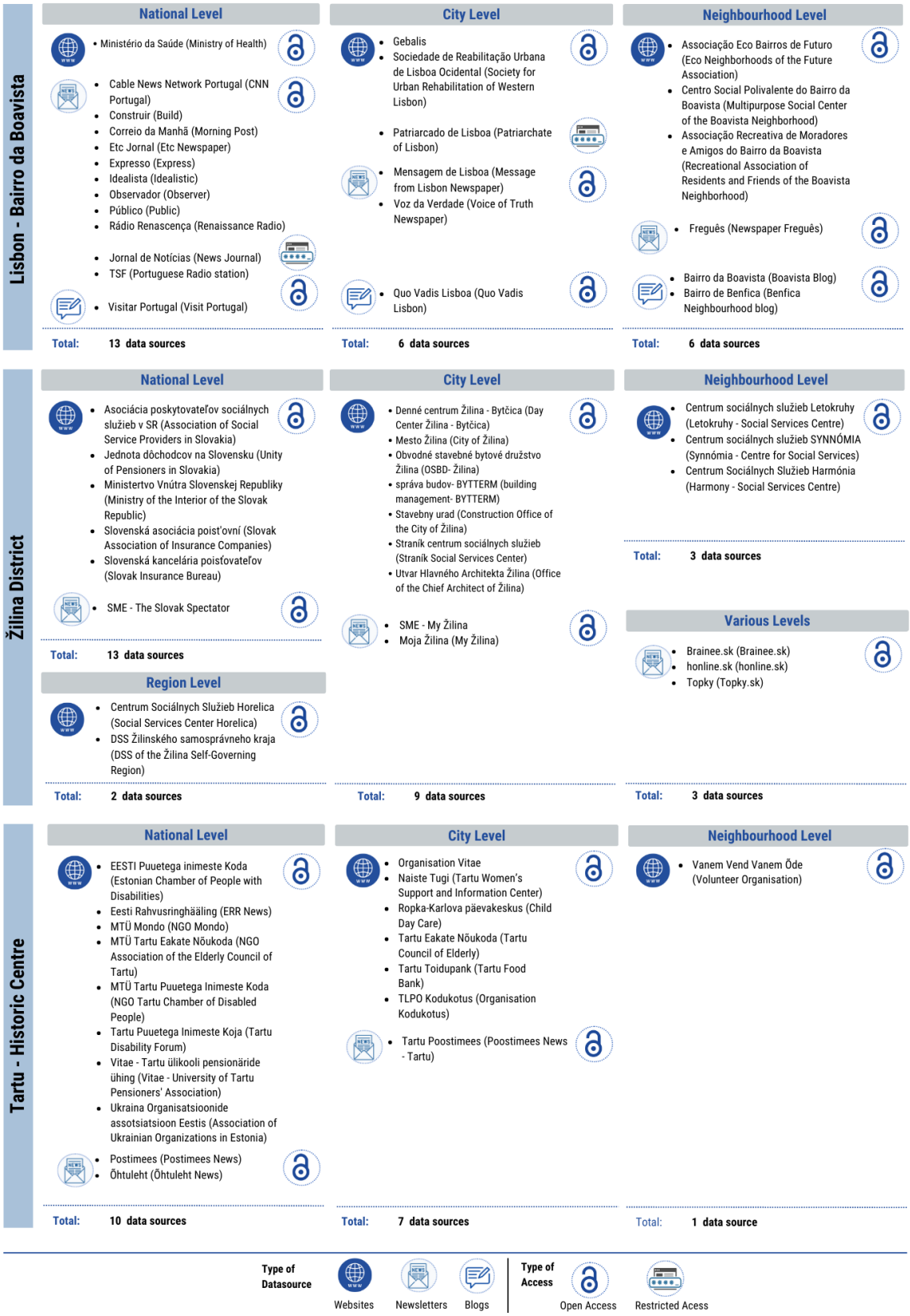


Figure 18. List of web-scraping data sources across the three RETIME pilot sites.

Once the topics are established and refined, they undergo a manual validation (Figure 19).

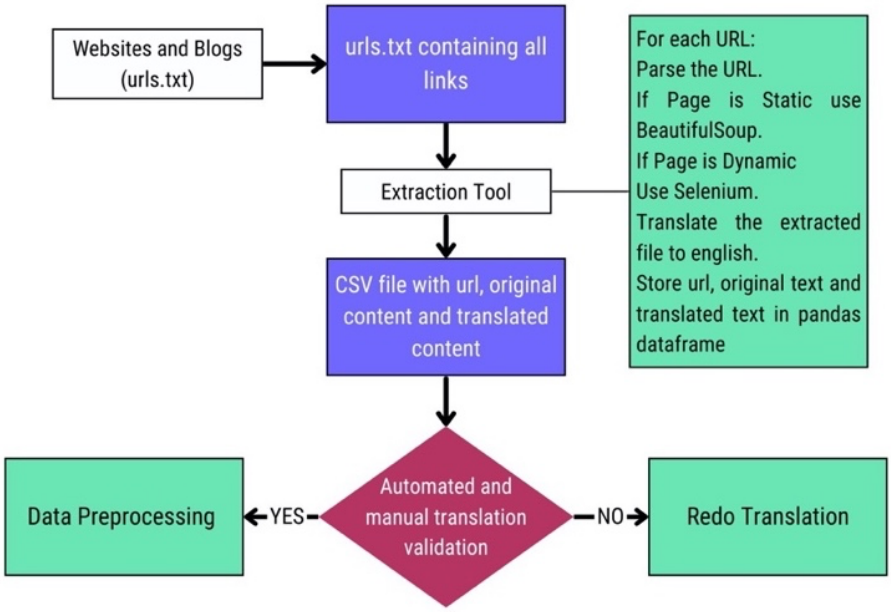


Figure 19. Extraction Tool: Web Scraping and English Translation.

Finally, the comparative analysis involves examining the risk dataset to uncover key themes and patterns related to public risk perception. This process leverages NLP analysis to identify and emphasise significant concerns, followed by the data visualisations.

5.2. Word cloud insights

Figure 20 displays the most frequent words[33] across the data collected from the blog and social media network of each pilot site, highlighting the key themes and issues within each community. In Lisbon's *Bairro da Boavista*, the most frequently mentioned terms highlight both physical structures and a sense of community belonging, with words like 'school', 'church', and 'building', alongside 'project', symbolising aspirations for future development. Terms such as 'investment', 'rehabilitation', and 'renovation' reflect ambitions to enhance living conditions and revitalise residential areas in this neighbourhood. The construction of a new church in the neighbourhood is evident through terms like 'priest', 'chapels', and 'church', indicating a strong religious

[33] Stop words, generic terms that are irrelevant to this analysis, plural/singular duplicates, and any punctuations and connector words are excluded.

influence within the community. Additionally, words such as 'community,' 'people', and 'social' emphasise the importance of communal ties and social cohesion.

In the Žilina district, the most common words – 'water', 'worker', 'building', 'storm', 'service', and 'community' – reflect the natural resources and the human activities shaping its development. Terms like 'storm' and 'rainwater' underscore key hazards, emphasising the impact of weather conditions on infrastructure and resources. Themes of emergency response and natural disasters emerge through words such as 'trapped', 'rescue', 'flood', 'damage', and 'quality', highlighting concerns about weather-related events and the critical role of local services. Weather-related challenges are further indicated by terms like 'storm,' 'flood', and 'rain', while words such as 'worker', 'department', and 'project' point to organisational efforts to address these issues. Additionally, terms like 'community', 'information', and 'provision' reflect the importance of societal and governmental responses in managing crises and fostering resilience.

In Tartu, the most frequent terms such as 'water', 'rain', 'association', 'Ukrainian', and 'organisation' highlight a strong focus on community support and disaster management. Words like 'support', 'volunteer', 'activities', 'children', and 'elderly' reflect the commitment to assisting vulnerable groups, particularly the elderly and children, often through social centres and non-profit organisations. The prominence of 'Ukrainian' underscores the relevance of this community and the support provided to Ukrainian refugees in the area. Disaster-related terms such as 'water', 'rain', 'flood', 'damaged', 'storm', 'drainage', 'disaster', 'risk', 'rescue', 'safety', and 'fire' emphasise the significance of floods and their aftermath. Additionally, words like 'festival', 'university', and 'culture' suggest a focus on social cohesion through education, cultural activities, and resilience-building. Like *Bairro da Boavista,* the terms like 'municipality', 'rehabilitation', and 'project' further highlights the active involvement of local authorities in recovery and urban development efforts.

Although the types and number of data sources (which include websites, newsletters, and a few blogs) vary, some brief comparative conclusions can be drawn from the collected data. Significantly, 'water' emerges as a key term related to natural resources in both Žilina and Tartu, while in *Bairro da Boavista*, the natural forest, regardless its proximity, is notably absent from the analysed user-generated content (UGC). The three-word clouds show some common themes around community resilience and disaster management across the three areas, such as the value of community support, with frequent terms like 'community', 'social', and 'people'. Local development and infrastructure projects, particularly those focused on housing, rehabilitation, and urban renewal, are also key priorities across the regions. Additionally, disaster preparedness and response are central themes, with frequent references to 'storms', 'floods', and 'emergency services'. In contrast, *Bairro da Boavista* shows little mention of natural-hazard risks, which may reflect either a lack of awareness about these issues or a focus on other issues.



Bairro da Boavista - Lisbon



Žilina District



Tartu Historical Centre

Figure 20. Word clouds in RETIME pilot sites.

5.3. Topic Modelling

Topics represent patterns of word distributions that NLP techniques extract from a corpus of documents. When topics share numerous overlapping terms, their distinctiveness becomes less clear, making both qualitative interpretation and quantitative analysis more challenging. Topics may or may not share words. When a word appears in multiple topics, it suggests the word has dual interpretations or relevance across different contexts.

In this context, the topics were derived from a combination of data-driven insights and a thorough review of the SoVI (Social Vulnerability Index), which was not defined but used solely as a reference to classify the topics. The SoVI measures social vulnerability to environmental hazards by analysing social, economic, and demographic factors such as income, housing quality, health, and access to social services. It identifies communities that are more susceptible to the adverse effects of disasters, aligning closely with the concept of *risk perception* in vulnerable areas.

Topics were identified using BERTopic, with manual adjustments to the model parameters to optimise the outcomes. Once the topics were extracted, they were named according to the categories from the SoVI. While the core topics remain consistent across the three pilot sites, some topics may differ, reflecting region-specific concerns and vulnerabilities. The topics were categorised based on the SoVI dimensions, providing a structured framework for analysis, and ensuring that all relevant areas of vulnerability were addressed. Five topics were selected using the approach described by Farea et al. (2024), which involves analysing the words that make up the topics. During an exploratory phase, the semantic meaning of these words was examined and grouped according to the dimensions of the SoVI, resulting in five distinct topics (Table 15).

Table 15. Five Topics identified in RETIME pilot sites.

Topics identified in RETIME pilot sites
Topic 1. Environmental and Neighbourhood Concerns: This topic covers environmental and spatial concerns within neighbourhoods.
Topic 2. Community and Social Institutions: This topic focuses on community-focused institutions (e.g., churches, schools, and community spaces), reflecting social support structures and religious involvement, civic engagement, and shared values.
Topic 3. Infrastructure and Development: This topic likely represents infrastructural development, particularly around housing projects and home improvement. It also focuses on to government initiatives and public programs.
Topic 4. Public Health and Safety: This topic focuses on public health and safety, intersecting community resilience, mobility, and interaction.
Topic 5. Housing Safety and Quality: This topic focuses on housing and urban issues, suggesting challenges with access, density, and affordability.

5.4. Discussion of results

After the topics were defined, each data source from the pilot site was classified according to the predefined topics, shown in Table 15. The axis of the graphs represents the contribution of each word to describing the topic. Words closer to the maximum value are more relevant to the identified topic. Each site feature unique priorities and challenges that reflect its socio-political context, environmental conditions, and infrastructure needs.

Both *Bairro da Boavista* and the Žilina district share the same five topics, but they are represented with different terms (Figure 21). In Tartu, due to the smaller dataset compared to the other two pilot sites, the algorithm was able to identify only three topics.

The topics identified in *Bairro da Boavista* shed light on key aspects of urban resilience and community development. *Environmental and Neighbourhood Concerns (Topic 1)* highlight terms such as 'rental', 'resilience plan', and 'municipal neighbourhood', suggesting that housing affordability and urban planning are critical factors influencing neighbourhood quality.

In Žilina district, *Topic 1* focuses on natural disaster management, with terms like 'landslide', 'torrential rain', and 'flooding destroy', highlighting challenges associated with climate-related risks.

In Tartu, under *Topic 1* 'rain', 'flood', and 'trash' indicate an emphasis on water management and waste disposal. The inclusion of 'pipeline' and 'river' may suggest challenges in water and waste infrastructure and management systems.

When comparing the terms under *Community and Social Institutions* (*Topic 2*) across the pilot sites, in *Bairro da Boavista* terms, such as 'church', 'priest', and 'exhibition' highlight the pivotal role of cultural and religious centres in promoting community cohesion and strengthening social resilience.

In Žilina district, the terms, such as 'assessment services', 'care', 'protection' reflect efforts to address both ecological and civic issues, along with references to the sanitary emergency – 'covid' – point to a focus on social and welfare services. The focus on 'certificate' indicates a drive for compliance and accountability.

In Tartu, 'association Ukrainian', 'refugee', and 'festival' point to social cohesion efforts and cultural roots ('Ukrainian culture', 'creativity festival'), likely related to integrating refugee communities and fostering cultural exchange. The attention to 'volunteer' and 'project' highlights active civic engagement.

In *Bairro da Boavista*, *Infrastructure and Development* (*Topic 3*) focus on 'municipal building', 'rehabilitation plan' and 'restore building' indicating investments in public spaces and infrastructure renewal.

In Žilina district, the focus shifts more towards mobility, with terms like ('public transport', 'bridge', 'train') as well as to administrative or practical aspects, such as 'approval', 'contractor',

and 'building material'. Terms like 'repair', and 'restoration public' indicate an emphasis on enhancing connectivity and maintaining urban infrastructure.

Terms such 'health service', 'resilience plan' and 'minister health' under *Public Health and Safety* (*Topic 4*) reflect need to enhance healthcare infrastructure and emergency preparedness in *Bairro da Boavista*. In Žilina, public health is a central concern, where 'nurse', 'hospital polyclinic', and 'operate funding' may indicate challenges in healthcare access and resource allocation.

In *Bairro da Boavista*, *Housing Safety and Quality* (*Topic 5*) draws attention to 'material', 'public work', 'student residence' and 'thermal brick', which highlight issues related to construction standards, housing quality, and energy efficiency.

Similarly, in Žilina district, 'apartment', 'building component', and 'boiler' reflect similar concerns. In Žilina district, under *Topic 5*, terms like 'apartment building', 'insure', and 'damage cause' highlight a focus on risk mitigation and structural integrity.

In Tartu's historic centre, terms such as 'demolish', 'rescue worker', and 'factory municipality' point to ongoing redevelopment efforts aimed at addressing aging infrastructure and ensuring safety. The presence of 'old heating' and 'ongoing chimney' reflects challenges related to energy efficiency and the modernisation of residential facilities.

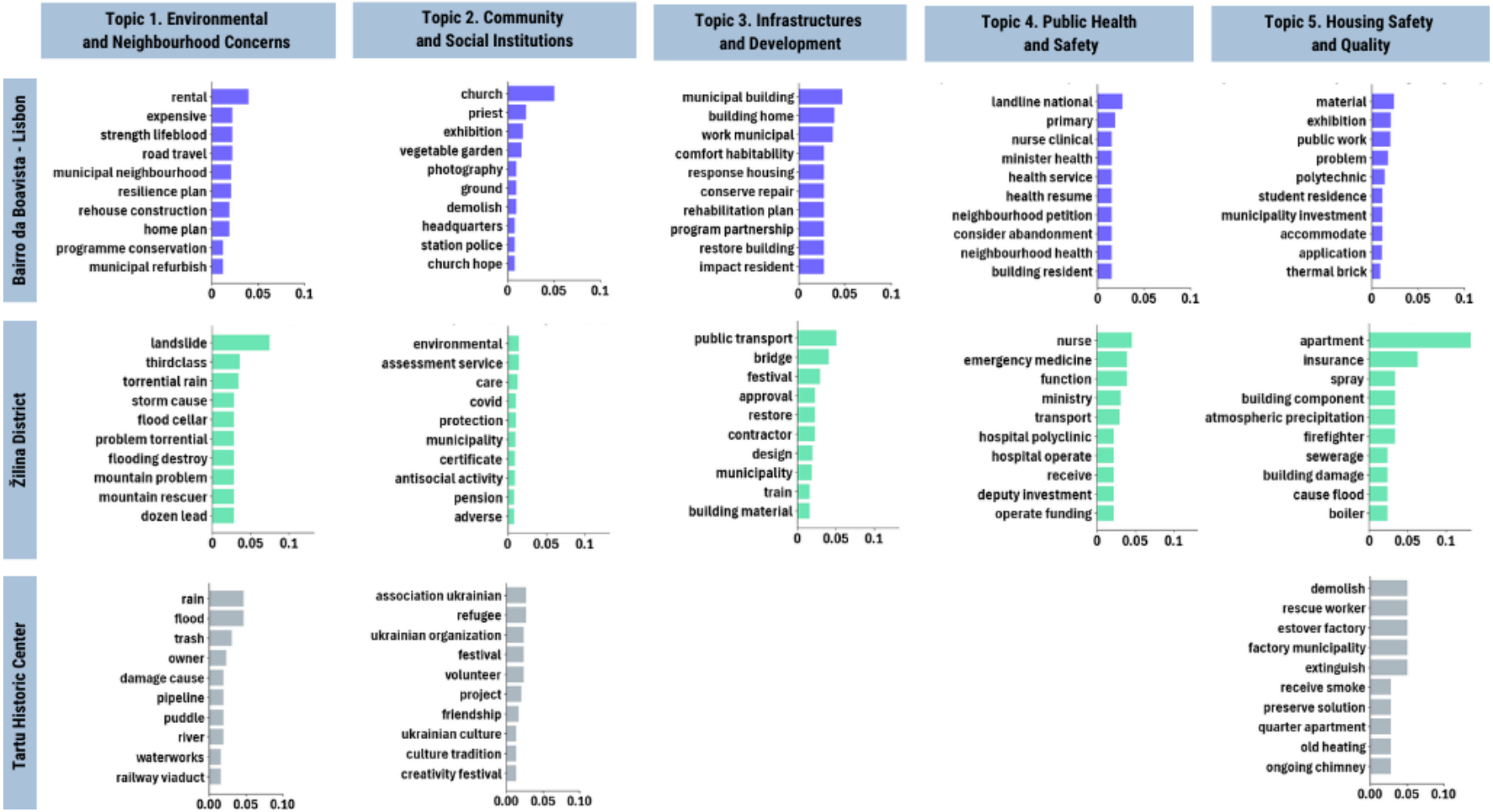


Figure 21. Topics identified in the blog, online newspapers, and social networks of RETIME pilot sites.



Figure 22. Influence of website/newspapers by source type.

Figure 22 shows the interests to various topics (identified in Table 15) across the three pilot sites considering the different source types analysed in this context. The analysis highlights significant differences in how each source type influences the discourse; however, the findings for Tartu may not be fully representative due to the limited number of data sources analysed.

Blogs and social media largely fail to address the five key topics across the three pilot sites, except for *Environmental and Neighbourhood Concerns* (*Topic 1*) and, notably, *Community and Social Institutions* (*Topic 4*). As expected, platforms managed by official institutions contributed to some topics, though they did not provide input on Environmental and Neighbourhood Concerns in either data source, instead placing greater emphasis on Community and Social Institutions (*Topic 4*). Journals and Newspapers cover the five topics across the three pilot sites for *Topic 3*, *Topic 4*, and *Topic 5*. *Community and Social Institutions* (*Topic 4*) is the most discussed topics among the selected.

This analysis clearly indicates that the data sources reviewed do not prioritise key aspects related to the future of districts, such as the evaluation of potential risks and strengths in infrastructural development, particularly in housing projects and home improvements.

The smaller dataset from Tartu may introduce bias, potentially underrepresenting certain topics or sources. This limitation should be taken into account, and further analysis is required, particularly to include other relevant and commonly used social platforms, such as *Facebook* and *X* for all pilot sites and *TripAdvisor* for Tartu, in addition to other local social media channels. Since the historic centre of Tartu is a popular tourist destination, some relevant information can be gathered from *TripAdvisor*, even though the topics may not be directly related to the RETIME project.

6. Social Vulnerability Assessment

6.1. Theoretical and operational framework

The last decades are marked by the growing need to identify and evaluate vulnerability related to disasters induced by natural processes and climate change. The impacts resulting from these processes are not only dependent on physical forces, but are also determined by social and economic factors, as stated in literature (Birkmann et al., 2022; Cardona et al., 2012). Vulnerability is a dynamic process with the constant flows between the natural and biophysical systems that influence a given territory (O'Brien et al., 2005). Vulnerability assessment processes aim to inform and share the vulnerability of a system with decision-makers and stakeholders (Aubrecht et al., 2013; Hinkel, 2011), emphasising the political and planning aspects inherent to vulnerability assessment (Mendes, 2009).

Social vulnerability (SV) is a fundamental indicator for risk governance, involving the processes and impacts resulting from events of natural, technological, and environmental origin. Analysing social vulnerability is essential – and complex – for supporting effective strategies in risk prevention, reduction, and mitigation. This analysis also enables the development of robust indicators that measure resilience and support capacity at both individual and community levels. SV is a multidimensional concept that helps characterise community exposure and assess their ability to respond and recover after a disaster (Cutter et al., 2003). It is not limited only to the characteristics of individuals, but also to their relationships in society, the nature of these relationships and the physical, social, and institutional environment in which individuals are inserted (Tapsell et al., 2010; Adger et al., 2004).

Society is not dimensioned as a homogeneous object, but rather as a reality influenced from different drivers of vulnerability such as, for example, age, gender, education, nationality, access to public facilities, conditions accommodation or the type and degree of disability. Pre-existing factors that impact disaster preparedness, response, and recovery should be considered (Chen et al., 2013). In a disaster, it is crucial to predict impact scenarios, identify vulnerable groups and their social weaknesses, and assess territories based on their capacity for relief, response, and recovery.

6.2. Methodology and case studies

In RETIME, social vulnerability is assessed considering criticality and support capacity (J. M. Mendes et al., 2011; J. M. de O. Mendes, 2009). This analysis is based on the social vulnerability assessment methodology developed by the Centre for Social Studies (CES) at the University of

Coimbra, in Portugal (hereafter: VS-CES-OSIRIS methodology),[34] which incorporates both key components. A high level of criticality increases social vulnerability, whereas a high level of support capacity mitigates it. The SV is assessed using Principal Component Analysis (PCA) methodology, used in previous studies (Chen et al., 2013; Cutter et al., 2003; Mendes, 2009; Schmidtlein et al., 2008; Tavares et al., 2018), and adapted to RETIME local reality and scale. For the PCA, SPSS® software was used. This evaluation is supported by data from the 2021 Census, municipal councils of Lisbon and Amadora, national statistical services of Slovakia and Estonia, and national geoportal databases. Prior to the final running of PCA, redundant variables are eliminated based on the iterative and combined analysis of several indicators (Pearson correlation matrix; variance rate parameters), which should be greater than 60%; Kaiser-Meyer-Olkin (KMO) sample measurement. After the definition of the final set of variables, PCA is carried out using normalized values to the z-score, Varimax rotation factor analysis. The SVI is calculated by combining Criticality and Support Capability using the following equation (Eq.1):

$$\text{Social Vulnerability} = \text{Criticality} \times (1 - \text{Support Capability}) \qquad \text{Eq. (1)}$$

The Eq. (1) is designed so that high values of Criticality and low values of Support Capability would represent a worse or higher Social Vulnerability composite index. The results obtained are grouped into different classes that vary from very low to very high in accordance with the standard deviation (SD) and the following categories: “very low,”< 1 SD; “low,” [−1, −0.5 SD]; “moderate,” [−0.5, +0.5 SD]; “high,” [0.5, 1 SD]; “very high,” ≥1 SD (Cutter et al., 2003).
Figure 23 outlines the SVA steps: i) *study area definition*; ii) *analysis of variables*; iii) *selection of reference unit*; iv) *survey of relevant variables* (e.g., section/subsection); *Principal Component Analysis* for the variables previously collected for each study area.

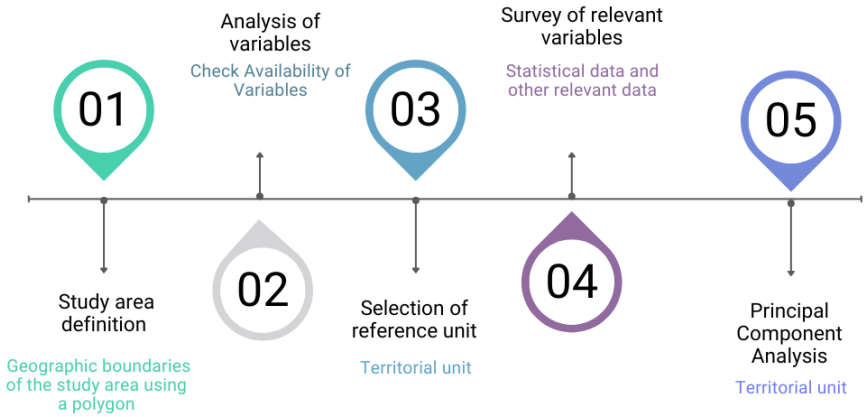


Figure 23. Social Vulnerability Assessment steps.

[34] https://ces.uc.pt/osiris/sobre-o-osiris [Accessed 04.10.2024]

6.2.1. Criticality

Criticality refers to individual traits and behaviours that can either amplify system and community disruptions (in less resilient populations) or enhance the adoption of effective self-protection measures in catastrophic scenarios.
The criticality assessment variables should reflect social support, condition of built heritage, demography, economy, education, housing, justice, and health, depending on data availability. The analysis scale enhances the selection and/or differentiated inclusion of the type of variables; on the other hand, it conditions the respective analysis depending on the selected statistical indicators. The hierarchy of criticality levels depends on the correlation between the degree of exposure and the expected damage and losses (human, material, and property losses).[35]

6.2.2. Support capacity

Support capacity can mitigate or worsen a certain level of criticality. It is defined by the set of systems, networks, infrastructures for public use and collective equipment aimed at supporting the population, which, given the imminent manifestation of a dangerous process with destructive potential, enable the strengthening of the Community resilience capacity and, in emergency planning and management, the preparation of predictable scenarios.
The basic domains of economic support capacity include the structural condition of the built heritage, social facilities, infrastructures and supply networks for water, electricity, and communications (i.e., 'lifelines'), the housing stock, the (sub)systems of civil protection and health, among others. At the infra-municipal scale, other domains may be considered, considering the specificity of the information available.
A high support capacity could constitute a counterpoint to a high level of criticality, consequently promoting the reduction of the degree of social vulnerability. The different levels of support capacity express, on the one hand, the potential and capacity to respond in the event of an emergency, and, on the other, the contingency levels, which will make it possible to mitigate

[35] *Very low criticality*: Only exceptional catastrophes would cause injuries, production disruptions, or significant environmental damage; *Low criticality:* Catastrophes have minimal impact, requiring few resources to restore normal conditions; *Medium criticality*: Even minor events require intervention, often affecting vulnerable populations like young children or social support recipients; *High criticality:* High likelihood of injuries, homelessness, and economic disruption, even without major events, due to systemic weaknesses; *Very high criticality:* Events like floods can cause complete system collapse, with severe economic losses, injuries, and fatalities.

disruptions to everyday socioeconomic functions. In short, they constitute levels of training to increase the community resilience.[36]

6.2.3. Selection of analysis units

In social vulnerability analysis, the scale and unit of analysis depend on the precision of available data and should align with the study's objectives and territorial size. Two scales are adopted in RETIME: local (statistical section level) for *Bairro da Boavista* (Lisbon) and regional (municipal) for Tartu and Žilina (Figure 27). The statistical subsection analysis offers greater detail and territorial differentiation of social vulnerability than broader administrative or statistical units. Census operations by National Statistics Institutes depend on the Base Reference Geographical Information (BGRI). The geographic base of a polygonal nature, with a hierarchical structure that integrates geographic objects ranging from greater level of disaggregation, up to the national level. The BGRI hierarchically divides each base administrative unit, the parish, into small homogeneous statistical areas or statistical sections. According to INE, statistical section is a territorial unit corresponding to a continuous area of a single parish with around 300 accommodations (dimension) intended for housing. According to the density of family homes, statistical sections are classified as: a) concentrated: all statistical subsections of the section are made up of blocks; b) dispersed: all statistical subsections of the section are made up of spaces not divided into blocks and/or isolated accommodation; c) mixed concentrates: Most of the statistical subsections are made up of blocks; d) mixed/dispersed: most of the statistical subsections of the section are made up of vacancies not divided into blocks or isolated accommodation.

The social vulnerability assessment at local scale use a set of 86 variables, 47 relating to criticality and 39 to support capacity (Annex C) and at regional scale using a set of 90 variables, 54 related to criticality and 36 to support capacity (Annex D). In each pilot site, the availability of each variable is evaluated[37], along with the identification of the maximum level of spatial

[36] *Very low support capacity:* The area lacks infrastructure to help the community manage adversities, leading to significant losses due to limited resources; *Low support capacity*: Some essential infrastructure exists, but catastrophes cause significant, sometimes irreparable, short-term socioeconomic disruptions; *Medium support capacity*: Damage is repairable, albeit costly. Socioeconomic activities may pause briefly during the critical period; *High support capacity*: Some activities may pause, but diversified strategies minimize impacts. Losses are minor and easily repaired; *Very high support capacity*: Losses are negligible, often limited to low-value assets like abandoned buildings.

[37] Due to the restricted access to certain data, which requires specific requests that take longer to process, the SV analysis will be carried out as part of the RETIME activities and shared through a planned scientific publication within WP2/T2.1.

disaggregation at which information can be obtained (e.g., statistical section, parish or municipality). After this analysis, a territorial unit of analysis is undertaken to obtain information relating to the different variables. These units can be at statistical section, parish, or municipality level. The information relating to each of the variables must correspond to each territorial unit of analysis.

Bairro da Boavista: According to the Official Administrative Charter of Portugal (CAOP), version of 2023, the municipality of Lisbon is divided into 24 parishes. The *Bairro da Boavista* is in Benfica parish, covering 29 sections (Figure 24, *top*). To holistically analyse the territorial framework and meet the PCA methodology's requirement of a minimum ratio of 5 units per variable, this study includes all parishes belonging to the municipalities of Lisbon and Amadora bordering the parish of Benfica with a total of 200 statistical sections for analysis.

Žilina District: The Žilina Region, one of 8 in Slovakia, comprises 11 districts and 315 municipalities, while the Žilina District includes 52 municipalities. The analysis in Žilina will be conducted at the municipal level. Administratively, Slovakia is divided into three levels: region, district, and municipality. For this analysis, all municipalities bordering the Žilina district will be included, totaling 219 territorial units (Figure 24, *centre*).

Tartu: Administratively, Estonia is divided into 15 counties and 79 municipalities, including 15 towns and 64 rural municipalities. Tartu County is divided into 8 municipalities, 7 rural and 1 urban. Social vulnerability in Tartu will be assessed at the municipal level, as this scale provides access to a broader and more robust dataset (Figure 24, *bottom*).

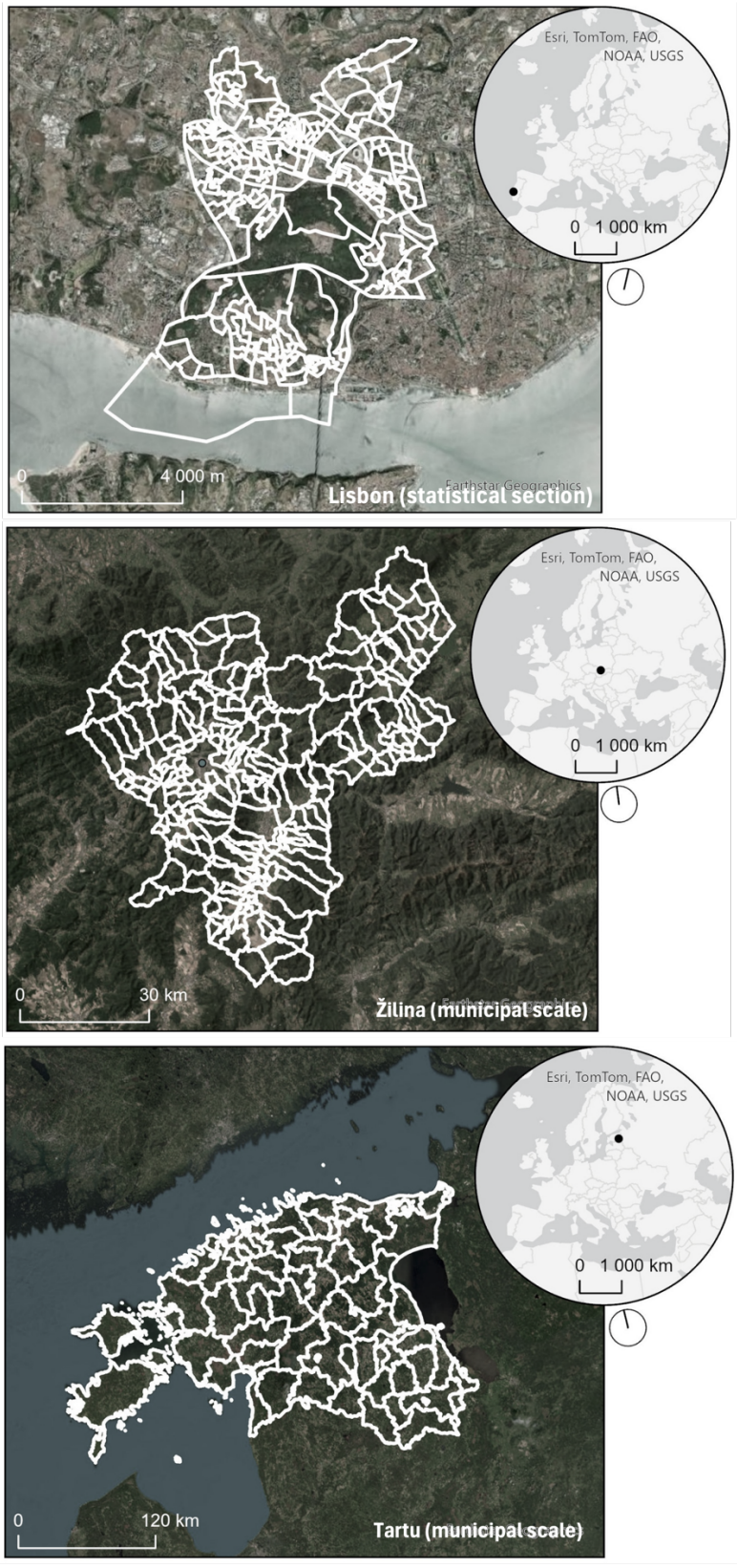


Figure 24. Territorial units of analysis for RETIME Social Vulnerability Assessment.

7. Final remarks

This study is based on a tripartite methodological framework that combines quantitative sociological research, qualitative analysis of social perceptions, and a hybrid approach for processing questionnaires and focus group data. This bottom-up approach has provided valuable insights, helping to define criticality variables and indicators for assessing social vulnerability to disasters in the three urban areas (Annex C and Annex D). This report is thus not intended to be exhaustive but establishes a comprehensive methodological framework to be used and further developed throughout the project RETIME.

The RETIME pilot sites each show distinct characteristics shaped by geography, history, and the current geopolitical context, which influence their cultural, political, economic, and social features. The sociological analysis reveals disparities among the areas. Ownership and legal issues will shape the nature of the key stakeholders involved and the actions to be taken across the RETIME pilot sites.

Bairro da Boavista, with its publicly owned buildings, faces significant social, economic, and urban challenges, despite having a strong district identity. In contrast, the Zástranie district in Žilina has a suburban character and a high proportion of owner-occupied housing. However, the vulnerable hotspot to be analysed in this pilot site, the Social Services Centre Straník, is owned by public authorities, and the key involved stakeholders are closely connected to this building. Instead, as in the case of Lisbon, the potential stakeholders in Tartu expand to the community level, involving various associations operating at the district and municipal levels. Tartu historic centre is a cultural and university hub, attracting residents and tourists, most of whom are property owners, even though public engagement projects and facilities are highly advanced.

RETIME pilot sites showcase strong inter-agencies collaboration and active involvement of numerous long-established local associations, many of which recognise the importance of addressing climate-related issues. At the same time, preliminary survey results from *Bairro da Boavista*, including questionnaires and focus groups, reveal residents' perceptions of their neighbourhood and the risks they face. While they recognise various social, economic, and cultural vulnerabilities in their daily lives, they are often reluctant to discuss these issues. This reluctance may stem from their view that living in a risky environment is simply part of their reality, and they may only acknowledge vulnerabilities when it serves their interests.

Overall, the study offers a thorough contextual characterisation of RETIME areas, establishing a foundation for future co-engagement activities and social surveys aimed at effectively addressing actions in line with the RETIME objectives.

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Annex A: Institutions and Local organisations at RETIME pilot sites

LISBON PILOT SITE

Benfica Parish Council I Junta de Freguesia de Benfica **Type of Organisation and Role:** It is presided over by Ricardo Marques. According to the 2021 Census, the parish council of Benfica served a population of approximately 35,500 inhabitants. **Main Target Groups:** Residents and the parishioners of Benfica. **Programs and Activities:** Construction of a university residence; Opening of a Multisensory Stimulation Centre, which will operate in the new facilities of the Retirement Association of Bairro da Boavista). **Type of Community Engagement:** *Voices of Freedom Project*, *Senior Pilates Classes*, *Senior Hydrotherapy*, Computer Classes, *MAS Projec*t, and *Recreational* Walks.

Gebalis **Type of organisation and Role:** It is composed of a Board of Directors supported by 5 support offices. It presents leadership based on three dimensions: corporate dimension, business dimension, and support dimension. The corporate dimension encompasses all the other mentioned dimensions. Business Dimension (Local Intervention Direction (11 local intervention offices, 2 citizen shops, and 3 departments), and Property Maintenance and Conservation (3 departments, and 12 nuclei) Support Dimension: 5 Directions, 17 departments, and 3 nuclei. **Mission:** promote local development through the promotion and management of municipal housing properties. **Target Groups:** Population of Lisbon neighbourhoods. **Date of Foundation:** 1995. **Personnel:** 277 (end of 2023). **Key Programs and Activities:** *Morar Melhor Program*, *3 em Linha Program* (for employees), *ComVida Lots* (collaborative management of lots), *Welcome Program*, *Radar Project*, *Safe Neighbourhood*, *Community Champions League Project* (equal access to sports), and *Guardians of the Garden Program* (preservation of green spaces). **Type of Community Engagement:** Informational Sessions, Inflatable Cinema, *Memories Project: Each house tells a story, each street a memory*, *Housing Access Support Program*, *Rock the House Kids Program* (financial literacy for youth up to 12 years old, *Re-act* (joint action network), *Game My neighbourhood, my city*, and *Fun Coders Academy*.

Lisbon City Town Council I Câmara Municipal de Lisboa (CML) **Type of Organisation and Role:** The Lisbon City Council (hereafter CML) is an autonomous organisational unit, which holds a variety of responsibilities. In the actual political framework, some of these are exercised directly by the president, while others are delegated to five councillors for Finances, Transport, Mobility, Human Resources; Citizenship, Human and Social Rights, Education, Youth, Health; Smart City, Public Space, Urban Planning, Information Systems, Transparency and Anti-Corruption, Urbanism; Sports, Green Infrastructure, Urban Hygiene, Animal Protection, Security and Emergency Services; Housing and Local Development, Municipal Work). In addition, there are 16 elected councillors in the Lisbon Municipal Assembly. **Date of Foundation**: 1179. **Mission:** Define and implement policies that promote the development of the municipality across various areas. Its responsibilities and legal framework are established in the Local Government Act. Lisbon Municipality have responsibilities in the following domains: social action; environment;

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communications; external cooperation; culture and science; consumer protection; sports; education; energy; rural and urban infrastructure; housing; land use planning and urbanism; heritage; municipal policing; development promotion; civil protection; sanitation; health; leisure; and transport. **Key Target Groups**: CML governs and manages a multidimensional territory. Its aim is to meet the expectations of various groups, including residents, workers who commute to the city daily, students, visitors or tourists, vulnerable populations in need of social support, such as the elderly, individuals with disabilities, and low-income families. **Personnel**: 9,655 employees. **Key Programs and Activities**: i) Municipal Plan for Homeless Individuals: Lisbon approves the project for the plan addressing homelessness. ii) Supported Rent Program: Offered by the Lisbon City Council, focusing on housing assistance; iii) BIP/ZIP Program: Aimed at promoting local development and social inclusion. BIP/ZIP; iv) Local Social Development Contracts (CLDS 5G): Initiatives designed to enhance social development within communities. **Type of Community Engagement:** Food Security (s*ocial Canteens, and food Baskets),* Health (*street clinics, and support program for individuals with chronic illnesses-Healthy Neighbourhoods), and* Professional Training and Employment (employment network, digital skills training for beginners).

Lisbon Municipal Civil Protection Service I Serviço Municipal de Proteção Civil de Lisboa (SMPC) **Type of Organisation and Role:** The department, an integrated unit of the Lisbon City Council (CML), comprises two divisions: Division of Prevention and Public Awareness, and Division of Operations and Support for Populations. **Date of Foundation**: 1988. **Mission:** i) promote the protection and assistance of population, assets, heritage, and the environment within the municipality of Lisbon; ii) ensure the operation of all municipal civil protection bodies and managing related information; iii) assist in designing and implementing civil protection strategies through risk analysis and mitigation studies; iv) develop municipal planning instruments, including the Municipal Emergency Plan, and ensuring regular updates; v) assess and analyse collective risks in Lisbon to reduce vulnerabilities; vi) promote public awareness, training, and information on civil protection to mitigate risks; vii) coordinate municipal civil protection agents and services during emergencies, collaborating with public and private entities; vii) maintain updated records of civil protection resources and incidents in Lisbon; viii) prepare intervention plans and organising drills and simulations; ix) work with the Firefighters Regiment on safety and emergency plans for municipal buildings; x) promote research and analysis in civil protection; xi) develop volunteer models and supporting the rehabilitation of communities affected by disasters. **Key Target Groups:** General population**,** Residents and Visitors who utilise the urban space of Lisbon. **Type of Community Engagement:** Awareness Campaigns, Training and Simulations, Educational Programs in Schools.

Lisbon Municipal Police I Polícia Municipal de Lisboa (PM) **Type of Organisational and Role:** It operates under the authority of the President of the Municipal Chamber. Police duties are carried out by officers from the Polícia de Segurança Pública (PSP). The service is organised into five main areas: i) Operational Area (Operations and Information Unit, Information and Communications Systems Unit, Studies, Planning, and Control Unit); ii) Support Area (Logistics Unit, Human Resources Unit, Financial Resources Unit, General Support Unit); iii) Police

Division; iv) Traffic Division; and v) Prevention, Security, and International Relations Unit, which is under the command of the Superintendent. **Date of Foundation:** 1891. **Mission:** Exercise all legally assigned competencies to the Municipal Police of the municipality of Lisbon; Centralised Enforcement Actions; Conduct Inspections; Report Anomalies; Forest Area Surveillance; Public Safety Cooperation; Document Offenses; Execute Notification Orders. **Main Target Groups:** i) Population in Lisbon; ii) Visitors and Tourists; iii) Entrepreneurs and Merchants; iv) Vulnerable Communities; v) Educational Institutions.

Lisbon Firefighters Regiment | Regimento de Sapadores Bombeiros de Lisboa (RSB) **Type of Organisational and Role:** The Professional Firefighters of Local Administration directly depend on municipal councils and are designated as 'sapadores' firefighters. It is equivalent to a municipal directorate and is commanded by Lieutenant Colonel Alexandre Rodrigues, supported by a Deputy Commander and four Technical Advisors (one civilian and three career operational staff). There are 11 fire stations in the city supported by administrative or support departments, and six specialised teams. **Date of Foundation:** 1395. **Mission:** RSB aims to guarantee the safety of people and property in the city of Lisbon and throughout the national territory. The RSB also participates in international missions as part of the European civil protection framework. **Key Target Groups:** General population. **Personnel:** 938 personnel. **Key Programs and Activities:** Its main activities include Firefighting; Rescue Operations; Prevention; Support for Civil Protection. The RSB is also involved in training and awareness activities for the population, promoting safety and preparedness for emergencies, particularly among vulnerable communities. Its training school offers programs for firefighters, civil protection agents, and public and private entities. **Type of Community Engagement:** Various demonstrations and activities, e.g., *Donation to the Food Bank Against Hunger*, *Demonstration Day of Civil Protection Means*, *First Aid Training Session*, *Participation in the Safety Project / Traffic Schools Program* - Municipal Mobility Directorate, *Children's Day at Mata da Madre de Deus*.

Lisbon Urban Information Centre | Centro de Informação Urbana de Lisboa (CIUL) **Type of Organisation and Role:** Its primary goals include promoting knowledge generation and dissemination while establishing collaborative networks around innovative themes and processes. Working in partnership with the academic and scientific community, the CIUL Centre leverages various aspects of its space to achieve these objectives. It acts as a bridge between different stakeholders, providing privileged access to resources and knowledge from the Lisbon City Hall. This collaborative approach fosters a more informed and engaged community regarding urban development and planning issues. **Date of Foundation:** 2001. **Mission:** i) promote and disseminate urban information about Lisbon and knowledge related to urbanism; ii) encourage learning, reflection, participation, and the co-creation of solutions for the sustainable development of the city. **Main Target Groups:** Population of the City of Lisbon. **Key Programs and Activities:** Urbanism Meeting (focused on discussing urban planning, policies, and practices), UNIVERcidades Meeting (collaboration between universities and urban planners to address urban issues), Workshop on Open Data Platform, and an Open Class (educational sessions that provide insights into various urban-related topics, encouraging public engagement

and participation). **Type of Community Participation:** Walking Tours of the City; Public Awareness Meetings on Urban Space.

Municipal Directorate of Maintenance and Conservation | Direcção Municipal de Manutenção e Conservação (DMCC) **Type of Organisation and Role:** The DMCC is responsible for the preservation and maintenance of municipal infrastructure, including equipment, and urban furniture. Specifically, the DMCC aims to guarantee maintenance of roads and sidewalks, conservation of public infrastructure, management and maintenance of parks and gardens, public lighting, and urban waste system. **Mission:** enhance urban quality of life. DMCC is tasked with providing rapid responses to infrastructure-related emergencies, such as potholes, lighting failures, or issues with sewage networks. **Key Target Groups:** i) General population; ii) Vulnerable communities and neighbourhoods; iii) Users of transport and mobility infrastructure; iv) Managers of public buildings; v) Companies and businesses. **Personnel:** 370 employees. **Key Programs and Activities:** While the DMCC lacks specific programs for vulnerable populations, its maintenance of public spaces enhances quality of life and access to essential services.

Public Security Police | Polícia de Segurança Pública (PSP) **Type of Organisation and Role:** The PSP is a police force operating in mainland Portugal, the Azores, and Madeira. It follows a hierarchical structure, with police personnel adhering to command hierarchy and non-police personnel following public service protocols. Reporting to the government official responsible for Internal Administration, the PSP operates nationwide, excluding areas covered by other security forces. In the Azores and Madeira, it has exclusive jurisdiction. Its structure includes two Regional Commands (Azores and Madeira), two Metropolitan Commands (Lisbon and Porto), and 16 District Commands. The National Directorate is based in Lisbon. **Date of Foundation:** 1954. **Mission:** Upholding democratic legality; Ensuring internal security; Protecting citizens' rights. **Key Target Groups:** It focuses on fostering visibility and encouraging community involvement in crime prevention. Special attention is given to vulnerable groups, including children, youth, and the elderly, through targeted programs. **Personnel:** 20,235. **Key Programs and Activities:** *Support 65: Elderly Safety, Safe Commerce, Safe School, Integrated Proximity Policing Model (MIPP), Blue Signal,* and *Domestic Violence*; Other projects: *Concerto de Palmo e Meio, Safe Destination, Safety for the Future, Together for Everyone, SOS Azulejo,* and *Animal Protection Program*. **Community Engagement:** community policing; partnerships with schools: community events; victim support; collaborations with security forces, local authorities, and ngos to enhance public safety; digital communication: social media and digital platforms.

Unidade de Saúde Familiar de Monsanto (USFM) | Monsanto Health Unit
Type of Organisation and Role: Equipped with a total of six clinical and nursing offices and with services in maternal and child health, the Boavista Unit now offers consultations with family health teams. **Mission:** Provide healthcare services. The aim is for more patients to receive direct care at the Boavista Unit, progressively extending its hours of operation. **Target Groups:** General public. **Date of Foundation:** 2020. **Personnel:** 9 doctors, 8 nurses, and 5 administrative staff. **Type of Community Engagement:** It serves 4,500 users and includes a Community Care Unit.

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Army of the Slovak Republic is responsible for the security and safety of the Slovak Republic. During an emergency, it closely collaborates with other parts of the Integrated Rescue System. It can be mobilized to assist in interventions during an emergency**.**

City of Žilina (municipality) I Mesto Žilina prepares the population protection plan, coordinates the performance of civil protection tasks, manages rescue work if it does not fall under another remit, plans, announces, manages, and provides evacuation, emergency accommodation and emergency supply in its territory.

District Directorate of the Fire Department and Rescue Service I Okresné riaditeľstvo HaZZ handles firefighting, rescue operations, and environmental protection during accidents, disasters, and emergencies. It also manages fire protection duties not covered by the Regional Fire Department or Ministry of Interior, and assists municipalities with fire protection tasks, including advice on regulations and fire protection records.

District Directorate of the Police Department I Okresné riaditeľstvo Policajného zboru acts in the protection of fundamental rights and freedoms, particularly in protecting life, health, personal liberty, and the security of individuals, as well as in protecting property, detecting crimes, and identifying illegal activities. The District Directorate is administratively subordinate to the Regional Directorate.

District Office I Okresný úrad analyses the territory for emergency risks, applies civil protection construction standards, and develops population protection plans. It manages preparedness activities, organises preventive actions with public institutions, and oversees rescue operations and evacuation planning. In emergencies, it informs relevant authorities and, if needed, notifies the district office to propose declaring an emergency. It is also responsible for the Civil Protection Information System.

District office at the seat of the region I Okresný úrad v sídle kraja analyses the territory to define the occurrence of possible emergency events, applies construction-technical requirements for buildings for the needs of civil protection, manages and controls the performance of tasks, manages rescue work if the emergency exceeds the level of the district office, develops PPP, manages and ensures the evacuation, manages and information system of civil protection. It is in a close cooperation with the District Office.

Integrated Rescue System Coordination Centre I Koordinačné stredisko integrovaného záchranného systému ensures the reception of emergency calls, processes and evaluates information from emergency calls, ensures voice and data transmission of information through telecommunication networks and telecommunication equipment, keeps an overview of the forces and resources of the rescue components of the integrated rescue system, keeps an overview of the forces and resources of legal entities and natural persons - entrepreneurs, issue

instructions to the components to carry out an intervention. In emergency events ensures warning of the population, if this has not been done by legal entities or natural persons (entrepreneurs), notifies state administration bodies and other legal entities that provide tasks related to rescue work, participates in the performance of tasks related to the implementation of rescue work.

Slovak Red Cross | Slovenský červený kríž cooperates in the field of humanitarian aid, blood donation, medical support of events, training, within the framework of the agreement with the Ministry of the Interior of the Slovak Republic. The SRC is the other component of the integrated rescue system. As the other component, they provide professional, medical, technical and other necessary assistance in distress on the basis of a call by the coordination centre or the emergency call centre. Within the CP, they are active in rescue work, training, education and promotion of the CP in cooperation with the district offices and the district offices in the region's seat. Slovak Red Cross cooperates with the Integrated Rescue System Coordination Centre, with the city, municipalities, and other actors of Integrated Rescue System. It is organizing education activities in first aid for the Fire Department, Police Department and Voluntary Civil Protection.

Providers of Emergency Medical Service | Poskytovatelia ZZS provides emergency medical services by providing emergency medical care through ambulances. They are the main rescue component of the Integrated Rescue System. They are coordinated by the Regional Operating Centre and Integrated Rescue System Coordination Centre.

Regional Directorate of the Fire Department and Rescue Service | Krajské riaditeľstvo HaZZ handles firefighting, rescue work in case of accidents, natural disasters and other emergencies, and protects the environment. Decides on the preparation and approval of the fire hazard analysis. Decides on the execution of tactical exercises. Supervises how the district directorate carries out the tasks of state fire supervision and how the municipality carries out the tasks entrusted to it by the state administration in the field of fire protection.

Regional Directorate of the Police Department | Krajské riaditeľstvo PZ
It acts in the protection of fundamental rights and freedoms, particularly in protecting life, health, personal liberty, and the security of individuals, as well as in protecting property, detecting crimes, and identifying illegal activities. Is the managing and executive territorial unit of the Police Department. It manages and professionally directs and controls the activities of the District Directorates of the Police in the region.

Regional Operating Centre of Emergency Medical Service | Krajské operačné stredisko ZZS ensures the reception of an emergency call to the emergency medical service, the processing of the emergency call and the implementation of the response to the emergency call, instructs the ambulance of the emergency medical service to intervene, if necessary, manages, coordinates and evaluates the emergency medical service to ensure its continuity.

Voluntary Civil Protection I Dobrovoľná civilná ochrana is currently the last rescue force operating in the Bratislava and Trnava regions. They also carry out their activities and assistance in other districts in Slovakia. The VCP is equipped with professional technical tools, and its experienced members assist in search operations, disaster response, public education, and emergency supply transport, among other tasks.

Social Services Centres in the city of Žilina

Residential social services for various disadvantaged groups. The centres are managed by different bodies. Social Service Centres (CSS) Stranik, CSS Harmony, CSS Letokruhy and CSS Synnómia - administered by the Žilina self-governing region, SMILE Senior Citizens' Centre - administered by Žilina city, Diocesan Charity of Žilina - administered by a church organisation. Support Services Agency provides help and support in independent housing for people with physical or mental disabilities. It's a non-profit organisation.

Various specialised social counselling centres of non-public providers operating in the Žilina City Subjects provide the following services to people in an unfavourable social situation: social counselling, assistance in exercising rights and help in preparing for school and accompanying the child to and from school, preventive activities, translating for deaf or blind etc.

National-level associations for the disadvantaged

Association of Social Service Providers in the Slovak Republic is a professional and interest association that brings together providers of social services, professionals, or organisations of employees in social services. The aim of APSS in SR is to assist its members in improving the quality of social services for beneficiaries and to actively enter the legislative process in an effort to bring positive changes in the social field. They represent more than 850 organisations providing services to more than 20,000 vulnerable people.

Association for the Support of People with Mental Disabilities in the Slovak Republic The association's main goal is the inclusion of people with intellectual disabilities into society. The association has over 10,000 members united in local organisations in all regions in Slovakia. Their activities include advocacy of rights and interests, education and awareness raising, teaching people with mental disabilities how to self-advocate, and providing free social counseling (expert advice on housing, education, employment, and social services. They advise people with intellectual disabilities, their parents, guardians, among others)

Unity of Pensioners in Slovakia Date of foundation: 1990. Protects the rights and legitimate demands of pensioners for fair and dignified pension, health and social care; provides social, health and legal counselling assistance; participates in the organisation of health, recreational, sports and tourist care; assists in the implementation of lifelong learning and supports the cultural and social activities of seniors. They operate on a national level.

Institutions involved in the process of building renovation

Department of the Chief Architect of the City of Žilina is a workplace dealing with architecture, urban planning, spatial planning, and the concept of city design. It coordinates spatial planning and urban-architectural activities, prepares conceptual documents in the field of city planning and design and collects important information about the territory.

Centre of Design for All (CEDA) is based at the Faculty of Architecture and Design of the Slovak University of Technology in Bratislava. The CEDA Centre focuses on research and professional support for the design and implementation of barrier-free environments following the principles of inclusion and non-discrimination. CEDA's goal is to explore and apply the principles of designing environments using the *Universal Design method - Designing for All*.

Construction Office of the City of Žilina ensures the delegated performance of state administration in the field of territorial proceedings and building regulations. They issue building permits in accordance with legislation of the Slovak Republic.

NGO Kodukotus | MTÜ Kodukotus Founded in 1990, Kodukotus aims for its members to develop and maintain an active lifestyle and to provide them with opportunities for social interaction. The NGO's target group is the elderly from the city of Tartu, and it gathers around 900 members. Kodukotus organises activities such as gymnastics, dance nights and bowling, as well as cultural activities such as ensembles and a travel club. Kodukotus additionally provides its members with assistance and participates in conferences and round tables. Engagement with local communities thus takes place through participatory programs and advocacy. Kodukotus is governed by a 6-member board and employs around 10 salaried workers.

Slovak Association of Insurance Companies is an interest association of commercial insurance companies and its aim is to represent, protect and promote the common interests of its members in relation to the central government authorities, other legal entities, the general public and abroad. The Association's activities are mainly focused on insurance economics, education and promotion of the insurance sector as a whole. It operates at the national level and was founded in 1993 at the establishment of the Slovak Republic. It brings together 12 insurance companies operating in Slovakia.

TARTU PILOT SITE

Association of Annelinn I Annelinna Selts was founded in 2016, Association of Annelinn connects people living in the Annelinn district with the aim of connecting the different communities of Annelinn into one whole community and stand for their interests, promote the living environment of the district and strengthen the regional identity of its residents. The Association makes proposals to the government and other stakeholders on issues of the development, future and infrastructure of Annelinn. Preserves and shares the history and identity of Annelinn with the wider public, organizes cultural and information events, promotes sustainable development principles. Engagement with local communities is done through collaboration with public authorities, advocacy, and participatory events.

Association of Ränilinn I Ränilinna Selts was founded to connect people living in the Ränilinn district to stand up for a better living environment of Ränilinn, so that it is safe and supportive for all age groups. Clean-up days, Grandparents' Day and Children's Day are among the events that have been organized. Engagement with local communities is done through participatory events and advocacy.

Association of Supilinn I Supilinna Selts Founded in 2002, the Association serves both residents of Supilinn district and those concerned with its wellbeing. It focuses on preserving the district's values and improving the living environment while considering residents' interests. The Association represents local views to authorities and the public, organising information days, workshops, and publishing an annual newspaper. It engages with communities through participatory programs, advocacy, and collaboration with local authorities. 4 board members.

Association of Tammelinn I Tammelinna Selts Since 2015, people living in Tammelinn district and those interested in the wellbeing of Tammelinn have been connected through an association with an aim to promote the living environment of the Tammelinn district, help preserve the value of the milieu and strengthen its regional identity. Home Café festivals, district festivals (culture, arts, sports events) are organized. Engagement with local communities is done through participatory events and advocacy. 3-member board.

Association of Tartu Districts of Veeriku and Vaksali I Tartu Veeriku ja Vaksali linnaosa 1100 people living in Veeriku and Vaksali district and those that generally like the district are connected in an Association since 2018 with the aim of sharing information about the current ongoings of the district. Arts and crafts workshops, open door days, game nights, canoe nights are examples of events organised. Engagement with local communities is done through participatory programs.

Association of Tähtvere I Tähtvere Selts was founded in 2016 for anyone interested in the wellbeing of Tähtvere district with an aim to improve, maintain and develop the district as a safer, healthier and family-friendly place to live, to help preserve the value of its surroundings, to

contribute to increasing the security of the districts, to strengthen its regional identity and cooperation of the district's inhabitants. The Association makes proposals to the local government and other stakeholders on issues related to the development, future, living environment, security and infrastructure of Tähtvere. Engagement with local communities is done through advocacy, participatory programs, and collaboration with public authorities. The Association has a 5-member board.

Association of Veeriku I Veeriku Selts Since 2020, people living in Veeriku district have been connected to promote the living environment and preserve the milieu of Veeriku. Sports venets, open garden and gafé festivals, general meetings are organized. Engagement with local communities is done through participatory programs.

Association of Ihaste I Ihaste Selts Since 2015, it has been targeted towards connecting anyone interested in the development of Ihaste district. The Association organises community café days, district clean-up days, information events. Engagement with local communities is done through participatory events and advocacy.

Association of Karlova I Karlova Selts Since 2007, Association of Karlova has aimed to enhance the living environment in the district of Karlova, to contribute to the preservation of the milieu and to strengthen the regional identity of the people of Karlova district. The Association makes proposals to the government and other stakeholders on issues of the development, future and infrastructure of Karlova, conducts opinion polls and surveys, promotes joint activities between the residents of Karlova, cooperates with other district associations, the Tartu City government and other natural and legal persons. Engagement with local communities is done through collaboration with local authorities, participatory events.

Association of Ukrainian Organisations in Estonia I Ukraina Organisatsioonide Assotsiatsioon Eestis was founded in 2000 and aims to unify, coordinate and work and increase the effectiveness of the activities of Ukrainian communities in Estonia, as well as support and develop Ukrainian-Estonian and international cultural ties. The Association constantly admits new Ukrainian organisations as members, provides opportunities for their development, protects their rights and interests, and promotes their participation in integration processes. Engagement with the community is done through advocacy and community outreach. The Association is governed by a chairman, a deputy chairman and a board.

Estonian Chamber of People with Disabilities I Eesti Puuetega Inimeste Koda was founded in 1993, the Estonian Chamber of People with Disabilities aims to enhance the quality of life, inclusion and fulfilment of people with disabilities and chronic illnesses through advocacy and cooperation. For this, the Chamber shapes policies, raises awareness about the rights and needs of people with disabilities and chronic illnesses, advises them, issues information, organizes trainings and conferences. Engagement with the local community is done through

advocacy, participatory programs, community outreach and collaboration with local and national authorities. The Chamber is governed by a 9-member board.

Estonian Union of Housing Associations I Eesti Korteriühistute Liit was founded in 1996, the Union connects Housing Associations in Estonia and represents their interests. The Union represents Estonian Housing Associations nationally and internationally and it stands up for the problems and needs of Housing Associations in Estonia, offers counselling and advice, publishes information. Currently, around 1400 Housing Associations are represented and community engagement is done through advocacy, participatory programs, and collaboration with local authorities. Daily operations are governed by a 3-member board.

Inhabitants of Ropka I Ropka Elanikud Since 2018, people living in Ropka district have organised trainings, cultural events (movie nights, concerts, Christmas markets), workshops and information events. Currently, around 1200 are included in the group. Engagement with communities is done through participatory programs.

Inhabitants of Tartu I Tartu Elanikud was founded in 2021, Inhabitants of Tartu Facebook group connects over 12 thousand people living in the city of Tartu, who would like to share their opinions on the city and its people. The aim of the group is to connect the community and support communication to find solutions and discuss about situations, improvements, and the inhabitants' needs. The group organizes workshops, webinars, conferences, concerts among else. Engagement with local communities is done through, participatory events.

International House Tartu I Tartu Rahvusvaheline Maja was founded in 2011 and directed towards newcomers to Tartu, International House Tartu provides information to people moving to Tartu from other countries, as well as advises employers working with newcomers. Programs help discover Estonia, learn the language, make connections, request assistance. For this, the House organises cuisine evenings, sports events, language nights and a course on culture. Engagement is done through participatory programs, collaboration with local authorities and community outreach. The House has a 2-member board and employs coordinators.

NGO Independent Life I MTÜ Iseseisev Elu was founded in 1997, NGO Independent Life is targeted towards individuals with special needs. Independent Life aims to improve and maintain the quality of life of people with special needs and more to place value in caring more broadly. The NGO helps these individuals find activities and work that match their skills. Employment support service, housing service, daily assistance is offered. Engagement with local communities is done through participatory events, advocacy and community outreach. Independent Life has a 2-member board.

NGO Lifeline I MTÜ Eluliin was founded in 1996, and it offers emotional support to individuals who might be at risk of taking their own lives; additionally, support is offered to victims of prostitution and victims of human trafficking. The NGO provides an emotional support phone

number for people in crisis, troubled by loss, suffering from violence and social troubles. Engagement with communities is thus done through providing support. Governance of the NGO is based mainly on the principle of voluntariness, but there are also 3 board members and 6 honorary board members.

NGO Life of Kvissental | MTÜ Kvissentali Elu People living in Kvissental district have been connected through Life of Kvissental since 2024 with the aim of promoting and improving the living environment in the Kvissental district, strengthening the regional identity and organizing common events. The NGO conducts surveys and opinion polls, draws up development plans and ensures their implementation, promotes collects and shares information on the history and characteristics of Kvissental, cooperates with other natural and legal persons. Engagement with local communities is done through participatory events and advocacy.

NGO Mondo | MTÜ Mondo was founded in 2007 and focuses on aiding refugees through a broader mission of alleviating global inequalities. One current ongoing project in Estonia focuses on supporting Ukrainian refugees in overcoming trauma and settling in Estonia. Free mental health counselling, youth camps and meetings, digital skills training is offered to support Ukrainian refugees in finding employment, making meaningful contacts in Estonia and improving their mental health. Engagement with local communities is done through participatory programs, advocacy and community outreach. NGO Mongo has 2 board members and over 30 workers in charge of a regional project.

NGO Refugee Aid | MTÜ Pagulasabi was founded in 2001 and operates to stand up for the rights and wellbeing of people suffering from humanitarian crises in Estonia and abroad. The NGO offers refugees relevant and up-to-date information based on their personal needs in order to assist them in rebuilding their lives in a new country, entering the labour market, founding small businesses. Community support activities, mental health support and counselling is also provided. Engagement with local communities is done through participatory programs and advocacy. The NGO is governed by a director, there are 8 salaried employees and volunteers. NGO refugee aid partners with the Estonian Food Bank for organizing food aid and there is a food collection facility in Tartu for accepting donations.

NGO Tartu Council of the Elderly | MTÜ Tartu Eakate Nõukoda Founded in 2004, the Council operates with the aim of generally assisting the elderly and more specifically of helping process and solve any problems raised by the elderly in Tartu. Annually, the Council receives a flow of requests from around 26, 000 elderly persons from Tartu and directs them towards relevant departments of the city of Tartu or the ministries of Estonia. Further, the Council organises monthly meetings for the elderly with specialists of various fields, as well as representatives of the State, offers the elderly free legal aid and counselling, help with formatting documentation and contacting authorities. Engagement with local communities is thus done through participatory programs, advocacy, and collaboration with public authorities. The Council of the Elderly work entirely based on voluntariness.

Older Sister, Older Brother | Vanem Õde, Vanem Vend has a mission of supporting children in need of friendship, role models and emotional support in society, to ensure their right to be heard, create a strong foundation for them to grow into successful individuals with healthy self-esteem and prevent them from falling into at-risk groups. The program has operated in Tartu since 1997, and a dedicated NGO was founded in 2015. The organisation targets the youth who feel social excluded, have special need, or need additional emotional support. The program pairs together an adult support worker (mentor) and a child in need, currently, 30 children and 30 volunteers are involved. Older Brother, Older Sister engages with the community through participatory programs and advocacy and is governed by several managers, volunteer mentors and volunteers.

Tartu Chamber of People with Disabilities | Tartu Puuetega Inimeste Koda was founded in 1994 and is directed towards supporting people with disabilities to help them feel that they are equal members of the society and, through the organisation, to influence and cooperate with the legislative and executive branches of the Estonian government. For this, the Chamber organizes conferences, information days, leisurely activities (literature club, concerts etc.) and services (e.g., blood pressure measurements). Engagement with local communities is done through participatory programs, advocacy, and collaboration with local and national authorities. The Chamber is governed by 3 board members, there are additionally 4 employees who direct the Chamber's daily functions. Tartu Chamber of People with Disabilities is a local branch of the Estonian Chamber of People with Disabilities.

Tartu Food Bank | Tartu Toidupank aims to fight poverty, reduce food waste and build solidarity between people. Specifically, the Food Bank targets low-income individuals who have been assigned food aid through social workers. The Food Bank organises both regular food distribution as well as emergency food distribution in the form of soup kitchens. Engagement with the community is thus done through participatory programs and collaboration with public authorities. Tartu Food Bank has two main coordinators and volunteers. Tartu Food Bank is a local branch of the nation-wide Estonian Food Bank.

Tartu University Pensioners' Organisation VITAE | Tartu Ülikooli Pensionäride Organisatsioon VITAE Since its founding in 1997, VITAE has connected the former employees of the University of Tartu who have reached the age of retirees. The aim of the organisation is to facilitate connections between the former employees of the University of Tartu, keep its members up to date with the activities of the University as well as with world affairs more broadly. VITAE organises lectures and meetings with prominent Estonians, as well as excursions, Spring and Christmas parties, and clubs for interests such as biographies and chemistry. such as biography and chemists' clubs. Engagement with local communities is done through participatory programs. VITAE is governed by a 6-member board.

Tartu Union of Housing Associations | Tartu Korteriühistute Liit was founded in 2009 and is targeted towards housing associations, owners of residential buildings and apartment owners joined with an administrator. The Union promotes cooperation between housing associations in Tartu and coordinates their activities. The Union offers free legal aid, training, information days, study trips, seminars and conferences, organises changes to urban space, joint procurements and campaigns. Engagement with the community is done through participatory programs and collaboration with public authorities. Governed by a board.

Tartu Women's Support and Information Centre | Naistetugi focuses on women who have been victims of violence and defends their interests. The mission is to be a regional, national, and international advocate on the issue and be involved in as well as initiate policymaking to prevent violence against women. Psychological, legal, economic, and emotional support is provided for the victims. The Centre brings attention and raises awareness of the problem of intimate partner violence. Engagement with communities is done through advocacy, participatory programs. The Centre is governed by a board member and employs coordinators, social advisors, lawyers, psychologists and a family therapist.

Ukrainian House | Ukraina Maja Founded in 2022, it aims to connect the Ukrainian community in Tartu and Estonia more broadly, as well as assist with creating connections between the locals, different organisations, public authorities and Ukrainians. Social and cultural initiatives (art exhibitions, workshops, movie nights, celebration of Ukrainian holidays) are coordinated. Informational support to the Ukrainian community as well as the Estonian society is offered. Engagement with the community is done through participatory programs, advocacy, and collaboration with local authorities. Ukrainian House has 3 founders and volunteers.

People of Tartu Ülejõe District | Tartu Ülejõe Inimesed People living in Ülejõe district have been connected through an Association since 2016, currently totalling around 2100 members. Museum days, family mornings, charity events, guided tours, escape room events have been organised, for instance. Engagement with local communities is done through participatory programs.

Residents of Tartu City Centre | Tartu Kesklinna Elanikud was founded in 2021 with the aim of promoting the living environment of Tartu City Centre, contributing to joint activities and strengthening the identity of the local community. For this, different cultural events, workshops, political strikes, information events among else are organized. Engagement with the community is done through participatory events and advocacy.

Raadi-Kruusamäe Group | Raadi-Kruusamäe Grupp was founded in 2013 with the aim of connecting the people living in Raadi-Kruusamäe district and now includes around 2800 people. Family events, workshops, webinars, arts and crafts classes, sports classes, farmers' market, and other events are organised. Engagement with local communities is done through participatory events.

Annex B: Guide for Stakeholder mapping exercise

Exercise 1: Stakeholder Engagement Options Framework (SEOF)

First step: Complete Table 16 by indicating the relevant stakeholders and marking each one with an X at the appropriate engagement level(s).

Table 16. Engagement level for each stakeholder (example).

Level of engagement	Inform (NEB: 1)	Consult (NEB: 1)	Involve (NEB: 2)	Collaborate (NEB: 2)	Empower (NEB: 3)
Local police department	X				
Citizens of a specific neighbourhood	X	X			
Add a row for each Stakeholder					

Second step: Motivate the positioning of a stakeholder in one or more levels by filling Table 17.

Table 17. Motivation for the engagement (example).

Key stakeholder	Motivation for the different level of engagement
Local police department	They can collaborate to the realisation of a prototype of a map related to the situation of car accident during an alert and how to design it in an accessible way
Citizens of a specific neighbourhood	They can be invited to the presentation of the prototyped map and be informed on how to read it in case of an alert
Add a row for each Stakeholder	

The Power/Influence-Interest Matrix (PIM)

Once stakeholders are mapped within the spectrum, it is important to understand how to manage them during the project lifetime. The PIM is a strategic framework used to categorise stakeholders into four quadrants based on two primary factors, namely, the power or influence they can have on project implementation and their level of interest in project goals, activities, and outputs, as shown in Figure 25.

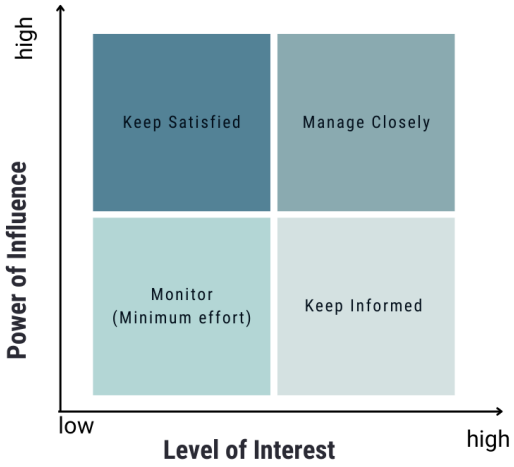


Figure 25. The Power/Influence-Interest Matrix.

The four quadrants are related to specific combination of power and interest that need to be taken in consideration by applying different engagement strategies:

High Influence/High Interest (HI-HI): Stakeholders are crucial players requiring close collaboration due to their significant influence and interest with regards to project outputs and outcomes. They need to be managed closely to get them on board, avoiding shortcomings in the implementation of a project activity due to a not proper stakeholder management system.

Related strategies: Stakeholders need to be included in local working groups, Steering Committees, testing and validation groups, and they need to be always informed and engaged on specific decisions regarding the implementation of eventual changes that can affect their participation to the project or the 'promise' made to them in relation to project impacts.

High Influence/Low Interest (HI-LI): while these stakeholders possess substantial power or authority, they may not be directly invested in the subject's outcomes. It is crucial to maintain their satisfaction without inundating them with excessive communication. They need to be kept satisfied by involving them in relevant decisions and taking care of their role beside the project.

Related strategies: Stakeholders need to be constantly consulted about strategic choices regarding the project development since they can have some influence for example in regulatory matters that are not directly included in the project development but can affect it.

Low Influence/High Interest (LI-HI): Stakeholders here may lack significant power but hold a strong interest in the subject's outcomes. Engaging them effectively can garner support and address potential concerns. They need to be kept informed by updating on relevant activities in which they can be allied for the proper implementation of the project since they are really interested in outputs and outcomes.

Related strategies: Stakeholders need to be informed through direct channels or specific events, focus groups or workshops dedicated to explaining the potential outcomes of project activities.

Low Influence/Low Interest (LI-LI): These stakeholders have low influence and interest in the subject. While they may not need intensive engagement, keeping them informed fosters transparency and goodwill. They need to be monitored as their influence or interest in the project may increase, changing their position in the matrix and requiring new management strategies (e.g., an informal citizens' group becoming a formal interest group for a specific project aspect). *Related strategies:* Stakeholders can be informed of project activities through regular communication channels, avoiding excessive technical details or mass emails, using key messages from the Communication and Dissemination Activities (WP6).

Exercise 2: How to create and use the PIM

6-step guide to completing the PIM (Table 18):

1. Identify stakeholders for the pilot implementation.
2. Work with the local pilot team to assess stakeholders' influence/power and motivations.
3. Discuss each stakeholder's interest in project objectives, noting motivations in Table 18.
4. Define each stakeholder's position in the matrix and corresponding management strategy.
5. Validate the stakeholder matrix in meetings with members from ICONS and ISTAR-ISCTE.
6. Review and update the matrix quarterly for changes in stakeholder status.

Table 18. Stakeholder Matrix (example).

Key stakeholder	Influence motivation	Interest motivation	Quadrant of the matrix	Strategy
Local police department	They are the one in charge of the traffic alert system in the city	They are interested in designing a more user-friendly system to map traffic jams in case of alerts	HI-HI	Consider them as a well-informed stakeholder that can contribute to co-create solutions such as interactive maps
Citizens of a specific neighbourhood	They have low influence in the design of traffic alert	They are interested in traffic jam only in case of delays in their daily routes	LI-LI	Inform them about the new alert system related to traffic jams
Add a row for each Stakeholder				

HI-HI: High Influence/High Interest; HI-LI: High Influence/Low Interest; LI-HI: Low Influence/High Interest; LI-LI: Low Influence/Low Interest.

Annex C: Variables for Social Vulnerability Assessment at local scale

Table 19. Support Capacity variables at local scale.

Support Capacity variables	
1. Electrical Distribution Network (medium voltage, high voltage and transformation stations)	21. 3rd cycle and secondary school
2. Military public and private hospitals	22. Secondary school
3. Pharmacies and parapharmacies	23. Private schools - preschool
4. Health centres	24. Private schools - 1st cycle
5. Sports facilities	25.Private schools - 2nd and 3rd cycle
6. Sports centres	26.Private schools - high school
7. Urban rehabilitation area	27. Professional schools
8. Urban Area of Illegal Genesis	28. Road network
9. Fire Stations	29. Rail network
10. Police Stations	30. Cycle paths
11. Tree density	31.Tourist accommodation
12. Water elements (e.g., lakes, fountains, reservoirs)	32. Pendulum migration (work or school)
13. Green spaces	33. Location of cultural associations
14. Parks and gardens	34. Gas stations
15.Commercial census (e.g., restaurants, commercial stores, supermarkets)	35. Fire hydrant location
16. Shopping centres	36. Water supply network
17. Universities	37. Location of telecommunications antennas
18. Preschool	38. Location of day centres and nursing home
19. 1st cycle school	39. Buildings
20. 2nd cycle school	

Table 20. Criticality variables at local scale.

Criticality variables	
1. Density of the medium voltage electrical network (km/km^2)	27. Number of inhabitants per km^2
2. Density of Transformation Stations (km/km^2)	28. Proportion (%) of resident population benefiting from social housing programs
3. Density of the road network (k/km^2)	29. Number of buildings per km^2
4. Number of telecommunications antennas	30. Proportion (%) of buildings built before 1970
5. Density of the water supply network (km/km^2)	31. Proportion (%) of classical structurally constructed buildings with 1 or 2 dwellings
6. Proportion (%) of resident population under the age of 5 years old	32. Proportion (%) of classical structurally constructed buildings with 3 or 2 more homes

Criticality variables	
7. Proportion (%) of resident population aged between 15 and 24 years old	33. Proportion (%) of buildings with 1 or 2 floors
8. Proportion (%) of resident population aged 65 or over	34. Proportion (%) of buildings with 3 or 4 floors
9. Proportion (%) of female population in the total resident population	35. Proportion (%) of buildings with 5 or more floors
10. Elderly dependency index	36. Proportion (%) of buildings with reinforced concrete structures (after 1960)
11. Youth dependency ratio	37. Proportion of buildings in need of medium and deep repairs
12. Proportion (%) of unemployed population looking for a new job or 1st job	38. Number of private domestic households with 5 or more people
13. Proportion (%) of resident individuals who are pensioners or retirees	39. Proportion (%) of classic family homes
14. Proportion (%) of individuals without domestic economic activity	40. Proportion (%) of family households with habitual residence
15. Proportion (%) of individuals residing without economic activity	41. Proportion (%) of classic family homes with habitual residence with owner-occupant
16. Proportion (%) of employed population	42. Proportion (%) of vacant homes
17. Proportion (%) of population employed in the secondary sector	43. Proportion (%) of traditional family homes rented
18. Proportion (%) of population employed in the tertiary sector	44. Proportion (%) of classic family homes with 1 or 2 divisions
19. Proportion (%) of individuals attending elementary school	45. Proportion (%) of classic family homes with 3 or 4 divisions
20. Proportion (%) of individuals attending high school	46. Proportion (%) of classic family homes with 5 or more divisions
21. Proportion (%) of individuals without any completed level of education	47. Proportion (%) of classic family homes with habitual residence with an area of up to 49 m^2
22. Proportion (%) of resident individuals with complete primary education	48. Proportion (%) of classic family homes with habitual residence with an area of 50 m2 to 99 m^2
23. Proportion (%) of resident population with completed 3rd cycle of primary education	49. Proportion (%) of classic family homes with habitual residence with an area greater than 100 m^2
24. Proportion (%) of resident individuals with complete secondary education	50. Proportion (%) of classic family homes with habitual residence with an area greater than 200 m^2
25. Proportion (%) of resident population with a higher education degree	51. Proportion (%) of area of the statistical section occupied by Urban Areas of Illegal Genesis
26. Proportion (%) of foreign population	52. Number of institutional domestic households

Annex D: Variables for Social Vulnerability Assessment at municipal scale

Table 21. Support Capacity variables at municipal scale.

Support Capacity variables	
1. Electricity consumption per inhabitant	19. Urban waste collected – kg/hab
2. Military public and private hospitals	20. Banks and savings banks (‰)
3. Pharmacies and parapharmacies	21. Accommodation capacity in hotel establishments /1000 inhab
4. Health centres	22. Firefighting corporations
5. Sports facilities	23. Firefighters/1000 inhab
6. Fire Stations	24. Collective accommodation (hotels, local accommodation, hostels)
7. Police Stations	25. Insurance companies (‰)
8. Universities	26. Land use and occupation % (artificial, agricultural and forestry areas)
9. Preschool	27. Utilised agricultural area
10. 1st cycle school	28. Electricity consumption per inhabitant
11. 2nd cycle school	29. Effective expenses of municipal councils (per capita)
12. 3rd cycle and secondary school	30. Average values of urban buildings transacted
13. Secondary school	31. Doctors per thousand inhabitants
14. Road network density	32. Large covered spaces (e.g., sports halls, warehouses)
15. Rail network density	33. Average value of ATM withdrawals
16. Gas stations	34. Natural gas consumption per inhabitant
17. Buildings	35. Population served by wastewater treatment plants (WWTP) (%) 2009
18. ATM (‰)	36. Population served by public water supply systems (%)

Table 22. Criticality variables at municipal scale.

Criticality variables	
1. Average value of social security pensions (€/ No.)	28. Number of buildings per km^2
2. Proportion of classic rented or subleased family accommodation	29. Proportion (%) of buildings built before 1970
3. Density of the road network (k/km2)	30. Proportion (%) of classical structurally constructed buildings with 1 or 2 dwellings
4. Density of the water supply network (km/km2)	31. Proportion (%) of classical structurally constructed buildings with 3 or 2 more homes
5. Proportion (%) of resident population under the age of 5 years old	32. Proportion (%) of buildings with 1 or 2 floors
6. Proportion (%) of resident population aged between 15 and 24 years old	33. Proportion (%) of buildings with 3 or 4 floors
7. Proportion (%) of resident population aged 65 or over	34. Proportion (%) of buildings with 5 or more floors

Criticality variables	
8. Proportion (%) of female population in the total resident population	35. Proportion (%) of buildings with reinforced concrete structures (after 1960)
9. Elderly dependency index	36. Proportion of buildings in need of medium and deep repairs
10. Youth dependency ratio	37. Number of private domestic households with 5 or more people
11. Proportion (%) of unemployed population looking for a new job or 1st job	38.Proportion (%) of classic family homes
12. Proportion (%) of resident individuals who are pensioners or retirees	39. Proportion (%) of family households with habitual residence
13. Proportion (%) of individuals without domestic economic activity	40. Proportion (%) of classic family homes with habitual residence with owner-occupant
14. Proportion (%) of individuals residing without economic activity	41. Proportion (%) of vacant homes
15. Proportion (%) of employed population	42. Proportion (%) of traditional family homes rented
16. Proportion (%) of population employed in the secondary sector	43. Proportion (%) of classic family homes with 1 or 2 divisions
17. Proportion (%) of population employed in the tertiary sector	44. Proportion (%) of classic family homes with 3 or 4 divisions
18. Proportion (%) of individuals attending elementary school	45. Proportion (%) of classic family homes with 5 or more divisions
19. Proportion (%) of individuals attending high school	46. Proportion (%) of classic family homes with habitual residence with an area of up to 49 m^2
20. Proportion (%) of individuals without any completed level of education	47. Proportion (%) of classic family homes with habitual residence with an area of 50 m2 to 99 m^2
21. Proportion (%) of resident individuals with complete primary education	48. Proportion (%) of classic family homes with habitual residence with an area greater than 100 m^2
22. Proportion (%) of resident population with completed 3rd cycle of primary education	49. Proportion (%) of classic family homes with habitual residence with an area greater than 200 m^2
23. Proportion (%) of resident individuals with complete secondary education	50. Number of institutional domestic households
24. Proportion (%) of resident population with a higher education degree	51. Purchasing power (%)
25. Proportion (%) of foreign population	52. Employed population according to the Census: total and by situation in the main occupation – self-employed as an employer (%)
26. Number of inhabitants per km^2	53. Seasonal households (%)
27. Proportion (%) of resident population benefiting from social housing programs	54. Social housing - social and supported renting (%)