



IN-HABIT – INclusive Health And wellBeing In small and medium size ciTies
D3.4 - Monitoring and evaluation of VIS for IHW in Lucca.
Final report

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VERSION LOG

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HISTORY OF CHANGES

Page	Description
2	Update of the VERSION LOG and HISTORY OF CHANGES
20	Update of Chapter 2.2 introducing a table to summarize the evaluation activities organised in Lucca, the explanation of the single methodologies has been inserted through boxes in the specific results' chapters
25-111	Revision of Chapter 3 to include changes needed to better present the evaluation of results to address the comments of the reviewers. Inclusion of the detailed ex-ante and ex-post analysis of the entire process.
111-119	Revision of Chapter 4 to include changes on critical discussion of outcomes and long-term impacts



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LIST OF ACRONYMS

AAI	Animal Assisted Interventions
A-NBS	Animal-Nature Based Solutions
B4B	Bridge For Billions
DFC	Design For Change
EU	European Union
H2020	Horizon 2020 projects
H-NHA	Human-Non-Human Animals
IHAUP	Integrated Hum–Animal Urban Policy
IHW	Inclusive Health and Wellbeing
IUCN	International Union for Conservation of Nature
NBS	Nature Based Solutions
NEB	New European Bauhaus
NGOs	Non-Governmental Organizations
NHA	Non-Human Animals
PAR	Participatory Action Research
RRI	Responsible Research and Innovation



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SE	Sleep Efficiency
TST	Total Sleep Time
UNIFI	University of Pisa
VIS	Visionary and Integrated Solutions
WP	Work Package

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EXECUTIVE SUMMARY

Project partners:

Dept. Veterinary Science - University of Pisa, Municipality of Lucca, Lucca Crea

Lucca city

Medium size city, 89.048 inhabitants (ISTAT, 2023), high rate of elders

Main ambition:

to create the first EU hum-animal city with and Integrated hum-animal urban policy

Timeframe of the report:

from September 2024 to August 2025

Physical Infrastructures:

historical identity, cultural roots, ancient wall embracing the centre: good rate of green areas, separation between inside and outside the walls (figure 1)

Welfare landscape:

good ratio of social services in Tuscany and specific decisional supports in Lucca (consulta - formalised working groups- on marginality and on disabilities installed by municipality), medium-high per capita income, good provision of services but with decreasing financial trends and emerging needs

Institutional landscape:

civic engagement and good number of NGOs, high attitude for co-planning

Target groups addressed in the co-design:

elderly, vulnerable people, persons with disabilities, children and families, city inhabitants at large

Undervalued resources valorised to boost Inclusive Health and Wellbeing (IHW):

human-animal bonds and interactions, Animal-Nature Based Solutions (A-NBS)

Hard VIS:

Animal Lines and relational areas



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Soft VIS:

Animal Assisted Interventions (AAI) in nursing homes, Pet care services for people owning pets but in temporary need, educational activities with children and families, board game on pets, events on the newly built relational areas for social interactions of various groups, social activities with children and adults, city map with pet friendly services, business-oriented training.

Innovative aspects:

Introduction to the idea of A-NBS as a common good provider and of the opportunity of an Integrated Hum-Animal Urban Policy (IHAUP), involvement of University degree and master students, training in primary schools with *mindset change methods*, among the others. The **Lucca case** within the European project **IN-HABIT (INclusive Health and Well-being in small and medium size ciTies)** developed a pioneering approach to improving inclusive health and well-being by introducing **animals as Animal-Nature Based Solutions (A-NBS)**. This innovative perspective reframed animals from being private resources to **urban public goods**, integrated into regeneration policies and citizen services.

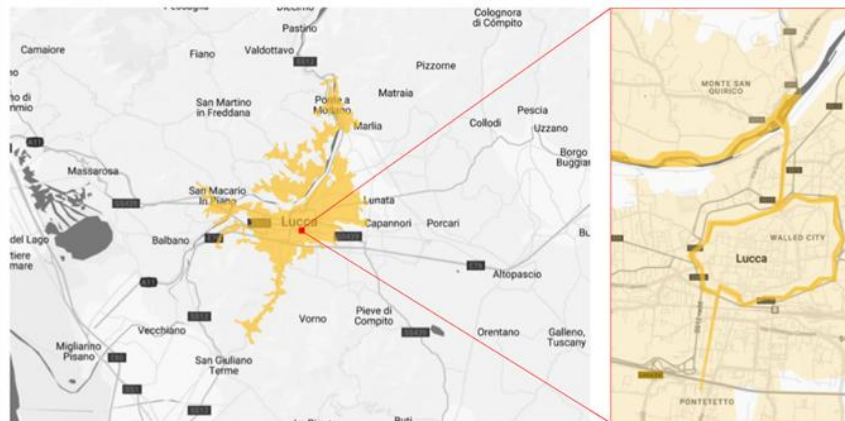


Figure 1. Map of the city of Lucca and detail of the centre

Objectives and Approach

- **Conceptual innovation:** recognizing the human–animal bond as an urban resource for generating public goods and fostering social inclusion.
- **Methodology:** **Participatory Action Research (PAR)** combined with co-design, participatory governance, and transition management.
- **Challenges faced:** COVID-19 pandemic, economic and inflationary pressures, the Russia–Ukraine conflict, and a change in Lucca’s municipal administration. Despite these factors, the process consolidated new practices, tools, and alliances



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Expected actions on the restorative dimensions in the city:

impacts mainly on green, sensory, neighbourly, active, playable, inclusive dimensions

Expected impact on IHW:

Spatial and environmental wellbeing, Subjective wellbeing, Social Wellbeing, Individual Wellbeing, Healthy lifestyles, Economic Wellbeing in various degrees according to specific initiatives and targets.

Monitoring and evaluation methods:

according with diverse pilots, focus groups, interviews, storytelling, questionnaires, wearable devices, physiological parameters in both humans and non-human animals.

Public-Private-People Partnership (PPPP) figure 2:

In a first phase the participation in the IN-HUB was installed in both plenary session and group



Figure 2. The organisation of the partnership in Lucca

sessions. Moving forward along the project more devoted meetings on specific pilots were run. Plenary sessions were organised to monitor and evaluate the achievements. A new phase was launched by the Lucca municipality for 19th September 2024 to revitalise the IN-HUB and share the ongoing activities. More INHUB activities were organised along the last years. Beside the IN-HUB the city partners work jointly and in connection with the project partners.

Co-design phase: Initially 5 working groups were identified: **Citizenship, Tourism sector, Social sector, Pet care professional sector, Education, Community and families.** They worked in plenary and in groups to share the topic and to open the discussion to new ideas. Activities were organised online (during the pandemic situation) and in presence. Devoted activities were also organised by:



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- Involving directly the existing **social working groups (disability and marginality)** to ensure the involvement of categories of people at risk of exclusion
- Organising **Ecowalks** along the spaces devoted to Animal Lines for co-designing the new public spaces (**Animal Lines**)
- Sharing the idea of a **Game board** inspiring a correct behaviour towards animals

Co-deployment phase: all Hard and Soft VIS were deployed according to the Italian laws for public intervention. In the co-deployment of soft VIS the **Italian law for co-progettazione with NGOs** was applied for the AAls and Pet-Care services. **Public open calls opened by the Municipality**– (i) to co-deploy/to co-manage AAls in 2 nursing homes; (ii) to co-deploy/ co-manage innovative services for vulnerable pet owners (pet care services) in **collaboration with local health authorities and NGOs**. Interventions in the schools were co-deployed by city partners with schools.

Co-management phase

- The Municipality of Lucca with University of Pisa are organising a draft **Chart of principles** for the hum-animal city (a first version was initially co-designed with university students) and now is under finalization by the municipality. **A strategic and action plan** has been prepared also to upscale the project in other cities and territories.
- The positive outcomes achieved in AAI with elders is bringing the municipality to continue thinking on the policy legacy funding resources on its own internal budget. From this point of view there is an effort of the Municipality trying to fund them in the next future on its own budget.
- Specific **contracts** for the management of relational areas with selected NGOs have been established in collaboration with the municipality during the project and is going to be internalised on the environmental area of the municipality.
- In case of the PET care services the Municipality have already prolonged for the next two years the delivering in agreement with the selected NGOs funding the activities on its own budget.

Mindset change in the Lucca process regards:

- looking at A-NBS to enhance common pool of resources, to improve the restorative city' dimensions and to increase IHW
- interacting with many **different public authorities and policies** to build a more integrated vision and policies (participatory action research, social innovation and transition management paths)
- **combining public and private participation** in a short time



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- **transforming urban spaces** in a highly regulated city due to the historical roots and the Soprintendenza (Superintendence of Cultural Heritage) control.

Key points of attention along the Lucca process:

- Schemata shift and new collective knowledge creation and to look at animals in a new public perspective and common resource, to facilitate innovation to spread and to root.
- Educate the wider public on new perception about nature and A-NBS
- Looking in a new perspective on existing underused resources
- Local stakeholders' competences and willingness
- Community involvement in practical and simple proactive initiatives
- Approaches and methodologies to involve and support the processes
- PPPP as key mobilisation resource and strong institutional involvement
- New architectural solution for Animal-lines and relational areas

Crucial/critical points in the Lucca Process:

- The multi-actors (public, private, people) mindset change
- The passage from the project to a sustainable and well rooted path
- The continuity of the dialogue among public and private actors
- To maintain innovation at the core of the city dialogue
- The newly created/recreated A-NBS spaces to be maintained with the PPPP involvement
- Ownership and management require shared responsibility that is growing in local inhabitants
- Adherence to agreements for the maintenance of the new spaces is also better defined and becoming part of the individual responsibility of the users
- The organisation of clear rules to keep the hum-animal city working in the long run

In terms of **beliefs and attitudes**, some additional risks might be considered like:

- a. Stop believing in the idea developed over the project duration
- b. Residents may not perceive the complexity of the process and might react critically to emerging issues, beyond support and management, more communication efforts are needed
- c. Lack of real endorsement and empowerment in the long run to plan/control the process
- d. Potential conflicts emerging among groups of users

Key Achievements until now

- a. **The political engagement** of the municipality in Lucca
- b. **Clear evidence of A-NBS and their results:**



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- **Urban infrastructures (Hard VIS):** creation of **relational areas** and **Animal Lines** (15 km of paths), widely used and appreciated by citizens and visitors.
- **Animal Assisted Interventions (AAI):** implemented in two nursing homes, improving mobility, memory, psychological and emotional well-being of elderly residents.
- **Pet care services:** innovative support for vulnerable individuals temporarily unable to care for their pets.
- **Educational activities in schools:** two editions involving more than 350 students, resulting in increased knowledge and awareness of animals and pet-friendly cities. A dedicated board game (City Pets) facilitated the educational process toward gamification.
- **Entrepreneurship and tourism:** incubation of new business initiatives linked to the human–animal bond and development of manuals for **pet-friendly tourism**.
- **Citizen engagement:** events, playful and educational activities, digital tools (apps, games, social media).
- **Biodiversity monitoring:** use of LEKO acoustic sensors to assess species presence and the ecological impact of new infrastructures.
- c. **Upscaling activities:** upscaling actions were carried out both internally and externally, with the aim of increasing awareness, acceptance, and transferability of the Hum-animal
 - **Internally:** the organisation and implementation of the various pilots, together with their documented results, contributed to consolidating and reinforcing the hum-animal city concept through evidence-based outcomes.
 - **Externally:** focus groups and meetings with Councillors from other cities, associations of municipalities, regional-level policymakers, members of the Italian Senate, local and national organisations active in animal and environmental protection, as well as firms operating in urban regeneration, provided positive feedback on the feasibility and relevance of the hum-animal city concept.

Expected Impacts

- **Short-term (outputs):** pilot solutions, new methods, manuals, digital apps, educational programs.
- **Medium-term (outcomes):** increased awareness among stakeholders, improved skills, new collaborations, replication of pilots in other cities (e.g. Pisa, Florence, prisons, schools).



- **Long-term (impacts):** enhanced inclusive health and well-being, innovative **hum-animal urban policies**, growth of the pet economy and pet-friendly tourism, contribution to the **New European Bauhaus** and EU debates on **Nature-Based Solutions**.

Conclusions

The project demonstrated that even small and medium-sized cities like Lucca can **mobilize unconventional resources** (animals as A-NBS) to foster well-being, inclusion, and sustainable urban regeneration. The experimentation created a **replicable model of the “hum-animal city”**, based on co-creation with citizens, integration of municipal policies, and the recognition of human–animal relations as a driver of social, cultural, and economic innovation.



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1. Introduction

This deliverable builds upon the intermediate report submitted in August 2024 and provides an overview of the activities carried out over the past year within the Lucca IN-HABIT project. In addition, it includes reflections on the ex-ante versus ex-post situation in Lucca.

The Lucca IN-HABIT case, addressed within the IN-HABIT partnership under the EU research call SC5-14-2019: *Visionary and integrated solutions to improve well-being and health in cities*, focused on innovative forms of resource mobilization, particularly exploring the role of “non-human animals” (NHA) in cities to foster Inclusive Health and Well-being (IHW) for both vulnerable people and the wider urban population. In line with this objective, the project in Lucca adopted a “**more than human perspective**”, considering the role of NHA in their interaction with humans at city level within the scope of the call. The presence of NHA in the cities and their link in a hum-animal perspective may encompass several dimensions, including: a) the presence and role of wild animals and their coexistence with other NHAs, b) the presence of food-producing animals, approached from both innovative and traditional perspectives, reflecting local culture and geography, c) the presence of companion animals, serving both private and public purposes. Regarding companion animals in cities, they are generally regarded either as private resources (e.g. private companion animals/pets) or as subjects of public hygiene, managed (in Italy but also elsewhere) by municipal authorities in cooperation with public health veterinary services.

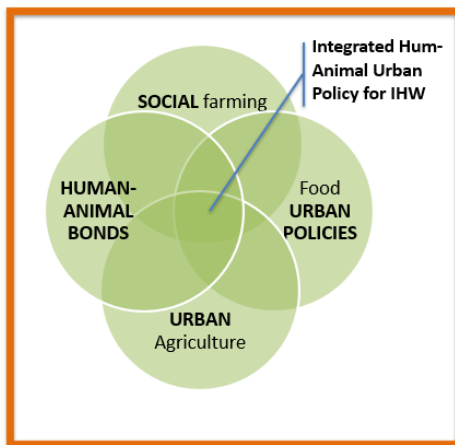


Figure 3. The convergence of topic and the emerging space for an integrated hum-animal urban policy. (elaboration from the authors)

The Lucca project introduced an innovative perspective by framing **NHA as Animal-Nature Based Solutions (A-NBS)**, thereby recognising their contribution to **public goods** and everyday urban life (with particular attention to inclusive health and well-being), while also promoting attention to animal rights. Due to time constraints and project boundaries, it was not possible to address all dimensions of the Human-Non-Human Animals (H-NHA) perspective at the urban level. Nevertheless, several aspects were considered by building on previous work carried out in the Lucca area, notably in the fields of wild animal and biodiversity management, as well as food-related practices and policies.

Within both EU policy frameworks and the scientific literature on Nature-Based Solutions (NBS), a **notable**



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gap persists, as discussions predominantly focus on “green” and “blue” solutions, while green do not often take into consideration also the **role of animals**. By contrast, **research on the human–animal bonds**, together with insights from feminist literature, highlights the positive impacts of animals on multiple dimensions of human life. Building on this body of evidence, the Lucca project aimed to pilot **the first integrated hum–animal urban policy** (figure 3) in Europe, with the objective of **enhancing inclusive health and well-being, particularly for vulnerable people**.

At first glance, this approach may not appear as a radical innovation. However, the presence of animals in contemporary societies is increasing and is accompanied by a cultural shift towards a more-than-human perspective. While animals (especially pets) are increasingly recognised in Western societies (and beyond), they largely remain confined to the private domain. **Food-producing animals** are generally considered marginal within urban contexts, despite the emergence of innovative solutions such as aquaponics or insect-based systems. **Wild animals**, in turn, are often perceived as being in conflict with human activities, or vice versa, although growing attention is being paid to the creation of restorative spaces aimed at maintaining high levels of biodiversity within urban environments. **Companion animals** are mainly treated as a private matter, addressed primarily in terms of coexistence, animal rights, and public hygiene requirements, with limited consideration of their **potential contribution to public goods and to inclusive health and well-being**. The **Lucca project reimaged animals** - including companion animals, wildlife, and food-producing animals - as collective urban resources. By adopting a more-than-human perspective, the project aimed to develop an integrated human–animal urban policy. The core idea is that, **through a dedicated hum–animal integrated policy, animals can be mobilised to generate public goods and to advance inclusive health and well-being**. This conceptual shift can be understood as both straightforward and, at the same time, deeply challenging.

The Lucca project tested and provided evidence for **A-NBS solution** by developing a **transformative pathway** that actively engaged both public and private stakeholders in a shared **process of change** aimed at establishing an **integrated hum–animal urban policy**.

To implement this transformative approach, the project adopted a **participatory action research (PAR)** methodology, grounded in the principles of **social innovation** and **transition theory**.

The process faced several **challenges**, including the onset of the COVID-19 pandemic in 2020, the economic repercussions of the Russia–Ukraine conflict, inflation affecting investments in public space reorganization, and a mid-term political change in Lucca’s administration. While these factors slowed progress, they also enriched the research by providing valuable lessons for future replication and scaling strategies.



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Despite these challenges, the project achieved significant and innovative outcomes. IN-HABIT in Lucca demonstrated: 1) the feasibility of delivering visionary and integrated solutions (VIS) at the intersection of social, cultural, digital, and nature-based innovation to improve health and well-being in cities, 2) embedded A-NBS into the design and management of public spaces, 3) enhanced participatory co-design and co-planning processes, 4) reduced health-related burdens, and 5) fostered equitable and sustainable urban regeneration, furthermore, the project 6) introduced new approaches to transition management, governance models, legal frameworks, and financing mechanisms to reimagine public spaces and urban commons, while 7) assessing their contribution to health and well-being. By fostering multistakeholder collaboration, citizen engagement, co-creation and co-ownership of public spaces, the Lucca initiative advanced the vision of an innovative hum-animal city.

2. Methodology

This chapter introduces the main methodological aspects regarding the evaluation of the IN-HABIT Lucca case in terms of results achieved, emerging outcomes, and expected long term impacts.

As always well known, also in this report:

1. Results (Outputs): are the immediate products or deliverables of the project, achieved during or shortly after its implementation. In our case they include research findings, new solutions and pilots, methods, reports, educational hum-animal programs, pilot hum-animal solutions and services provided, policy recommendations.
2. Outcomes: represent the medium-term effects that result from the use or adoption of the project's results. They reflect how the results are taken up, disseminated, and used by the intended target groups. Examples include improved skills and capacity building, increased awareness among stakeholders, new collaborations, or the adoption of new hum-animal solutions in the cities.
3. Impacts: are the long-term, wider effects of the project on society, the economy, or science. They are enabled by the project's outcomes and represent significant changes in the long run. Examples include improved public health, economic growth, environmental protection, or advancements in scientific knowledge.

2.1 Assessing the evaluation in the Lucca case

This report offers a comprehensive analysis of the key results, outcomes, and impacts derived from the Lucca IN-HABIT case. A central focus is placed on giving evidence to the project's transformative impact and its cross-cutting integration throughout the city. This integration went



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beyond mere physical interventions, promoting a significant shift in mindset regarding the societal value of animals - both within the local administration (including politicians and technical staff) and among various citizen groups. The variety of pilot initiatives implemented further demonstrated the potential of hum-animal solutions, reinforcing the pathway towards this transformative change.

Before presenting the main findings (in terms of results, outcomes, and impacts), the following chapters will outline the methodologies adopted for the project’s evaluation.

2.2 Evaluation methods used for the areas of intervention in Lucca

The IN-HABIT project in Lucca joint the complexity of a participatory action research (PAR) process on a previously unexplored topic with its transformation into a political agenda, integrating the outcomes into specific policies and translating them into a set of innovative solutions (both “hard” and “soft”) designed to support inclusive health and well-being for vulnerable populations as well as the broader citizenry. To this end, both qualitative and quantitative methods were employed, as summarised in Table 1.

Table 1. Summary of the evaluation activities organised in IN-HABIT-Lucca. (elaboration from the authors)

Evaluation area	Type of aspect	Methodology	Methods	Steps for the evaluation	
Process	Institutional reorganisation	Qualitative	Embedded participation	Along the process	
	Stakeholders’ involvement	Qualitative	Embedded participation	Along the process	
City	Ex-ante/ex-post evaluation	Qualitative + quantitative	Data monitoring / interviews	Ex-ante ex-post	
Hard VIS	Animal Lines and relational areas	Qualitative + quantitative	Platform for Data monitoring + interviews	Ex-ante ex-post	
Soft VIS	AAI	Qualitative+ quantitative	Quantitative (devices biological samples humans+ dogs), Qualitative (Focus groups)	Ex-ante ex-post	
	Pet Care	Quantitative + qualitative	Focus groups+ survey	One shot	
	Educational activities	Quantitative + qualitative	Survey	Ex-ante ex-post	
	Board game “City Pets”	Quantitative + qualitative	Linked to educational		
	Economic	Quantitative + qualitative	participants	Along the process	
	Tourism	Qualitative	participants	Along the process	
	Events	Qualitative	participants	Along the process	
	Biodiversity	Quantitative	Platform for Data monitoring	Comparison	
	Regulatory	Chart of services	Matter of facts	Consensus building	Realisation
		Chart of principles	Matter of facts	Consensus building	Realisation
Guidelines pet friendly		Matter of facts	Consensus building	Realisation	

More detailed information on the methodology applied to each activity within the Lucca case is presented in dedicated sections of the following results chapters, to facilitate a clearer and more



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comprehensive understanding. As the Lucca IN-HABIT project was grounded in the introduction of a crosscutting, transversal concept - the hum-animal city and the Integrated Human-Animal Urban Policy (IHAUP) - the process itself holds particular significance and should be considered a primary outcome of the project. At the same time, the various piloted solutions generated specific outcomes which, collectively, contribute to a deeper understanding of the potential of both A-NBS and the IHAUP framework.

2.3 Limitations

As with any research project, the Lucca case encountered several limitations that are important to present in this chapter.

Projects based on real-life participatory actions require organizing pathways around the ability to co-create change with involved stakeholders. Stakeholder involvement is not neutral; it depends on factors such as the local organization, engagement of diverse interest groups, their attitudes and behaviours, the level of trust, and the openness of political authorities - in this case, the Municipality. The potential alliances that emerge (or fail to emerge) throughout the process shape the final trajectory, which itself constitutes part of the project outcomes and informs ongoing decisions.

From the outset, the IN-HABIT research project relied on the participation of public authorities, particularly the Municipality, and on the reorganization of public spaces to provide innovative solutions capable of enhancing IHW for both vulnerable populations and the broader citizenry. The call explicitly required embedding the research activity in a real-world, compromise-driven environment to generate practical solutions and evidence, while implicitly acknowledging the potential for suboptimal outcomes relative to the initial hypotheses.

The project was further affected by a range of unpredictable events, including the COVID-19 pandemic, high inflation resulting from the Russia-Ukraine conflict, and a mid-term political change in Lucca's administration. These events created delays, required adaptations in societal thinking, and introduced turbulence into the process. While these factors complicated ex-ante/ex-post impact evaluation, they also increased efforts to maintain the core hum-animal concept, albeit under evolving socio-political conditions.

Moreover, the Lucca project was not focused on a single place, target, or sector. Its ambition was to introduce a transversal concept based on A-NBS, mobilizing animal-based resources to provide public goods, and organizing an IHAUP at the city level. From this perspective, several limitations should be noted: **A)** the introduction of a mind-shifting idea on animal demanded continuous efforts to support stakeholders in embracing deep changes in perspective. **B)** the



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participatory process did not allow pre-planned pilot evaluations, requiring assessment methods to be developed iteratively for each pilot as the process evolved. **C)** addressing a crosscutting topic demanded diverse competences, their organisation as well as evaluation required a large range of capabilities. The research group time by time tried to engage additional research actors able to support the evaluation process, often facing delays due to the difficulty to achieve a prompt replay, full understanding and willingness to enter in the collaborative process of research. **D)** data collection challenges: ex-ante evaluation, was hindered by COVID-19 restrictions, evaluation metrics needed adaptation to evolving pilot activities, ethical approval from the Ethic Committee of the University of introduced additional time constraints. **E)** while citizens were generally open to participatory activities and events, response rates for surveys and questionnaires were lower than desired, reducing the volume of collected data. **F)** bias in transversal assessments: the broad hum-animal concepts sometimes limited the ability to capture precise impacts of specific pilots (such as AAI or Pet Care services) and the organisation of surveys collecting transversally data (ex-ante and ex-post). **G)** In such perspective, on one side certain pilots (e.g. AAI) prioritized testing potential over producing exhaustive scientific evidence, limiting sample size while ensuring data remained relevant for stakeholders. **H)** researchers should meet their wish with the steps possible along the participatory process focusing on possible optimum. The starting expectations were and still are high in the promotion of A-NBS and IHAUP, since the beginning the proposal was to link the presence of wild animals, food-producing animals and companion ones. Time and process management constraints concentrated pilots on areas most aligned with the call's focus on IHW and public goods provision by promoting A-NBS and pets in this direction. At the same time in Lucca, complementary areas (e.g. green corridors and biodiversity maintenance, urban food policies) were supported by ongoing prior initiatives that can complement the effort done by the project. **I)** Lucca's status as a historical city imposed strict control of cultural heritage institution in Italy with many constraints on interventions that can be authorised. Accordingly, during the project in Lucca it limited specific interventions in both reorganising spaces along the ancient walls or the placement of signals highlighting hard solutions (Animal Lines and relational areas) in a proper way. **L)** As for many other topics, integrating policies across institutional levels is an issue in terms of policies organisation, the resistance of sectoral silos and existing routines, political representation of interests and will. Establishing an IHAUP required continuous effort to manage both participatory and institutional change processes, which remain ongoing.

In the organisation of the diverse pilots some limitations also emerged as presented below.

Limitations of the Animal Assisted Interventions (AAI) in nursing homes

The Animal Assisted Intervention study conducted in nursing homes presents some limitations that should be considered when interpreting the results. First, the sample size was relatively



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small, both for elderly participants and for the dog–handler dyads, which limits statistical power and reduces the generalisability of findings. Health deterioration or withdrawal of consent by patients, further reduced the number of participants completing all measurement points. Second, the study was conducted as an opportunistic field study, without randomisation or a control group, which prevents strong causal conclusions regarding the observed effects. Third, some outcome measures relied on proxy-reported questionnaires completed by nursing staff for cognitive impaired participants, which may introduce subjective bias.

Limitations of the Educational Anthrozoology Program in Schools

The educational anthrozoology project implemented in primary schools also presents some limitations. For example, the lack of follow-up do not allow assessment of whether the observed improvements in knowledge and attitudes are maintained over time. Due to time constraints the educational activities were focused mainly on the interaction with pets although the relevance of interaction with animals in a wider perspective. Finally, the program did not include direct interaction with animals, which limits comparability with other educational anthrozoology or animal-assisted education studies and may have influenced the depth of learning or the maintenance of knowledge over time.

Limitations of the IN-HABIT Questionnaires

The sample size was little (36 respondents), with variation across years (22 ex-ante and 14 ex-post), which may affect the robustness of comparisons. As the survey captures subjective perceptions of quality, safety, and use, responses may have been influenced by other factors such as seasonality, weather conditions, temporary events, or changes in individual expectations rather than solely by infrastructural interventions. Despite repeated and sustained efforts to increase participation, the overall sample size remained limited throughout the project duration. Data collection was conducted at different moments of the project lifecycle and through multiple complementary modalities to maximise outreach and inclusiveness. Trained researchers from the University of Pisa carried out several in-person data collection campaigns in Lucca, initially relying exclusively on paper-based questionnaires administered on site, and subsequently combining face-to-face administration with the dissemination of an online version of the survey via links and QR codes. These strategies were intended to reduce access barriers and accommodate different respondent preferences.

Nevertheless, response rates remained lower than expected. A key constraining factor appears to be the specific context in which potential respondents were approached, namely public outdoor spaces, where individuals were often engaged in time-sensitive activities such as walking, or accompanying their dogs. In such situations, many potential participants reported limited availability or reluctance to interrupt their activities to complete a questionnaire. In



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addition, the overall length of the survey and the number of questions required to capture multiple dimensions (perceived quality, safety, use, and related aspects) may have further discouraged participation or led to non-response. These challenges are consistent with those commonly reported in field-based surveys conducted in real-life urban settings and highlight structural limitations that are not easily mitigated through methodological adjustments alone. As a result, the final sample should be considered indicative rather than statistically representative of the broader population, and findings should be interpreted with caution, particularly when drawing general conclusions or making comparisons. However, despite these limitations, the collected responses still provide valuable qualitative insights into users' perceptions and experiences, which complement other evaluation components of the project.

Limitations of data collection during the events, and participatory activities

As for the previous aspects, during public events it can be rather difficult and disturbing from the participation the use of specific surveying methods. Since the focus was on engagement and participation, specific surveying in these contexts was avoided to prevent disruption and ensure inclusivity.

Limitation in monitoring biodiversity

Installed sensors collected limited data due to shadowing of the PV panels issue, reducing reliability of absolute scores. According to the provider, differences between zones should not be over-interpreted considering the limited data collected. As emerges from the data evidence, the tested zones seem to have quite similar scores. However, these scores give an indication about main impacting pollutions. The indicators on the one hand represent a means to provide a quick overview on the biodiversity recording results to the public (i.e. non-specialists), which is very useful in the IN-HABIT project context. They however do not have a deep scientific meaning, and they should only be used to compare different states of play of similar habitats to understand the local ecosystems dynamics through space and time.

Despite these limitations, the Lucca project was innovative, stimulating, and groundbreaking, successfully producing evidence of outcomes, which are presented in the following chapter.



3. Analysis and results

3.1. The ex-ante/ex-post evaluation

The ex-ante evaluation in Lucca was conducted following the IN-HABIT methodology developed by ISIMPACT, initially focusing on data collection regarding the environmental and social context, complemented by a dedicated survey, focus group and narrative mapping. Some of these results were presented in D.3.3 or in specific deliverables produced by the responsible partners. In this chapter, we present only the main aspects directly related to the specific focus of the Lucca project. Selected insights from the first focus group in Lucca, held during a partially open phase of the COVID-19 pandemic, are also summarised to allow comparison with the ex-post evaluation. The ex-post evaluation was organised by the University of Turin (UNITO), which succeeded ISIMPACT within the IN-HABIT partnership. Data collection largely followed the same survey questions as the ex-ante evaluation, enabling direct ex-ante/ex-post comparisons of outcomes.

3.1.1 The state of the art of environment and biodiversity

Lucca is a small-sized historic city located at the crossroads of several watercourses (most notably the Serchio river) and is surrounded by green hilly landscapes. Among the city's most distinctive landmarks are the ancient walls encircling the historic centre, as well as the Guinigi Tower located in the city core. The city walls are bordered by extensive green areas (known as *Spalti*) which form a natural and continuous green corridor around the historic centre and connect with two major green systems: the Serchio river park area and the Nottolini Aqueduct corridors, which link the city centre to the forested areas of the Monti Pisani. In addition, the Lucca plain (*Piana di Lucca*) is intersected by approximately 13 km of small waterways (locally known as "Il Fosso") which cross the urban area and host distinctive aquatic and semi-aquatic fauna.

Biodiversity in Lucca

The Lucca area is characterised by a high level of biodiversity, as documented in various studies and publications¹.

¹ Giannotti A., Puccioni D., Canovai R., Chines A. (2022) "Lucca e la tutela della biodiversità progetto sperimentale di ripristino di corridoi ecologici della città", unpublished

Chines A., Pascale M., Braccini S. (2014) "Atlante dei Pesci delle acque interne della Provincia di Lucca", Provincia di Lucca, Fipsas - Sezione Provinciale di Lucca Verducci D., Chines A. (2009) Avifauna della Zona di Protezione del Fiume Serchio (Lu) *U.D.I. XXXIV* (1-2): 7-18

Gabbrielli B., Cosimi S., Chines A., Canovai R. (2025) "La popolazione carabidologica (*coleoptera: carabidae*) presente sugli spalti della città di Lucca: risultati preliminari", *Atti Soc. Tosc. Sci. Nat., Mem., Serie B*, 132 CC-BY 4.0 pag. 77-84; fig. 2; tab. 5; doi: 10.2424/ASTSN.M.B.2025.07

Antonetti M., Chines A., Bertolini V.C. (2023) "Le orchidee delle Mura di Lucca: un esempio virtuoso di ecologia urbana da non abbandonare", *GIROS Orch. Spont. Eur.* 66 (2023:2): 165-176



These include a wide range of plant species and varieties, both autochthonous and allochthonous trees, as well as diverse groups of small invertebrates, birds, and fish. The ancient city walls have also been studied for their role in hosting vegetation and providing nesting habitats for small fauna species. The presence of interconnected green corridors, rich plant communities, and management practices that allow vegetation to reach full flowering stages in spring support insect life cycle and pollination processes. In addition, the network of channels and areas of dense vegetation provides suitable habitats and reproductive conditions for small invertebrates and insects, which in turn sustain urban bird populations. Overall, this integrated system has been extensively studied and is actively managed to support biodiversity conservation at the city level.

In recent years, the presence of fireflies has also been reported in the Lucca area, despite potential disturbances caused by artificial night lighting. Regarding larger mammals, species such as wild boar, foxes, wolves, deer, and fallow deer have been observed in the wider territorial context. Citizen science initiatives further contribute to biodiversity monitoring. Through platforms such as iNaturalist.org, residents can record species observations. In the broader Lucca area, more than 3,200 observations covering over 1,000 flora and fauna species have been reported by approximately 1,000 contributors.

In 2020, the Municipality of Lucca introduced a policy focusing on green corridors and the preservation and monitoring of local biodiversity. This process received technical support from CREA, as well as from the Universities of Siena and Trieste, which provided recommendations for managing local vegetation to enhance biodiversity. In 2021, a technical decision was made to postpone grass cutting in order to allow flora to fully flower and support insect life cycles. The adoption of these practices generated political tensions between local citizens, environmental associations, and the municipality. In 2023, the new municipal administration responded to public demand for maintaining tidy areas around the city walls. Following protests from environmental associations and political opposition, and after intervention by public authorities to safeguard biodiversity, delayed grass-cutting practices were reintroduced. This ongoing dialogue illustrates the existing tensions surrounding urban biodiversity management. Citizen science initiatives, school-based exercises, and naturalist excursions organised by environmental associations further support biodiversity monitoring and public engagement. In 2021, Lucca municipality adopted a masterplan for green areas. As highlighted in D3.3, among Italian cities, Lucca has the largest extent of pedestrian areas per capita, with 682 m² per inhabitant (2019). Publicly managed urban green areas available for citizen use amount to 17.7 m² per inhabitant (ISTAT). Better integration of biodiversity policies and human–wildlife coexistence could further strengthen the human–animal urban approach in the future.

Regarding food-producing animals, since 2018, a public dialogue on food policies has been conducted in Lucca and the surrounding Piana di Lucca area, focusing on the links between food

Comune di Lucca (2021) Masterplan del verde pubblico.

Comune di Lucca, Le mura della biodiversità

https://www.comune.lucca.it/app/uploads/2024/05/Le_Mura_della_biodiversita__prati4a97-1.pdf

Casolini G. (2023) "Paesaggi fortificati, valori da difendere. Verso una rigenerazione dei 'Paesaggi Perduti'", PhD thesis Trieste University



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systems, health, and well-being, as well as the local food footprint. This initiative, supported by the previous municipal administration, promoted local food chains and a farm-to-fork approach (see Piano Intercomunale del Cibo, 2022²; Arcuri et al., 2019³; Arcuri, Galli & Minotti, 2022⁴). After the political change in 2022, municipal support for the Piana di Lucca food plan was withdrawn, although neighboring municipalities maintained the initiative with some internal reorganization (Rovai, 2023⁵). The food policy does not explicitly address food-producing animals, as it primarily focuses on supporting local farmers, promoting short supply chains, and implementing a farm-to-fork strategy.

3.1.2 The state of the art in the social dimensions

As summarised in Deliverable D3.3, the social context of Lucca can be characterised as that of a small city with approximately 89.000 inhabitants and a pronounced ageing trend: around 26% of residents are over 65, of whom 53% are older than 75. Approximately 10% of the population and 11% of families reside within the ancient city walls. Families in the historic centre tend to be smaller, with an average of 1,92 members compared to the city-wide average of 2,18 members. Lucca presents a clear divide between the gentrified city centre and surrounding neighbourhoods. The prevalence of dementia is higher than the regional average in Tuscany, as is the number of elderly residents in nursing homes, while the provision of home-based care is lower than the Tuscan average. Other social indicators, including disability and the presence of vulnerable populations, align with the broader regional context. The city also demonstrates a strong culture of collaboration and civic engagement, with approximately 750 registered NGOs active in the area. Average income in Lucca is higher than the Tuscan regional average, reflecting a relatively affluent population compared to surrounding areas.

² <https://pianadelcibo.it/wp-content/uploads/2022/10/Piano-Intercomunale-del-cibo-1.pdf>

³ Arcuri S., Belletti G., Brunori G., Bottiglioni G., Innocenti S., Galli F., Marescotti M., Pensa A., Rovai M., Soldani L. (2019). "Innovazioni istituzionali e approcci multi-attore nelle politiche alimentari locali: il piano intercomunale per il cibo della Piana di Lucca". In: Dansero E., Marino D., Mazzocchi G., Nicolarea Y. (a cura di), 2019. *Lo spazio delle politiche locali del cibo: temi, esperienze e prospettive*. Torino: Celid, 121-132.

⁴ Arcuri S., Minotti B., Galli F. (2022). "Food policy integration in small cities: The case of intermunicipal governance in Lucca, Italy". *Journal of Rural Studies*. 89. (2022). 287–297. <https://doi.org/10.1016/j.jrurstud.2021.12.005>.

⁵ Rovai M. (2023) "La Piana del Cibo di Lucca: una local food policy in fase di stallo", *Rivista della Rete Italiana Politiche Locali del Cibo*, Vol. 2, n.1: 82-99



3.1.3 The analysis from the direct interviews on the green spaces

Before and after the main interventions on urban infrastructures, an analysis was conducted on the use of different green areas and on inhabitants' perceptions of their relationship with animals. Interviews were conducted in person with visitors to several sites in Lucca (Parco del Serchio, Area ex-old hospital, the Nottolini area, San Concordio area, the ancient city walls, and the surrounding green spaces). Data collection proved challenging. A total of 38 respondents participated, with 12 interviewed before and 24 after the main infrastructural interventions done with the IN-HABIT project in the first three areas.

Methodology
 Interviews were conducted between April 2023 and May 2025. The main questionnaire included 63 demands covering personal and socio-economic characteristics of respondents and their families, the availability and use of private outdoor spaces, pet ownership and management, the role assigned to animals in different contexts, and perceptions and use of the various green areas in Lucca. A second questionnaire, aimed at a more in-depth analysis of human-animal relationships, did not collect sufficient responses to allow meaningful analysis..

While the sample size does not allow for statistical generalisation, the results provide valuable insights into citizens' interactions with animals and green areas, and their connection to socio-economic conditions. Respondents were mainly women (61%) with an age well distributed in the various classes (1 born in 1946, 8 in the 1960s, 4, in the 1970s, 5 in the 1980s, 11 in the 1990s, 7 millennials). Most of them live in Lucca (78%) with the others commute from nearby municipalities, 2 from further areas. Among Lucca residents, participants represented diverse neighbourhoods, with a higher representation from the east area (n=9 from S.Vito and S.Marco) and the historic centre (n=6). Most of them were Italian (34 of 36) with their residence in the area (100%). About education, 22 respondents got a diploma from the secondary (n=6) and the high (n=16) schools, while the other had higher education degrees. Respondents were in prevalence working as employees (n=18), freelancers (n=6), while n=7 were students, n=1 unemployed, n=2 retired, with n=2 others. Occupied were mainly full time (n=16) while the part-time were n=8. Regarding their income, 50% of the respondents declare that is sufficient for their daily life, 39% fully comply with their needs, while 11% do not manage to satisfy their life standards.

Table 2. Composition of the family for the respondents. (elaboration from the authors)

Composition of the families (n.)						
gender	1	2	3	4	6	Total
Other			1			1
Female	1	9	6	6		22
Male	3	2	3	4	1	13
Total	4	11	10	10	1	36



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Most of them (n=22) are married or live as a couple, while 9 of them are singles, divorced or widows, while the remaining 5 do not declare or others. Regarding living conditions only 6 live alone, while the most (n=27) do live in families (with 1 sharing a flat, 1 not declaring or 1 others). The household sizes of the respondents ranged from 2 to 4 members. Only one household

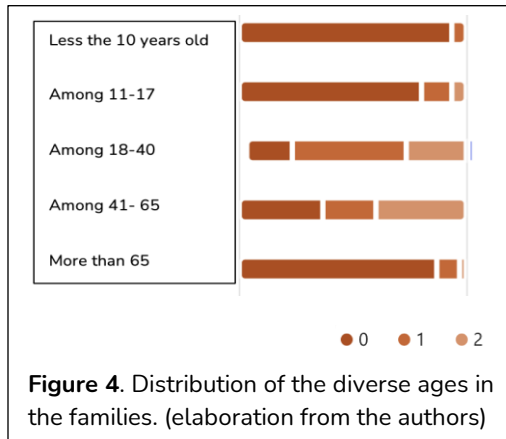


Figure 4. Distribution of the diverse ages in the families. (elaboration from the authors)

included six members, while four respondents lived alone (primarily men) (see table 2). The age of household members was predominantly in the middle-age groups, with most individuals aged between 18–40 and 41–65 years (see Figure 4). Regarding health and care considerations, four respondents reported living with a disability, and two additional respondents lived with household members with disabilities.

Most respondents reported having access to some form of private outdoor or semi-outdoor space at their residence, as illustrated in Figure 5. Cross-analysis of the data indicates that access to such spaces is not significantly associated with respondents' socio-economic conditions. Almost all respondents, with only one exception, owned companion animals - primarily dogs, but also cats

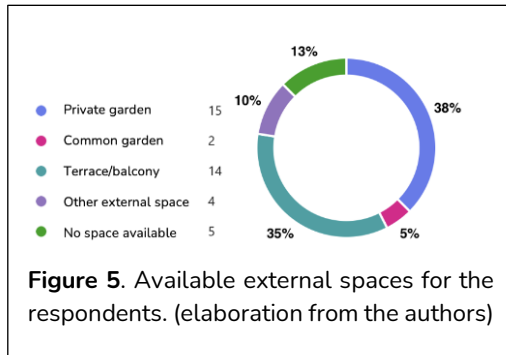


Figure 5. Available external spaces for the respondents. (elaboration from the authors)

and other emerging companion animals (see Figure 6). Reported limitations to owning animals were mainly related to limited space availability (4 out of 36 respondents), while lack of time and economic constraints were each mentioned by one respondent. In most cases (24 out of 36), respondents acquired their first companion animal before the age of 10; in five cases between the ages of 11 and 20, and in six cases after the age of 20.

The questionnaire also explored respondents' attitudes towards animal ownership (Figure 7), and, more broadly, towards the role of animals in society (Figure 8). From a personal perspective, respondents largely associated relationships with companion animals with companionship, caring for another being, and improved quality of life. Animal ownership was also perceived as contributing positively to physical

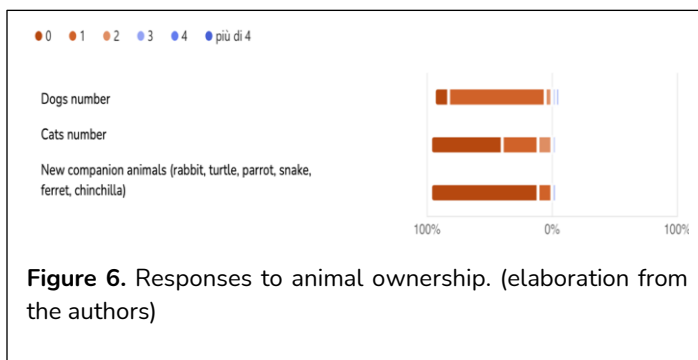
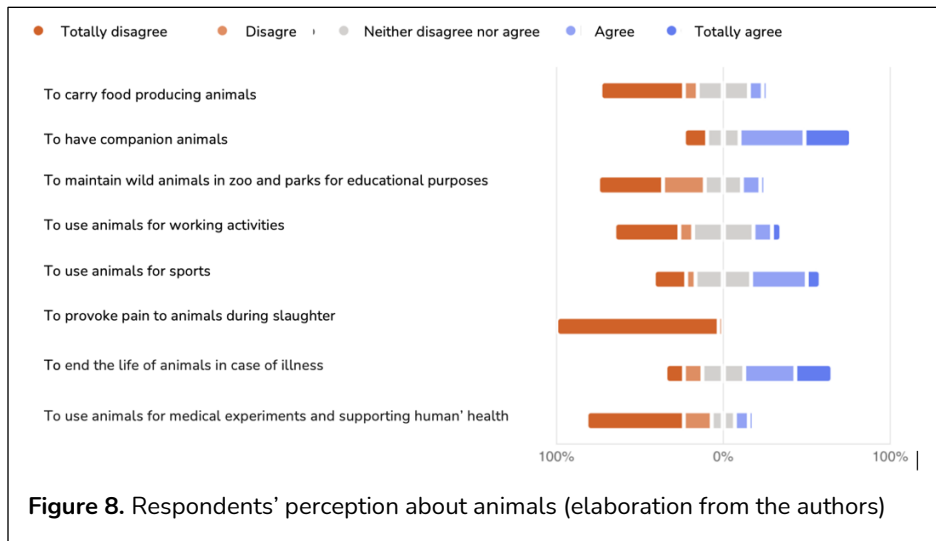
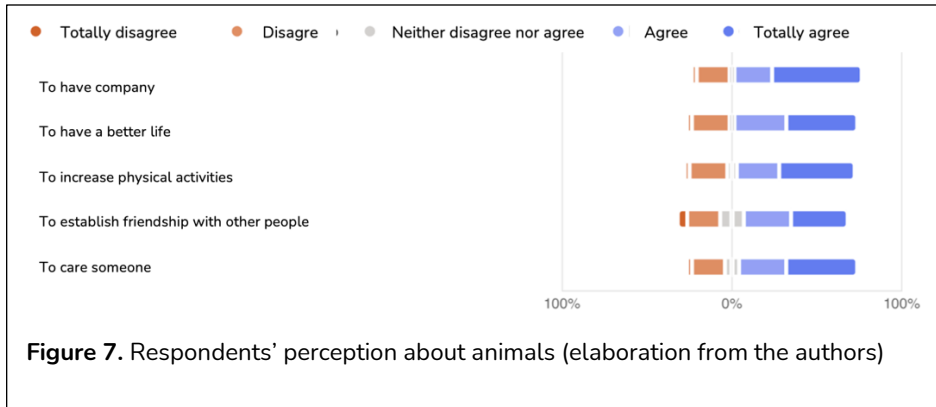


Figure 6. Responses to animal ownership. (elaboration from the authors)

and, more broadly, towards the role of animals in society (Figure 8). From a personal perspective, respondents largely associated relationships with companion animals with companionship, caring for another being, and improved quality of life. Animal ownership was also perceived as contributing positively to physical





activity. To a lesser extent, animals were seen as facilitating social interactions and the establishment of friendships with other people. As shown in Figure 8, respondents expressed strong acceptance of animals as companions and in recreational or sport-related contexts, as well as support for end-of-life decisions in cases of severe illness. Conversely, less favourable attitudes were expressed towards practices involving animal pain or instrumental use, such as experimentation,

slaughter, or animal labour. Given that most respondents were animal owners, the presence of animals within the household appears to shape perspectives on human–animal relationships. This is further reflected in Figure 9, where respect for animal behaviour and well-being emerges as a dominant concern, and the suppression of animal life is considered acceptable primarily in situations where human health is also at stake.



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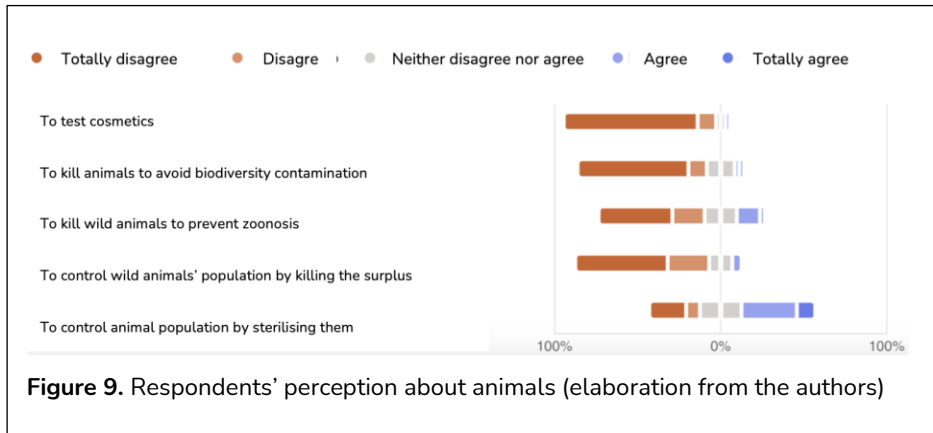


Figure 9. Respondents' perception about animals (elaboration from the authors)

Among the key aspects explored by the survey was the assessment of green spaces in Lucca. A subset of respondents was interviewed prior to the implementation of the hum-animal

infrastructures, while 24 respondents participated after their reorganisation. For each area, the survey investigated frequency of use, perceived quality, level of maintenance, accessibility for people with disabilities, and suitability for human-animal interactions. Overall, five areas were analysed: the Serchio River Park, the Former Hospital Area, the Nottolini Area, the San Concordio Area, the Ancient City Walls and the green spaces surrounding the walls.

Serchio River Park area

The Serchio River Park is located to the north of the city, along the Serchio River, in close proximity to the ancient city walls, although separated from the historic centre by the main ring road. In the ex-ante phase, three respondents reported using the area on a daily or weekly basis. In the ex-post phase, a higher number of respondents declared regular use of the park, including daily (n=5), weekly (n=3), and occasional users (n=9). With regard to the overall perceived quality of the area, both very good and good ratings increased in the ex-post evaluation (also in percentage terms) compared to the ex-ante assessment, while sufficient and fair ratings decreased. A similar, though less pronounced, improvement was observed in perceptions of maintenance, indicating a generally more positive ex-post assessment. Concerning the quality of the human-animal experience, ex-post judgements were again more positively oriented than those expressed by ex-ante respondents, mirroring the trend observed for overall quality. Finally, accessibility for people with disabilities received a more favourable evaluation in the ex-post phase, although some critical remarks were still reported. See Table 3.

Table 3. Serchio River Park area: perceptions of diverse parameters from respondents (ex-ante/ex-post) (elaboration from the authors)

Frequency of use	Perception about the quality of the area						Total	Frequency of use	Perception of the hum-animal interaction						Total
	Very good	Good	Fair	Suff.	Bad	Don't use			Very good	Good	Fair	Suff.	Bad	Don't use	
ex-ante	1	3	2	4		2	12	ex-ante	1	3	2	4		2	12



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daily			2		2			4
never				1				2
occasionally				1	1			3
weekly	1	1	1	1				3
ex-post	4	6	1	6				7
daily	1	2	1	1				5
never		1						6
occasionally	3	2		3				9
weekly		1		2				3
Total	5	9	3	10				9

daily	1	2	1	2				6
never								2
occasionally		1		1				2
weekly				1	1			2
ex-post	4	5	2	6	2			8
daily	1	2		1	1			5
never	1							6
occasionally	2	2	1	3	1	2		9
weekly		1	1	2				3
Total	5	8	4	10	2	10		36

Frequency of use	Perception about maintenance						Total
	Very good	Good	Fair	Suff.	Very Bad	don't use	
ex-ante		1		5		6	12
daily							
never				1		4	5
occasionally		1		3		2	6
weekly				1			1
ex-post	3	2		7	2	10	24
daily					1	6	1
never	1			1		4	8
occasionally		1		3	1		9
weekly	2	1		3			6
Total	3	3		12	2	16	36

Frequency of use	Perception about accessibility						Total
	Very good	Good	Fair	Suff.	Very Bad	don't use	
ex-ante	1	1	1	7		2	14
daily				3			5
never						2	2
occasionally		1	1	2			4
weekly	1			2			3
ex-post	3	6	1	5	2	7	24
daily		3		1	1		1
never		1			1	5	8
occasionally	2	2	1	2		2	9
weekly	1			2			6
Total	4	7	2	12	2	9	36

Old Hospital area

Similarly to the Serchio River Park, the Old Hospital area, located in the eastern part of the city of Lucca, was analysed using the same evaluation framework, as reported in Table 4. This area was one of the sites where IN-HABIT project infrastructures were implemented. In the ex-ante phase, the area was largely unused by respondents and, in the single case in which it was assessed, it was rated only as sufficient across the main evaluation dimensions. By contrast, ex-post respondents reported a substantially higher level of use and a more positive perception of the area. In particular, among the 12 respondents using the area after the interventions, 8 provided positive assessments of its overall quality, while 4 rated it as sufficient. In one case, a negative comment was also recorded. Positive assessments increase to 10 when specifically referring to the hum-animal facilities introduced by the project. The maintenance of the area



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received similarly positive evaluations, while accessibility obtained comparatively lower ratings, although still assessed as sufficient or above by the respondents.

Table 4. Old Hospital area: perceptions of diverse parameters from respondents (ex-ante/ex-post) (elaboration from the authors)

Perception about the quality of the area							
Frequency of use	Very good	Good	Fair	Suff.	Very Bad	Don't use	Total
ex-ante				1		11	12
daily				1			4
never						9	2
occasionally						2	3
weekly							3
ex-post	3	4	1	4	1	12	24
daily		2					5
never		1				9	7
occasionally	2		1	1	1	3	9
weekly	1	1		3			3
Total	3	4	1	5	1	23	36

Perception of the hum-animal interaction							
Frequency of use	Very good	Good	Fair	Suff.	Very Bad	Don't use	Total
ex-ante					1	11	12
daily							
never				1		9	5
occasionally						2	6
weekly							1
ex-post	5	2	3	2	1	11	24
daily	2		1				1
never	1	1	1			8	8
occasionally	1	1		1	1	3	9
weekly	1		1	1			6
Total	5	2	3	2	1	22	36

Perception about maintenance							
Frequency of use	Very good	Good	Fair	Suff.	Very Bad	Don't use	Total
ex-ante					1	11	12
daily							
never				1		9	5
occasionally						2	6
weekly							1
ex-post	5	2	3	2	1	11	24
daily	2		1				1
never	1		1			8	8
occasionally	1	1		1		3	9
weekly	1	1	1	1	1		6
Total	5	2	3	3	1	22	36

Perception about accessibility							
Frequency of use	Very good	Good	Fair	Suff.	Very Bad	Don't use	Total
ex-ante					1	11	12
daily							
never				1		9	5
occasionally						2	6
weekly							1
ex-post	2	4	1	5	2	10	24
daily	1	1			1		1
never	1	1		2		7	8
occasionally		1	1	1		3	9
weekly		1		2	1		6
Total	2	4	1	6	2	21	36

Ancient walls and its surrounding areas

Both the areas are part of the Animal Lines circuits however, no major infrastructural interventions were possible due to regulations from cultural heritage authorities, with the exception of installing dedicated drinking water stations for dogs. The ancient walls are well



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maintained, primarily for their historical and aesthetic value, and are consistently appreciated by both residents and survey respondents (Table 5). Regarding human–animal interactions, although no structural improvements were implemented, the areas remain welcoming and friendly spaces. Frequency of use is high among all respondents, and overall appreciation of the areas is generally positive. When specifically evaluating the facilities for human–animal interaction, ex-ante respondents gave lower ratings, while ex-post respondents reported higher scores. This suggests that even small adjustments, such as the installation of dog drinking stations, can significantly enhance the perception of pet-friendly public spaces. Accessibility received generally positive evaluations, as both areas are easily navigable, including for people with some disabilities.

Table 5. Ancient Walls area: perceptions of diverse parameters from respondents (ex-ante/ex-post) (elaboration from the authors)

Perception about the quality of the area							
Frequency of use	Very good	Good	Fair	Suff.	Very Bad	Don't use	Total
ex-ante	2	4	2	2		2	12
daily	1		1				2
never		1				1	2
occasionally	1	1		2		1	5
weekly		2	1				3
ex-post	6	5	1	8	1	3	24
daily	1	2		2	1		6
never						2	2
occasionally	4	1		3		1	9
weekly	1	2	1	3			7
Total	8	9	3	10	1	5	36

Perception of the hum-animal interaction							
Frequency of use	Very good	Good	Fair	Suff.	Very Bad	Don't use	Total
ex-ante			4	6	1	1	12
daily			1	1			2
never			1			1	2
occasionally				4	1	2	5
weekly			2	1			3
ex-post	3	4	6	7	1	3	24
daily		1		4		1	6
never	2						2
occasionally	1	2	3	2		1	9
weekly		1	3	1	1	1	7
Total	3	4	10	13	2	4	36

Perception about maintenance							
Frequency of use	Very good	Good	Fair	Suff.	Very Bad	Don't use	Total
ex-ante	2	3	3	3		1	12
daily		1	1				2
never		1				1	2
occasionally	1		1	3			5
weekly	1	1	1				3
ex-post	3	8	3	4	3	3	24
daily	1	2	1		2		6
never						2	2

Perception about accessibility							
Frequency of use	Very good	Good	Fair	Suff.	Very Bad	Don't use	Total
ex-ante	1	3	1	5	1	1	12
daily		1	1				2
never		1		4		1	2
occasionally				1	1		5
weekly	1	1		7			3
ex-post	6	4	3	2	1	3	24
daily	1	2		3	1		6
never						2	2



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occasionally	2	4	1	1		1	9
weekly		2	1	3	1		7
Total	5	11	6	7	3	4	36

occasionally	3	1	2	2		1	9
weekly	2	1		3			7
Total	7	7	4	12	2	4	36

The evaluation of the green spaces surrounding the ancient walls (*Spalti*) (Table 6) is generally consistent with that of the walls themselves. Usage is relatively high among all respondents, and the overall appreciation of the area - both in terms of general quality and suitability for human-animal interaction - is positive. Some ex-post respondents expressed criticisms regarding maintenance. These concerns may reflect differing perspectives between dog owners and biodiversity management priorities. As discussed in the previous chapter, the delayed grass cutting implemented to promote biodiversity may be perceived negatively by dog owners, who may prefer more frequent mowing for hygiene and safety reasons. This tension highlights the need for further investigation and the development of coexistence strategies that balance biodiversity objectives with the practical needs of pet owners. In this context, the organisation of dedicated areas for dog management could also contribute to mitigating conflicts and improving the overall human-animal experience in these green spaces.

Table 6. Surrounding green spaces: perceptions of diverse parameters from respondents (ex-ante/ex-post) (elaboration from the authors)

Frequency of use	Perception about the quality of the area						Total
	Very good	Good	Fair	Suff.	Very Bad	Don't use	
ex-ante	2	3	2	4		1	12
daily		1	1	2			4
never						1	1
occasionally	1	1		1			3
weekly	1	1	1	1			4
ex-post	3	5	5	6	1	4	24
daily	1	1	2	2	1		7
never			1			3	4
occasionally	1	1	1	1		1	5
weekly	1	3	1	3			8
Total	5	8	7	10	1	5	36

Frequency of use	Perception of the hum-animal interaction						Total
	Very good	Good	Fair	Suff.	Very Bad	don't use	
ex-ante	1	2	3	5		1	12
daily	1	2		1			4
never						1	1
occasionally			1	2			3
weekly			2	2			4
ex-post	4	4	4	6	2	4	24
daily	1	1		3	2		7
never		1				3	4
occasionally		2	1	1		1	5
weekly	3		3	2		1	8
Total	5	6	7	11	2	5	36

Frequency of use	Perception about maintenance						Total
	Very good	Good	Fair	Suff.	Very Bad	don't use	
ex-ante	2	3	3	3		1	12
daily		1	1				2

Frequency of use	Perception about accessibility						Total
	Very good	Good	Fair	Suff.	Very Bad	don't use	
ex-ante	1	3	1	5	1	1	12
daily		1	1				2



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never		1				1	2
occasionally	1		1	3			5
weekly	1	1	1				3
ex-post	3	8	3	4	3	3	24
daily	1	2	1		2		6
never						2	2
occasionally	2	4	1	1		1	9
weekly		2	1	3	1		7
Total	5	11	6	7	3	4	36

never		1		4		1	2
occasionally			1	1			5
weekly	1	1		7			3
ex-post	6	4	3	2	1	3	24
daily	1	2		3	1		6
never						2	2
occasionally	3	1	2	2		1	9
weekly	2	1		3			7
Total	7	7	4	12	2	4	36

Nottolini area

The Nottolini area connects the city centre with the Monti Pisani forest, following the route of the historic aqueduct and providing an extended natural walking path outside the urban core. Along the path, a crossing over the highway leads to stairs and a small pedestrian bridge, which partially limit accessibility, particularly for people with reduced mobility. The area is visited by approximately half of the respondents, most of whom provided positive evaluations regarding both overall quality and the suitability for human–animal interactions. Notably, positive assessments of the human–animal experience were higher among ex-post respondents, suggesting that the introduction of the Animal Lines path enhanced their perception and use of the area. (Table 7)

Table 7. Nottolini area: perceptions of diverse parameters from respondents (ex-ante/ex-post) (elaboration from the authors)

Frequency of use	Perception about the quality of the area						Total
	Very good	Good	Fair	Suff.	Very Bad	Don't use	
ex-ante	1		4	1		6	12
never			1			4	5
occasionally	1		3			2	6
weekly				1			1
ex-post	2	4	3	5		10	24
daily				1			1
never	1					7	8
occasionally		1	3	2		3	9
weekly	1	3		2			6
Total	3	4	7	6		16	36

Perception about maintenance

Frequency of use	Perception of the humanimal interaction						Total
	Very good	Good	Fair	Suff.	Very Bad	don't use	
ex-ante				2	4	6	12
never					1	4	5
occasionally			2	2		2	6
weekly				1			1
ex-post	3	2	4	5	1	10	24
daily					1		1
never		1				7	8
occasionally	1		2	4		3	9
weekly	2	1	2	1			6
Total	3	2	6	9	1	16	36

Perception about accessibility



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Frequency of use	Very good	Good	Fair	Suff.	Very Bad	don't use	Total
ex-ante		1		5		6	12
never				1		4	5
occasionally		1		3		2	6
weekly				1			1
ex-post	3	2		7	2	10	24
daily					1	6	7
never	1			1		4	6
occasionally		1		3	1		5
weekly	2	1		3			6
Total	3	3		12	2	16	36

Frequency of use	Very good	Good	Fair	Suff.	Very Bad	don't use	Total
ex-ante		1		5		6	12
never				1		4	5
occasionally		1		3		2	6
weekly				1			1
ex-post	3	2		7	2	10	24
daily					1	6	7
never	1			1		4	6
occasionally		1		3	1	4	9
weekly	2	1		3			6
Total	3	3		12	2	16	36

San Concordio area

The area, located in the southern part of the city, appears to be less frequently visited by respondents, and relatively few evaluations were collected. Nevertheless, among ex-post respondents, the area received generally positive ratings (see Table 8). Most assessments indicated sufficient or higher scores for overall quality and suitability for human–animal interactions, although two negative comments were recorded. Similar patterns were observed for maintenance and accessibility.

Table 8. San Concordio area: perceptions of diverse parameters from respondents (ex-ante/ex-post) (elaboration from the authors)

Frequency of use	Perception about the quality of the area						
	Very good	Good	Fair	Suff.	Very Bad	Don't use	Total
ex-ante		1				11	12
daily						1	1
never						8	8
occasionally						2	2
weekly		1					1
ex-post	2	3	1	6		12	24
daily							7
never	1			1		10	12
occasionally	1	3		3		2	7
weekly			1	2			3
Total	2	4	1	6		22	36

Frequency of use	Perception of the hum-animal interaction						
	Very good	Good	Fair	Suff.	Very Bad	don't use	Total
ex-ante				1		11	12
daily							
never						1	1
occasionally						8	8
weekly				1		2	3
ex-post	2	2	3	4	2	11	24
daily							
never		1		1	1	9	12
occasionally	2	1	1	2	1	2	7
weekly			2	1			3
Total	2	2	3	5	2	22	36

Perception about maintenance

Perception about accessibility



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Frequency of use	Very good	Good	Fair	Suff.	Very Bad	don't use	Total
ex-ante			1			11	12
daily						1	1
never						8	8
occasionally						2	2
weekly			1				
ex-post	2	3	1	4	1	13	24
daily							
never	1		1			10	12
occasionally	1	2		2	1	3	9
weekly		1		2			3
Total	2	3	2	4	1	24	36

Frequency of use	Very good	Good	Fair	Suff.	Very Bad	don't use	Total
ex-ante			1			11	12
daily							
never						1	1
occasionally						8	8
weekly			1			2	3
ex-post	4	2	1	5		12	24
daily							
never			1	1		10	12
occasionally	3	2		2		2	9
weekly	1			2			3
Total	4	2	2	5		23	36

Main results: As previously noted, the analysis has several limitations due to the small number of respondents, which does not allow for statistical generalisation. Nevertheless, several points of interest emerged from the survey responses: A) management of pets appears as a cross-cutting issue, independent of respondents’ age, gender, or economic conditions; B) limitations to keeping animals are primarily related to residential space availability, time constraints, and economic considerations; C) the human-animal bonds, from a personal perspective, are considered having multiple positive aspects, including companionship, caring for another being, opportunities for physical activity, and overall improvement in quality of life; D) pet ownership and human–animal interactions influence cultural attitudes and raise awareness of human practices that may cause harm to animals, such as feeding practices, experiments, and other activities, though the perceived relevance of these issues varies among respondents; E) green spaces evaluation: respondents’ appreciation of Lucca’s green spaces increased in the ex-post evaluation, particularly in areas where specific interventions were implemented, even minor ones, or where the concept of Animal Lines paths introduced a new perspective on their use; F) broader implications of pet ownership: considering the wider presence of animals in households (in Italy and beyond), personal pet management clearly shapes citizens’ perceptions of daily life, expectations for public spaces and hum-animal related policies, and cultural habits related to human-animal interactions, although tensions and contradictory perspectives remain.

3.1.4 Analysis of ex-ante/ex-post interviews

In the first phase of the IN-HABIT project, an ex-ante survey was conducted by ISIMPACT with the support of local WP3 partners. The collected data were analysed in a dedicated report; here, we focus only on the evidence directly relevant to the Lucca Hum-animal case. A total of 184



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respondents participated in the ex-ante survey (Table 9), with a predominance of women and middle-aged individuals. Most respondents were employed and had a relatively high level of education, with 33.2% holding a master's degree.

The ex-post survey collected 98 responses. Despite the smaller sample size, the profile of respondents was broadly similar to the ex-ante group, with a predominance of women, middle-aged adults, employed individuals, and respondents with a good level of education (Table 9).

Methodology

In addition to personal data such as gender, age, and economic status, the ex-ante and ex-post analysis was conducted by grouping questions into 7 specific themes of interest as follows: Q1-Q9 Free time in Lucca; Q15, Q24 Pet management; Q20-Q25 Free time activities; Q26-Q29 Inclusion in the neighbourhood; Q30-Q34 Safety; Q35-Q48 Urban Quality; Q40-Q43 Inclusion; Q50-Q54 Maintenance of green areas; Q57-Q62 Civic education; Q49, Q56 Maintenance of green areas for dogs. The analysis was conducted through the following steps:

1. Step 1 Latent variable analysis: Cronbach's Alpha was calculated to assess the internal consistency of the grouped questions and to examine correlations between time devoted to animals (Q24) and the latent variables.
2. Step 2 Latent correlation of Q24 (Ordered logistic regression): the 7 latent variables that were significant in step 1 were correlated with different levels of time spent with animals (Q24) using a non-parametric (non-linear) ordered logistic regression model.
3. Step 3 Socio-economic correlation: Q24 was correlated with socio-economic variables.
4. Step 4 Gender correlation: Q24 was further analysed in relation to gender.
5. Step 5 ex-ante/ex-post validation: significant variables were then validated by comparing ex-ante and ex-post results.

In both samples, contact with animals⁶ was used as a dependent variable. Respondents who spent at least one hour per day attending to animals were classified as “managing animals.” This variable was then cross-checked against nine groups of responses (latent variables) representing different dimensions, including perceptions of: a) free time spent in Lucca's public areas, b) general use of free time, c) inclusiveness of the local neighbourhood, d) perceived security, e) urban quality, f) maintenance of green areas, g) civic engagement in the area, h) maintenance of green areas specifically dedicated to pets.

⁶ In Q24 five levels from never, to less than 1 hour, between 1 and 2 hours, between 2 and 3 hours and more than 3 hours of activity during the week have been questioned.



Table 9. Descriptive statistics of the samples. (elaboration from the authors)

Characteristics ex-ante (n=184)			Characteristics ex-post (n = 98)		
	Freq	%		Freq	%
<i>Gender</i>			<i>Gender</i>		
Male	53	28.8%	Male	32	32.7%
Female	131	71.2%	Female	66	67.3%
<i>Age</i>			<i>Age</i>		
18-24	12	6.5%	18-24	8	8.2%
25-34	40	21.7%	25-34	27	27.6%
35-54	79	42.9%	35-54	36	36.7%
55+	53	28.8%	55+	27	27.6%
<i>Educational level</i>			<i>Educational level</i>		
Equivalent of qualification gained fr...	20	10.9%	Equivalent of qualification gained fr...	7	7.1%
Higher level of vocational training	57	31.0%	Higher level of vocational training	27	27.6%
Bachelor's or university degree	33	17.9%	Bachelor's degree or university degree	17	17.3%
Master's degree	61	33.2%	Master's degree	34	34.7%
Doctoral degree	13	7.1%	Doctoral degree	13	13.3%
<i>Employment status</i>			<i>Employment status</i>		
Worker	138	75.0%	Worker	77	78.6%
Unemployment	5	2.7%	Unemployment	4	4.1%
retired	25	13.6%	Retired	4	4.1%
student	16	8.7%	Student	13	13.3%

In the first step, the internal reliability of the questions within the 9 groups was assessed using Cronbach's Alpha coefficient. All variables demonstrated good internal consistency, with Cronbach's Alpha exceeding 0.65 in all groups, except for groups a and b (free time spent in Lucca's public areas and general use of free time). These two groups were therefore excluded from further analysis (Table 10).

Table 10. Definition of latent variables (Cronbach's Alpha >0.65) (elaboration from the authors)

Group	Question	Latent variable	Cronbach alpha
1	Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q9	Free time in Lucca	0.5914
2	Q20, Q21, Q22, Q23, Q25,	Free time	0.6015
3	Q26, Q27, Q28, Q29	Inclusion in the neighborhood	0.7806
4	Q30, Q31, Q32, Q33, Q34	Security	0.7877
5	Q35, Q36, Q37, Q38, Q44, Q45, Q46, Q47, Q48	Urban quality	0.7421



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6	Q40, Q41, Q42, Q43	Inclusion	0.7158
7	Q50, Q51, Q52, Q53, Q54	Green areas maintenance	0.7694
8	Q57, Q58, Q59, Q60, Q61, Q62	Civic education	0.7307
9	Q49, Q56	Green areas maintenance for pets	0.6903

In a second step, each of the 7 latent variables was correlated with Q24 using a non-parametric model (ordered logistic regression). The analysis shows that Q24 is statistically negatively correlated with perceived urban quality and with the maintenance of green areas for pets, while it is statistically positively correlated with inclusion (Table 11). No statistically significant correlations were observed between Q24 and perceived security, neighbourhood inclusiveness, general maintenance of green areas, or civic engagement in the area.

Table 11. Ordered logistic regression Q24 and latent variables. (elaboration from the authors)

Q24	Coefficient	Std. err.	z	P> z	[95% conf. interval]
urban_quality	-36.7819	13.4246	-2.74	0.006	-63.094 -10.470
inclusion	13.5819	5.6108	2.42	0.015	2.585 24.579
mainten_animal	-5.6894	2.7874	-2.04	0.041	-11.153 -0.226

Reflecting on the data, it appears that the greater the amount of time spent with animals, the lower the perceived urban quality and security. Conversely, the relationship is reversed when inclusiveness is considered.

These findings suggest that individuals who spend more time caring for animals tend to explore and experience urban spaces more intensively and critically, particularly those areas they frequent regularly for pet-related activities. This deeper engagement may lead to a more demanding assessment of urban quality and safety conditions. At the same time, respondents who dedicate more time to animals appear to place greater positive value on social inclusion within their neighbourhoods, extending attitudes of care to animals to broader dimensions.

Significant correlations were also observed (exclusively among female respondents) between Q24 and gender (Table 12). In particular, among women, higher levels of time spent caring for animals were significantly associated with stronger perceptions of inclusiveness. From this perspective, caring for animals seems, especially for women, to be closely linked to a specific way of experiencing and interpreting participation in social life and community relations.

Finally, significant differences were investigated for each of the three latent variables (urban quality, inclusion, and maintenance of green areas for animals) between the pre-IN-HABIT and post-IN-HABIT phases. To this end, a one-way ANOVA was applied. While no statistically significant differences emerged for urban quality or inclusion, a significant difference was



observed in the perceived quality of maintenance of green areas dedicated to animals between the pre- and post-IN-HABIT phases (Tables 13 and 14).

Table 12. Ordered logistic regression Q24 and latent variables sort by gender (a- male, b- female). (elaboration from the authors)

a-Male						
Q24	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
urban_quality	-50.9251	-50.9251	-1.91	0.056	-103.149	1.299
inclusion	5.1362	5.1362	0.45	0.651	-17.110	27.382
mainten_animal	-4.9089	-4.9089	-0.88	0.379	-15.839	6.021
b-Female						
Q24	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
urban_quality	-30.2865	-30.2865	-1.94	0.052	-60.882	0.308
inclusion	15.6180	15.6180	2.41	0.016	2.924	28.495
mainten_animal	15.789	15.7896	-1.65	0.099	-11.758	1.005

Table 13. One-way ANOVA to test quality of maintenance of green areas for animals throughout pre and post IN-HABIT. (elaboration from the authors)

Source	SS	df	MS	F	Prob > F
Between groups	0.0278	1	0.0278	16.01	0.0001
Within groups	0.4852	280	0.0017		
Total	0.5130	281	0.0018		

Table 14. Averages of the perception of the quality of maintenance of green areas for animals pre and post IN-HABIT. (elaboration from the authors)

IN-HABIT intervention	Mean	Std. err.	[95% conf. interval]	
Ex ante	0.0811	0.0032	0.0748	0.0873
Ex post	0.1019	0.0039	0.0943	0.1095

This aspect is particularly relevant for the impact evaluation of the IN-HABIT project in Lucca. Nevertheless, taking into account the limitations discussed in Chapter 2.2, the analysis of ex-ante/ex-post variations allows us to highlight a change in perceptions among individuals who spend more time with animals. Specifically, in the ex-post phase, the perception of the quality of green areas dedicated to animals is no longer negatively associated with higher levels of time spent with animals. In this respect, following the IN-HABIT interventions, spending longer periods with animals in dedicated spaces is no longer perceived as being linked to lower-quality environments.



Overall, respondents reported an improvement in the quality of these spaces after the implementation of the IN-HABIT project, suggesting a positive contribution of the interventions to the perceived suitability and maintenance of green areas for human–animal interaction.

3.1.5 The main points emerged from the comparison among the ex-ante/ex-post focus groups

The quantitative data analysis revealed correlations between the time spent with animals and both attention to dedicated areas and perceptions of inclusiveness. To complement these findings, two Focus Groups were conducted during the IN- HABIT project (one ex-ante and one ex-post) in order to assess, from a qualitative perspective, key perceptions related to inclusiveness and quality of life in Lucca, as well as the condition of public spaces, with particular attention to green areas. Table 15 presents the participant selection process for both Focus Groups.

Table 15. Details of participation in the two focus groups (elaboration from the authors)

	1st focus group	2nd focus group
Number of invited people	14	20
Number of participants	10	13
Men	3	3
Women	7	10
Age range	20-60+	29-70+
Persons with disabilities	No	No
People belonging to ethnic minorities	Yes, Roma community	No
People belonging to the LGBTIQ+ community	Not declared	Not declared

The first focus group was organized after the initial COVID-19 lockdown and represented the first opportunity to share and discuss key observations regarding the state of living in Lucca, as summarized on the left side of the table. The second focus group, held at the end of July 2025, provided a forum to discuss the outcomes and impacts of the IN-HABIT project, primarily from a qualitative perspective. Some participants in the second session had also taken part in the first one. Analysis of both focus groups highlighted 3 main themes: spatial well-being, social well-being, and inclusion.



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Methodology

Two focus groups were organized to investigate the state of the art in Lucca with respect to the five dimensions of the IN-HABIT framework. The first focus group was conducted during the project's first year in collaboration with partner ISIMPACT, which was initially responsible for evaluating the impact of the implemented solutions. The second focus group took place at the end of the project (July 2025). In both cases, the participant selection process began with internal discussions to ensure balanced representation between social association representatives and citizens. For the second focus group, invitations were extended to participants from the first focus group as well as to additional individuals who had been actively involved in the project over the years. Potential participants were first contacted personally via email or phone, followed by formal invitations sent by email. The main topics of the first focus group included: i) Spatial well-being, ii) Social well-being, iii) Ability/inability for inclusion and iv) Intersections between human-animal interaction and previous themes.

The second focus group focused on: i) Spatial well-being, ii) Social well-being, iii) Subjective well-being, iv) Economic well-being. All themes in both focus groups were discussed in relation to human-animal interactions.

Spatial well-being

In the first focus group (2021), participants described Lucca as rich in historical and green spaces (e.g. the city walls and surrounding parks), but emphasized significant issues: poor public transport, lack of parking, and uneven accessibility, especially for the elderly and persons with disabilities. Although cultural events were appreciated, their promotion was inconsistent. A clear contrast emerged between tourists' idealized view of the city and residents' lived experience, which included concerns about public transport, traffic, noise, mobility management, a lack of communication, and over-tourism.

Regarding the environment and the role of animals, participants expressed clear expectations about the potential benefits of existing resources, with particular attention to supporting animal rights, as reflected in their comments:

*A: We should start from the **mapping of existing or potential** urban paths to allow animals having a life of their own, they too have the **right of their own sociality**.*

*E: In my opinion, any type of **exchange between animals and people** must be understood as an exchange between individuals, because animals are also that.*

At the same time, participants highlighted the importance of green spaces, ecological corridors, and dedicated areas to support improved management of both companion and wild animals.

*D: "As far as green heritage is concerned, I would like **local species** to be enhanced, I would like parks to have a note of naturalness with local plants. I'd like to come back to a more wild **and less manufactured nature**"*

A: I'm lucky because I live near the forest, and I have a lot of space to take my dog for a walk. Currently there aren't adequate spaces

*C: I would connect the idea of a sustainable city to **green corridors that link the city center to the suburbs to share time with their pets**. The green corridors were also designed for **wild animals**. To create an integration among biodiversity, people and environment as a new idea of city.*



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*G: In my opinion there is a serious **lack of services** by the municipality of Lucca **concerning animals**, in particular dogs. There isn't a real dog park neither in the old town nor in general.*

*F: I feel a lot the **lack of space**. I've to search for **forest areas** .. where we (with my dog) can stay alone.*

A: I'm lucky because I live near the forest, and I have a lot of space to take my dog for a walk. Currently there aren't adequate spaces

*E. A **cattery** is also missing, as we hear from the associations that take care of the feline colonies.*

Coexistence was also focused with an attention on the potential of educational activities regarding human-animal interactions:

*B: We need to talk about **dog education** but also about **human education**, many people don't respect the welfare of the animal because they don't know what it is. It would be nice to do something like "**animal education**" in schools. Pets become social subjects.*

In the second focus group discussion (2025), people recognized improvements in the quality and functionality of public spaces, especially those redesigned through a hum-animal and restorative lens (i.e. green, sensory, relational, inclusive). The two relational areas built within the IN-HABIT project were seen as fostering interaction between strangers through their pets. The city was described as more welcoming and emotionally engaging, with enhanced opportunities for spontaneous encounters and community use of space. The hum-animal concept was understood as a driver of both inclusivity and urban hospitality.

To compare the findings emerged from the two moments: the initial discussion emphasized infrastructural weaknesses and social fragmentation, while the final one highlighted new, inclusive, pet-friendly environments that enhanced both human-human and human-animal interactions. The hum-animal interventions appeared to partially address previously identified gaps in accessibility, sociality, and sensory quality of public spaces.

Figure 10 presents the main themes and discussions that emerged during the ex-ante and ex-post focus groups, providing a clearer overview for interpretation.



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<p>Lucca and its specific beauty</p> <ul style="list-style-type: none"> An open home Dominates everything, almost like a cover It is a "gem": upon entering the walls, one is immediately surrounded by beauty Some areas feel empty or are primarily designed for tourists, which diminishes their potential value for residents The ancient walls serve as a vital green space, enabling socialization and fostering a sense of community. Their preservation is essential. 		<p>In Lucca "we are on the right path", "100%"</p> <ul style="list-style-type: none"> "I often visit the relational areas and have realized that they are not only spaces for dogs, but also for the people accompanying them. Even strangers tend to connect when they share a common animal, talking not only about their dogs but about many other things." "I hope the Pet Care service continues. Both our association and LAV offered support to people over 65 who had temporary needs. Emotionally, it was a unique and enriching experience. This service should continue and perhaps even be expanded." "When I am with my dog, I feel a sense of peace. Thinking about how simple his life is—just needing affection, food, and walks—helps me relax amidst my own personal complexities, such as family or work concerns." The digital platform is an idea with great potential. With the hoped-for expansion of the project, it could include information on water points, dog areas, or specific pet services, as well as human-oriented services that accept animals. It could also provide event notifications or tips on responsible and conscious pet ownership. 	
<p>Nature is surrounding the city, but it may be better valorised</p> <ul style="list-style-type: none"> More naturalness with local plants The "Parco Fluviale" is a very beautiful space, but green areas should be made more accessible to all. 	<p>Social life is contradictory</p> <ul style="list-style-type: none"> It is perceived as "the European capital of volunteering". For women, the goal is to maintain Lucca a safe city The city hosts many foreign communities, and numerous initiatives are in place to support them. For the younger generations, engagement largely depends on the willingness and involvement of families. Some aspects of the city's character and traditions have been lost over time. 	<p>Reorganising spaces</p> <ul style="list-style-type: none"> Well-maintained environments: Redeveloped spaces provide a sense of "hospitality," welcoming not only residents but also visitors. Organization: A well-kept area creates a sense of order and encourages people to feel comfortable using it. Relationship-building: Even strangers can connect; people often start conversations and share experiences about their animals. Sharing: Encounters with other pet owners, such as someone walking a small dog, foster informal social interactions and community engagement. 	<p>Animal as public goods</p> <ul style="list-style-type: none"> From private to public animal resources: Fostering civic responsibility can make animals a shared urban resource, enhancing social awareness. Awareness-raising: Initiatives with children and the elderly are highly valued and effective, as shown in schools. AAI in nursing homes were considered very positive by participants, who hope they can be repeated. The board game by Lucca Crea was highly valued.
<p>Animals as a new subject in the city</p> <ul style="list-style-type: none"> Mapping existing or potential urban paths to allow animals to have a life of their own, recognizing their right to social interactions. Creating a sustainable city with green corridors linking the city center to the suburbs, enabling residents to share time with their pets. Recognizing that exchanges between animals and humans should be understood as interactions between individuals, as animals are sentient beings with their own needs and agency. Promoting integration among biodiversity, people, and the environment as part of a new urban vision. Current urban spaces and municipal services for animals, particularly dogs, are inadequate. There is no dedicated dog park in the historic center or elsewhere in the city. Education is needed not only for dogs but also for humans to ensure proper care and understanding of animal welfare. Many people fail to respect animal welfare due to a lack of knowledge and awareness. 		<p>Hum-animal city: I would describe it as a "forward-looking city", "innovative, beginning and replicable"</p> <ul style="list-style-type: none"> "Yes, indispensable," and a great opportunity for human-animal interaction. I believe the future lies in increasing social interaction with animals. "Gratification, affection, companionship, care" - highlighting the need for deeper psychological understanding. "What worries me is the tendency to over-humanize pets." 	
<p>Ex-ante main topics emerged during the focus group</p>		<p>Ex-post main topics emerged during the focus group</p>	

Figure 10. Focus group narrative in the ex-ante and ex-post dialogues in Lucca. (elaboration from the authors)

Social well-being

Social well-being has shifted from a fragmented, bureaucratically constrained context to a more inclusive, participatory, and emotionally engaging approach. In the first focus group, fragmentation across age, social, and geographic lines was highlighted. By the second session, stakeholders acknowledged the improvements brought by VIS initiatives (AAI, Pet Care services, and educational activities in schools and through board games) implemented through the IN-HABIT project. Participants noted expanded social opportunities through human-animal activities, especially AAI, Pet Care, and school programs, which were seen as emotionally rewarding and supportive of intergenerational and interspecies connections. The project was credited with enhancing social cohesion and fostering a "community feeling" based on shared values and responsibilities. In both focus groups, the city was described as culturally rich but limited in terms of accessible information and coordinated civic planning. Concerns were also raised about risks linked to the humanization of human-animal relationships and challenges arising from high demand for pet-related services. The sustainability and continuity of the human-animal perspective were emphasized as essential to ensuring the long-term growth and expansion of initiatives piloted through the IN-HABIT project.

Inclusion

Inclusion was a central topic of debate. Despite Lucca's reputation for active volunteering and openness, some participants - particularly from marginalized groups (e.g., members of the Roma



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community in the first focus group) - highlighted latent discrimination, especially in housing. In the second session, the hum-animal concept was described as a tool to bridge social gaps by normalizing diversity in public spaces. Initiatives in schools, nursing homes, and urban walking groups were cited as fostering empathy, responsibility, and intergenerational dialogue. Inclusion was framed not as a static label but as an evolving process supported by shared spaces and experiences with animals. There was a clear shift from diagnosing exclusion to actively practicing inclusion through design, education, and daily interactions with non-human companions, confirming that animals can serve as catalysts for social relationships.

The intersections of these themes with human-animal interaction were evident across all discussions. In the first focus group, participants expressed emotional bonds with pets but noted a lack of dedicated infrastructure (dog parks, green corridors, shelters). Some highlighted barriers for individuals unfamiliar with or afraid of animals, while others proposed school education and public awareness campaigns on animal behaviour. Discussions then moved from identifying missing services and risks to recognizing the value and potential of human-animal relationships. The second focus group emphasized not only emotional and social benefits - the hum-animal dimension was seen as central to urban well-being - but also the emergence of a new urban economy focused on animal care and pet-friendly infrastructure. Pet ownership was viewed as promoting stress reduction, emotional satisfaction, and daily motivation. Participants welcomed the creation of relational areas and the development of related initiatives (e.g. AAI in nursing homes and Pet Care services). Ultimately, human-animal relationships were framed as transformative and even therapeutic.



Figure 11. Baseline focus group



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Figure 12. Final focus group

As shown in Figure 10, the second focus group highlighted the positive outcomes of some pilot initiatives, particularly the new relational areas. More importantly, the discussion emphasized the hum-animal approach, widely regarded as innovative and forward-looking. Participants noted its potential to enhance public goods, such as societal dialogue and city-level networking, and its perceived capacity to positively impact the IHW of both vulnerable groups and the wider citizenry. The replicability of the approach in neighbouring municipalities and beyond was also discussed. A strong sense of pride emerged during the dialogue regarding the efforts and achievements of the Lucca IN-HABIT project.

Main results from the ex-ante/ex-post evaluation: beyond some **limitations**, the evaluation of the Lucca project highlighted both positive outcomes and points for reflection.

First, people who interact with animals appeared to participate more actively and critically in urban life across diverse contexts and situations, such as walking, exploring, and spending time differently from other citizens. This engagement seems to increase their sensitivity to the quality and management of city spaces, including safety concerns - often particularly noticeable among women. From this perspective, the reorganisation of dedicated spaces and urban infrastructures enhanced perceptions of quality and security. Seen as “sentinels,” these findings suggest that hum-animal infrastructures can contribute to a broader sense of safety and inclusiveness for all. Moreover, the **caaring attitude** toward animals appears to extend to human relationships, fostering friendlier and more inclusive dialogue when supported by appropriate hum-animal infrastructures.

Focus group activities confirmed that introducing the hum-animal concept and implementing pilots generated positive feedback, highlighting **innovation**, **forward-looking** city planning, and **attention to public goods** in unconventional ways. Addressing a **hybrid topic (humans and animals together)** proved challenging but allowed **diverse stakeholders** (animal associations, social workers, citizens, municipalities, schools, cultural organizations, businesses, and target groups) to share challenges and solutions transversally. This **hybrid environment** strengthened **social ties and social capital** among actors in a less sectoral, more integrated way, and



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demonstrated potential to mobilize unexpected resources, such as animals, for **cost-effective urban solutions**.

Nevertheless, the human-animal perspective in Lucca remains a **“box” with many untapped opportunities**. Areas such as *wild animals and biodiversity*, food-producing animals, addressing *new social issues*, and *creating economic and job opportunities* still offer significant **potential for an integrated hum-animal policy supporting IHW at the city level**. While Lucca has explored diverse aspects through multiple policies and approaches, there remains a need for greater policy integration under a more comprehensive political strategy.

Finally, from a political perspective, the increasing presence of animals in cities and their growing role in family life generate new demands and attention that policymakers should consider as part of everyday urban life, both to encourage active citizen engagement and to foster **positive public consensus**.

As presented in the next chapter, the transition process, the participatory activities organised in the IN-HUB, and the various pilots all contributed to the results perceived by citizens in Lucca, as reflected in both quantitative and qualitative evaluations. Each action will be further examined in the next chapter for deeper understanding and insight.



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3.2. The transition process

Methodology

The Lucca IN-HABIT case introduced a novel perspective by considering animals in urban contexts as A-NBS, aligned with the broader goal of delivering innovative public goods. The process was guided by three central questions:

- Considering the multiple challenges facing contemporary cities, is it both feasible and valuable to view animals and human-animal relationships as a potential public good capable of fostering inclusive health and well-being, particularly for the most vulnerable citizens?
- If so, what pathways, solutions, and potential impacts can be envisioned to enhance human well-being through human-animal bonds, and under what conditions can these be realized?
- Is it possible to design a “hum-animal urban policy” as an integrated approach that mobilizes human-animal bonds at the city level? Could such a policy be incorporated into urban governance in the near future, and what steps or support mechanisms would be required to advance it?

To address these questions, the Lucca IN-HABIT process was organized as a PAR exercise. In PAR, researchers co-lead the change process, supporting the co-design, co-deployment, co-management, and co-evaluation of innovative solutions and concepts. The key principle is to conduct research with actors directly involved - in this case, both Lucca partners and engaged stakeholders. Indicators within the PAR framework were primarily process-oriented and assessed through qualitative methods. For the hum-animal city process, key dimensions were identified for both stakeholders and the municipality. For stakeholders, these included: 1) Knowledge and evidence Awareness, 2) Participation & mediation, 3) Level of hum-animal perspective (wild, food-producing, companion animals in a public perspective), 4) Political engagement, 5) Regulatory & planning. For the Lucca Municipality, dimensions included: 1) Knowledge and evidence Awareness, 2) Implementation and policy capacity (Political engagement and feasibility), 3) Participation & mediation, 4) Integration of relevant policy domains, 5) Level of hum-animal perspective (perspective (wild, food-producing, companion animals in a public perspective), 6) Regulatory & planning. Each component was evaluated on a scale from 1 to 4. The process was organized into 5 phases (initial stage, close to the electoral phase, immediately after the election, following the reorganization of the municipal political-technical structure, and project closure. Evaluation relied on multiple sources: interviews, focus groups, analysis of formal municipal decisions, the sequence of pilot initiatives, and the knowledge accumulated by actors throughout the process. Specific indicators included:

- Evolution and intensity over time of formal decisions taken by the Lucca Municipality to support and accompany the process
- The temporal sequence of pilot initiatives implemented in the municipality, serving as an indicator of the underlying agreements and stakeholder alignment
- Results from focus groups conducted with selected stakeholders at the beginning and end of the project
- Political recognition and validation of project outcomes
- Organization of a final legacy of the municipality on some of the pilots introduced in the project
- Key demands and future expectations expressed by stakeholders engaged in the transformation process.

The entire process has been organised into specific steps like: A) initial stage, B) second year and election phase, C) new reorganisation and start with the new political guidance, 4) project finalisation.

IN-HABIT in Lucca focused on the potential role of human-animal bonds in enhancing inclusive health and well-being at the city level. The hum-animal perspective encompasses various dimensions, including the presence of wild animals and their coexistence with non-human species, food-producing animals - both in innovative and traditional forms, reflecting local culture and geography - and companion animals for private and public purposes. To address these challenges and support the transformation process, a progressive effort was made to foster shared understanding and alignment among a growing and diverse group of stakeholders. This was achieved through a series of meetings (initially online and later in person) designed to promote dialogue and convergence of visions. The process was complex, shaped not only by typical challenges but also by external factors such as the COVID-19 pandemic, inflation, and



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changes in local political administration. The overall process was analysed following the steps outlined in the methodological framework.

3.2.1. Building the idea and identification phase

The focus on the hum-animal city concept was initiated by the Pisa research group at the Department of Veterinary Science, linking four main domains - *urban food policies*, *social farming* (including animals), *urban farming*, and *human-animal bonds* - into a convergent vision. This laid the groundwork for developing **integrated hum-animal urban policies** (IHAUP) aimed at leveraging human-animal relationships to provide public goods, particularly inclusive health and well-being for vulnerable citizens.

Lucca was selected as the focus city for two main reasons: the involvement of Pisa during the electoral phase at the time of project identification and formulation, and the presence of promising relational and structural elements within the city itself. The identification phase was supported by bachelor's students from both the Departments of Veterinary Science and Engineering (specializing in architecture), who contributed to the initial concept development and the first stakeholder mapping exercise.

Bringing together these diverse topics under the overarching “hum-animal smart city” concept was both intellectually stimulating and inherently challenging, given the novelty of the approach. A concept note was subsequently shared with the Mayor's Cabinet of Lucca, which expressed clear interest in the idea:

“We are happy to reflect on smart cities beyond just digital solutions” (comment from the mayor's head of cabinet during the meeting)⁷

Subsequent steps included meetings with the city councillor responsible for environmental policies (appointed as the reference figure by the mayor), and later with other councillors working in areas such as social affairs, public infrastructure, and education (as a first group). While the responses were largely positive, there was some initial uncertainty about how to operationalize the concept. The idea was then formally presented to all the councillors of the Lucca municipality. At the same time, the technical responsible of the diverse areas of interest were also contacted and involved.

⁷ Following the meeting, and through a review of local newspaper articles, we discovered that during the previous electoral campaign, issues related to pets - their rights and the services provided by the Municipality- had been part of the political debate. This revealed that a third-party, scientific-based approach to the topic could gain political visibility and legitimacy within this specific domain



In parallel, stakeholder mapping activities initiated in university classes helped identify relevant local associations, which were also engaged in preliminary discussions to gather interest, feedback and suggestions. (Figure 13)

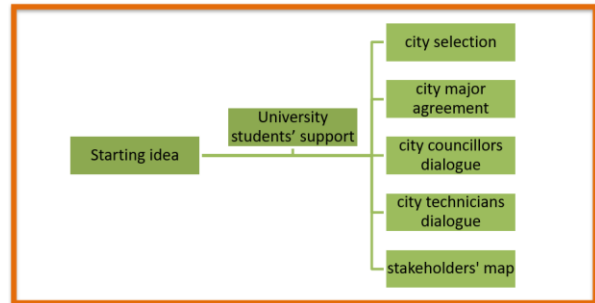


Figure 13. Identification phase in Lucca IN-HABIT. (elaboration from the authors)

3.2.2. Starting the process of change

Following the approval of the IN-HABIT project, the WP3 partnership was formalized and responsibilities were allocated accordingly. The Municipality of Lucca designated the Councillor

for the Environment and the EU Project and Planning technical office to oversee local implementation of the project. Meanwhile, the internal participatory process continued, engaging councillors and technicians to build support for the hum-animal concept. The IN-HUB was also organized, starting from the previously mapped stakeholders. However, the process was soon disrupted by the outbreak of the COVID-19 pandemic, which shifted the municipality’s priorities toward managing the public health emergency.

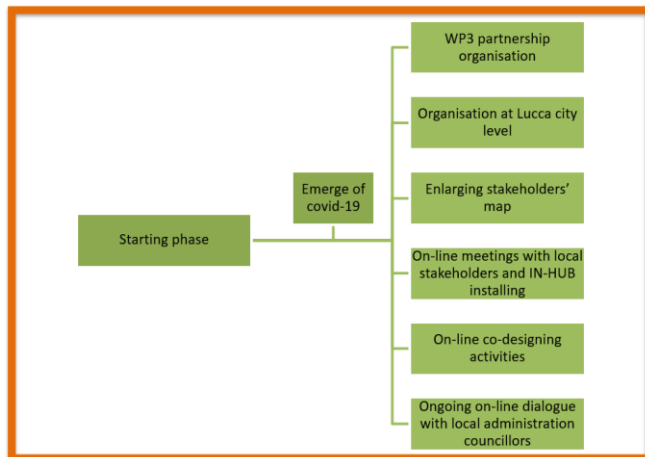


Figure 14. Starting phase in Lucca IN-HABIT. (elaboration from the authors)

participatory processes, which had to be moved online due to pandemic-related restrictions. The online activities involved individual citizens, NGOs working on animal-related issues, members of established urban networks supporting vulnerable groups, firms, and professionals from diverse fields. Despite the physical distance, the co-design process proved relatively effective in terms of engagement and contributions, particularly in addressing vulnerable target groups such as the elderly and youth, and in co-designing several innovative interventions within the human-animal framework.

Additional challenges emerged in establishing the IN-HUB and organizing



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Figure 15. Partnership and stakeholder involvement in the Lucca IN-HUB (elaboration from the authors)

In addition to the IN-HUB participatory process, an internal **institutional innovation process** was organized within the Municipality of Lucca to engage both **policymakers** (the councillors involved in the hum-animal integrated policy) and the relevant **technical staff**. This internal process aimed to support and facilitate dialogue around the proposals and ideas emerging from the IN-HUB activities.

A central challenge during this stage was the need to **align the diverse entry points and perspectives of the involved stakeholders** (as illustrated in Figure 15). The main objective was to establish a shared direction by presenting the concept, gathering feedback and concerns, building motivation, mitigating resistance, and fostering convergence toward a common vision.

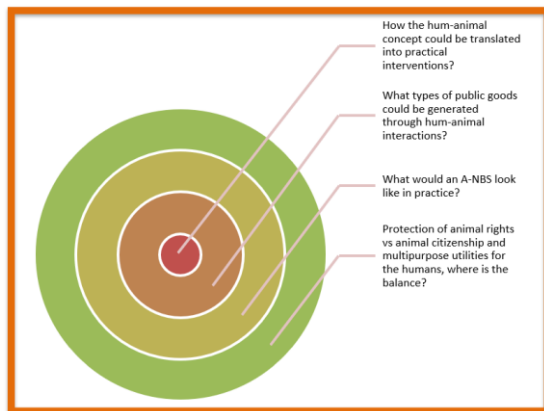


Figure 16. Key questions during the first phase of the process in Lucca IN-HABIT. (elaboration from the authors)

Main results from the starting process: During the first phase, the main questions focused on the points presented in Figure 16. This phase enabled both IN-HUB members and political representatives from the Municipality of Lucca to reach a preliminary, shared understanding of the concept, despite remaining uncertainties regarding its practical implementation. *Lesson learnt during the phase:* **1a) participatory processes are always broader than expected, 1b) they don't solely involve local stakeholders, rather, the engagement of internal political and technical components of the municipality becomes essential in**



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building an IHAUP, 1c) the active involvement and alignment of all actors is crucial for achieving the IHAUP.

3.2.3. Co-design phase and conclusion of the political cycle

The **second step** focused on fostering motivation and alignment among all participants (including stakeholders as well as technical and political actors within the municipal administration) engaged in defining the pilot solutions, as illustrated in Figure 17. These challenges were compounded by three main (often unexpected) events like: **1) the ongoing COVID-19 pandemic, 2) the economic uncertainties and inflation arising from the Ukraine-Russia conflict, 3) the upcoming local elections** in the Lucca municipality in June 2022. All the three aspects impressed fluctuations in this crucial phase with continuous negotiations, emerging frustrations, and the risk of resistance along the process of change, introducing further complexity, and impacting the project timeline and dynamics when stakeholder alignment was crucial to accelerating change.

Existing solutions	<p>Area for human-animal activities (mainly small places in the peripheral areas)</p> <hr/> <p>Corridors for biodiversity valorisation (existing intervention around the walls, in Serchio park area), Participatory mapping exercises</p> <hr/> <p>Participatory activities on food (process for urban food planning installed)</p>
Available spaces	<p>Owned and managed by municipality and not yet covered by other using plans</p> <hr/> <p>Selection and links logically coherent with the IN-HABIT & hum-animal idea</p>
Main focus	<p>Elders, youngsters, families, and vulnerable groups</p> <hr/> <p>Tourism & economic sector</p>
Potential pilots	<p>Hard VIS: relational areas and Animal Lines</p> <hr/> <p>Soft VIS: AAI, Pet Care services, education, board game, events, Chart of services</p>

Figure 17. Co-design process in Lucca IN-HABIT. (elaboration from the authors)

Beyond the initial uncontrolled phases, political cycles can often accelerate topics deemed politically advantageous. This was not the case in Lucca, where discussions on the hum-animal concept were still in their early stages and perceived as politically sensitive by one of the mayoral candidates (who later assumed office following the IN-HABIT project). As a result, the participatory process and its potential outcomes experienced a slowdown. The election led to a change in administration, with a complete turnover of councillors and some technical staff responsible for key intervention areas.

During this phase, trust, alignment, and the accumulation of evidence were key to consolidating the process and fostering

dialogue among stakeholders. Unexpected events and political developments could have a significant slowing effect on the change process.

Main results during this phase: **2a)** political/institutional processes have a strong impact on change initiatives, particularly when associated with political turnover, which introduces new organizational structures, actors, and the need to rebuild trust among all parties involved; **2b)** in



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PAR, political and societal dynamics can influence the process, potentially limiting outcomes while simultaneously testing the resilience of the process under conditions of instability; **2c)** despite its nonlinear and challenging nature, the transformation process can progress from uncertainty toward increasing commitment; **2d)** the political stress-test heightened attention to the hum-animal urban concept and reinforced recognition of its value.

3.2.4. Reorganisation of a new political cycle, co-deployment phase and trust building

This phase can be traced back to the reorganization of the new municipal administration in October–November 2022. Under the renewed organizational framework, the project resumed its transformative trajectory by consolidating previous achievements and initiating the co-deployment phase of pilot initiatives, as illustrated in Figure 18.

The organization of the **Lucca city visit** with all IN-HABIT partners represented both the first opportunity for in-person interaction and a key moment to engage the newly elected municipal administration within the IN-HUB. The

municipality's new technical staff received **clear political endorsement from the councillor** responsible for the IN-HABIT project (Councillor for the Environment). Moreover, improved **dialogue between councillors and technical staff** facilitated the co-deployment of several **pilots** across different intervention areas, including social services, education, public urban planning, and project management. The preparation of the city visit increased participation, commitment, and shared understanding of the project's trajectory, contributing significantly to translating the human-animal city concept into a concrete and operational reality.

Co-deployment of innovative services: in Lucca.

Following the initial participatory **co-design** work of the ideas within the IN-HUB, the process moved to an institutional phase, where the Municipality of Lucca launched public calls for proposals. These calls were aimed at selecting qualified associations (in the case of AAI also properly trained according to the National Guidelines on AAI) capable of implementing the services in line with the co-designed objectives. This led to **co-deploy innovative services** in close partnership with the selected NGOs, adhering to the Italian legal framework on *co-design with third sector organisations* ("co-progettazione con il Terzo Settore", in accordance with Article 55 of Legislative Decree No. 117/2017). This methodology, which integrates public procurement mechanisms with participatory governance tools, represents a significant innovation in the field of urban regeneration and social services. It not only ensures that service implementation is rooted in local needs and values - as identified during the IN-HUB process - but also fosters long-term collaboration between public administrations and civil society actors. Such an approach exemplifies a shift toward inclusive, sustainable, and social innovation, where beneficiaries are not merely passive recipients but active contributors to the creation and governance of services.



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AAI for elders	Meetings with local nursing homes institutions and social workers Municipality call for co-deployment with authorised NGOs Co-deployment activities of Municipalities with selected authorised NGOs, and nursing homes staff, with UNIFI support
Educational activities	Co-deployment with school directions, municipality, LuccaCrea, UNIFI, Design for change Educational participatory activities within university courses and course reformulation
“City Pets” board game	Co-deployment with LuccaCrea, UNIFI, skilled professionals, Beta test with university students Gaming activities planning with schools and events
Events	Co-deployment with Municipality, LuccaCrea and UNIFI of various events with local NGOs, cultural associations and in association with running initiatives (e.g. Murabilia, Lucca Comics)
Economic activities	Co-deployment with B4B and organisation of diverse editions Pet friendly tourism initiatives

Participatory activities across different areas of interest were consistently supported by smaller meetings and plenary sessions within the IN-HUB. In parallel, the participatory process was accompanied by an institutional process, as outlined in Table 16, which details the main formal acts issued by the Municipality of Lucca.

Figure 18. Co-deployment process in Lucca IN-HABIT. (elaboration from the authors)

Table 16. Details of activities and municipal acts. (elaboration from the authors)

Act	Content
<i>Municipal Council Resolution No. 129 of 23 June 2020</i>	Acknowledgement of the granted funding and mandate given to the Mayor, Prof. Alessandro Tambellini, to sign the Consortium Agreement.
<i>Determination No. 2495 of 18/12/2020</i>	Award of the technical service for the feasibility, final, and executive design of the European project “IN-HABIT – Human Animal City” to Arch. Moretti.
<i>Determination No. 2678 of 29/12/2020</i>	Award to Simurg of the service for the organisation and management of the project’s participatory processes
<i>Determination No. 1276 of 20/06/2022</i>	Award of works “Project for the creation of Animal Lines and Relational Areas – IN-HABIT – Infrastructures” through a negotiated procedure without prior call for tenders pursuant to Art. 63 of Legislative Decree 50/2016, as amended, and Art. 1(2) of Decree-Law 76/2020.
<i>Determination No. 2689 of 13/12/2022</i>	Approval of the public notice reserved for Third Sector entities for the submission of expressions of interest aimed at the co-deployment of pet therapy interventions in municipal nursing homes and allocation of funding.
<i>Determination No. 2648 of 09/12/2022</i>	IN-HABIT project funded by the European Union. Approval of the public notice reserved for Third Sector entities for the submission of expressions of interest aimed at the co-deployment of interventions in favour of elderly and/or disabled residents within the municipal territory who are temporarily unable or have difficulty caring for their pet.
<i>Determination No. 1226 of 03/06/2024</i>	Monitoring, support, and promotion activities for the enhancement of the two relationship areas. Grant of financial contribution pursuant to Art. 16 of Municipal Council Decision No. 2 of 08/01/2019 and subsequent amendments, “General Regulation for the Granting of Contributions and Economic Benefits to Individuals and Public and Private Entities.” CUP J69J24000560006 – CIG B1B264F52.



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Main results: During this 3rd phase, a new organizational setup at the municipal level, together with renewed dialogue among WP3 partners, enabled the project to restart following the political transition. Within the new political framework, the project re-engaged local stakeholders and resumed the co-deployment of pilots through more targeted initiatives.

Lessons learnt during this phase: **3a)** change processes may follow different trajectories depending on the political actors involved, **3b)** clear political endorsement facilitates technical engagement throughout the process, **3c)** participatory activities may be enabled or constrained depending on political orientation.

3.2.5. The co-management of pilot initiatives and the emerge of A-NBS evidence

The co-management of **pilot initiatives** across different areas of urban life began to demonstrate the potential impacts of **A-NBS**. Relational areas became increasingly frequented and recognized by a growing number of citizens. *Events, educational activities, and the board game* successfully **engaged broader segments of Lucca's population**, further embedding the project's objectives. **AAIs** provided clear evidence of the inclusive and well-being effects of human-animal bonds. The organization of **Pet Care services**, promotion of the **app**, development of a **Chart of services**, and initiatives related to **economic development and pet-friendly tourism** all contributed to a clearer understanding of the potential of A-NBS and the feasibility of an IHAUP.

Project visibility was reinforced through **positive coverage** in local and national newspapers, enhancing public awareness, engagement, political recognition, and stakeholder pride. Scientific dissemination (including peer-reviewed publications, conference and seminar presentations, and poster sessions) further supported the formalization and clarification of the A-NBS approach and the hum-animal city concept.

Main results during this phase: During the 4th phase, evidence emerging from the initiatives, together with a mirroring effect among citizens, policymakers, and the media, fostered greater understanding and awareness of the potential of A-NBS to support IHW.

Lessons learnt during this phase: **4a)** the change process entered an incremental phase in which evidence from the pilots could inform broader reflection among the actors involved, **4b)** the co-deployment of a cross-cutting approach such as the IHAUP carries the risk of generating isolated initiatives that may not converge into a coherent policy framework, depending on political, participatory, and contextual factors, **4c)** time, commitment, and the ability to connect individual pilot initiatives with the broader transformation pathway are critical to achieving lasting success.



3.2.6. The conclusive phase of the Lucca IN-HABIT project

The final activities of the Lucca project focused on both organizing specific events to engage local stakeholders and citizens, and on institutional arrangements to finalize the IHAUP.

A concluding event, held in one of the relational areas in July 2025, attracted a substantial number of participants, including youngsters from summer camps engaged with the “City Pets” board game, visitors to the relational areas and the Animal Lines, representatives of local associations, service managers, municipal staff, and project partners. The event provided a **platform for citizens to express** their evaluations and appreciation of the IN-HABIT project’s achievements, fostering open dialogue and inviting suggestions for future enhancements.

The presence of the councillor responsible for the project facilitated **direct interaction between pilot users and the administration, reinforcing political endorsement** of IN-HABIT activities and laying the groundwork for future improvements and the project’s lasting legacy in Lucca.

A significant insight emerged from comparing the outcomes of the initial **focus group** with those of the most recent session conducted in July 2025 (see Chapter 3.11 for details). The second focus group included participants from the first session as well as additional stakeholders engaged or affected by the project. **Discussions focused on perceptions of the human-animal city concept and its potential impact on inclusive health and well-being.** Participants provided overwhelmingly **positive feedback** regarding the results achieved, the **potential for upscaling** within and beyond Lucca, and the effectiveness of the initiatives. They also recognized and valued the sustained efforts throughout the project to build, test, share, and reflect on the A-NBS approach and the concept of a human-animal city.

Main results from the phase: Discussions during the final focus group, together with feedback collected from participants at the concluding event and users of the services, revealed a clear and consistent message: **citizens expressed pride in Lucca’s participation in the IN-HABIT experiment.** Some visitors even came from outside the city specifically to experience the pilot activities, and tourists frequently praised the relational areas. Residents increasingly saw themselves as contributors to an innovative shift in human-animal relationships, a topic of growing societal relevance. Key aspects include: **5a)** As often observed in successful transformation processes, *a positive feedback loop emerged: the city’s concrete actions generated visible results, which shaped public perceptions, were amplified through communication, and reinforced by stakeholder reactions,* **5b)** This **virtuous cycle** continues to enhance the visibility and legitimacy of the **hum-animal city concept, A-NBS,** and their **contributions to IHW in the city,** **5c)** the lifespan of a project represents only one phase within a longer trajectory toward a fully implemented IHAUP, given the large number of actors involved across both local society and institutional structures, **5d)** the challenges encountered in project management have created a supportive track for the ongoing change process, whose



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sustainability depends on continued direct engagement from municipal actors responsible for its governance.

3.2.7 Upscaling and sustainability of the Lucca IN-HABIT project

The partial success of the Lucca human-animal city concept has naturally generated **rising expectations**. Stakeholders expressed concern about the **potential discontinuation** of key services developed under the IN-HABIT project, such as AAls, educational programs, and Pet Care services, once the project concludes. At the same time, **citizens increasingly demonstrated a willingness to contribute to the upscaling of these initiatives** and to **support the maintenance of hard VIS** implemented across the city. Within the **municipal administration**, this commitment is now reinforced by **positive political feedback, driven by citizen engagement** and growing attention to the topic. The Municipality of Lucca has finalized its chart of principles, secured funding to maintain Pet Care services for the next 2 years, and committed to sustaining the hard VIS through the public green office. Additionally, a manual provides guidance for developing a comprehensive hum-animal strategy and action plan. Beyond Lucca, certain pilot initiatives (such as AAls and educational activities) have been upscaled and replicated in other areas, primarily leveraging existing local resources rather than dedicated funding.

Main results from the upscaling phase: There is scope for continued citizen participation within an arena focused on the hum-animal IN-HABIT project. Such a structure could sustain citizen engagement, foster new initiatives, and **encourage the municipal administration to maintain and expand activities beyond the project's formal conclusion**. In addition to the potential outcomes of A-NBS, the IN-HABIT project highlighted several considerations: **6a) resources to sustain key services** beyond the project will need to be integrated into the **municipality's ordinary budgets**, **6b) political and funding integration involves multiple departments in the context of an integrated hum-animal urban policy**, including *social services* (for AAls and Pet Care services), *education* (for school-based activities), *public buildings and environment* (for maintenance and upscaling of relational areas and Animal Lines), as well as *economic activities and tourism* (for pet-friendly initiatives), **6c) the upscaling process demonstrated the real potential to mobilize existing funds and resources across various institutions and actors within the framework of a hum-animal city policy**, **6d) this internal resource mobilization is supported not only by positive evidence from A-NBS but also by visible citizen advocacy** through the IN-HUB, reflecting recognition of the added value of the human-animal concept for Lucca's everyday life and urban identity.

3.2.8 Participatory action research in the processes of change



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Through its participatory action research approach, the IN-HABIT project embedded researchers within the “black box” of decision-making, providing in-depth insights into both the enabling factors and the challenges of transformative change. The project’s funding model supported hands-on, practice-based mobilization of innovative resources (such as animals as NBS within the hum-animal city of Lucca) while structured evaluations were conducted both ex-ante and ex-post.

Methodology

To provide clearer evidence of the process, the researchers developed an internal evaluation framework covering both the institutional and participatory dimensions. This framework was organized according to the main indicators and evaluation metrics presented in Table 17.

Each of the five researchers assigned a score to the various project steps based on selected key themes and a detailed scoring scale. The individual scores were then averaged and are presented in Table 18 and Figure 19.

Table 17. Evaluation metric for the institutional process. (elaboration from the authors)

Institutional process	
1. Knowledge and Awareness	
1.	Few or no understanding of the diverse components of the more than human perspective and of the existing suitable solutions and norms
2.	A sufficient understanding of some of the more than human components and solutions
3.	Availability of a good picture of the potential outcomes emerging from a more than human perspective although not from all the possible dimensions
4.	Complete knowledge about potential opportunities and evidence
2. Implementation and policy capacity (Political engagement and feasibility)	
1.	perception of high political risks related to a more than human perspective
2.	Low level of appreciation of the potential political rewards emerging from a hum-animal perspective
3.	Perception of the political potential of a more than human perspective
4.	Willingness to actively act in a more than human perspective (at least in some areas)
3. Participation & mediation	
1.	Low level of interest for participatory processes (the risks of lack of control prevail)
2.	Openness’s to some potential participatory consultative spaces but with very high attention to potential interferences
3.	Good level of openness’s in co-design activities
4.	High level of participatory involvement of local stakeholders in all the decisional and management cycle
4. Integration of relevant policy domains	
1.	Main focus on specific and sectoral interventions
2.	attention on few and limited integrations among city policies
3.	Ability in opening interconnection on one specific area of intervention in a more than human perspective (wild and biodiversity/ or food producing animals /or companion animal as public goods
4.	High level of integration of municipality policies in a global more than human perspective
5. Level of hum-animal integration	
1.	No attention on a more than hum-animal perspective
2.	Attention on few components mainly in a traditional way
3.	Attention on more components and to innovative solutions
4.	High level of pro-active attention on innovative & integrated more than human approaches
6.Regulatory & planning engagement	
1.	Very few existing and applied regulatory activities & planning in a more-than-human perspective
2.	Application of specific and sectoral regulatory activities with few influences on urban planning
3.	Good attention to regulatory and planning activities although in a not totally connected and embedded way
4.	High level of integration of regulatory plans and urban planning in a more than human perspective



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The data provide evidence of the progressive engagement of both the institution and stakeholders throughout the process for the selected key themes. Additionally, the discontinuity observed during the electoral phase highlighted its clear impact on the evolution of the change process.

Table 18. Evaluation of the institutional change during the PAR. (elaboration from the authors)

Institutional involvement	1. Knowledge and awareness	2. Implementation and policy capacity (Political engagement and feasibility)	3. Participation & mediation	4. Integration of relevant policy domains	5. Level of humanimal perspective (wild, food-producing, companion animals in a public perspective)	6. Regulatory & planning
stage 0 kick off	1,29	2,29	2,43	1,29	1,57	1,29
stage 1 electoral phase	2,43	2,71	2,43	2,00	2,71	2,43
stage 2 after vote	1,71	2,29	2,00	1,43	1,86	1,71
stage 3 reorganisation of the political frame	2,43	3,00	2,57	2,14	2,57	2,43
stage 4 by the end of the project	2,86	3,29	2,86	3,00	3,14	2,86

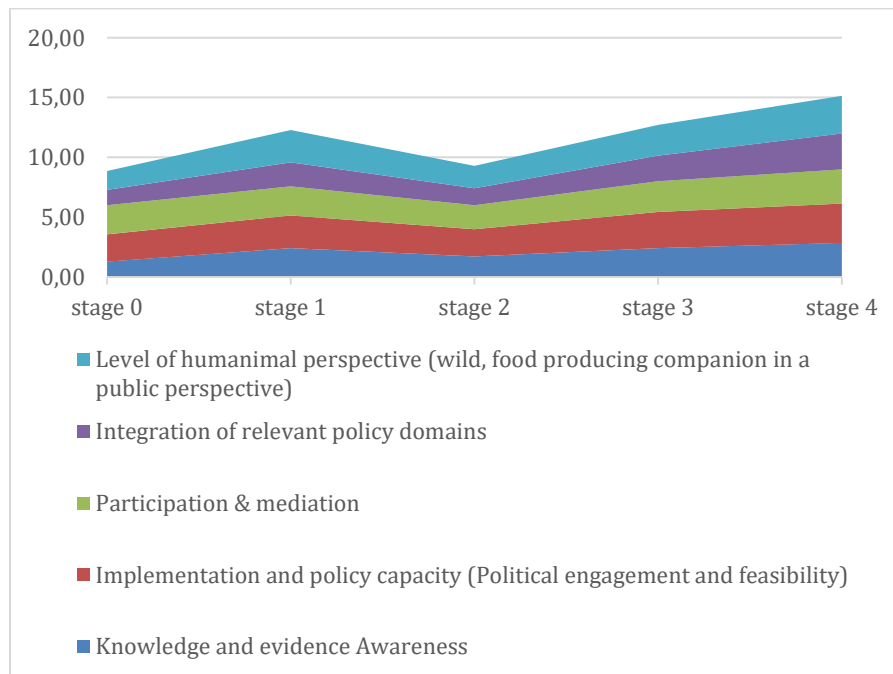


Figure 19. Institutional process of change in Lucca IN-HABIT. (elaboration from the authors)



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Main results: key **messages** from the transformation process can be summarized as follows: **7a) small and medium-sized cities can intentionally mobilize unconventional resources**, such as **A-NBS** in the case of Lucca, if they act proactively, follow a structured mid- to long-term pathway, and ensure continuous support and coordination, **7b) sustained attention throughout the process is essential**, particularly during the inevitable up and downs of a transformative journey. Based on the Lucca experience, several measures are recommended for cities seeking to upscale the hum-animal concept and secure long-term commitment: **7c) introduce an urban pet policy manager** to oversee the process, coordinate between councillors, technical staff, and the IN-HUB, maintain engagement, and ensure continuity, **7d) develop a “Chart of intentions/principles”** to capture the core values of the hum-animal city concept and guide future activities, **7e) draft a strategic paper and action plan** to formalize the project’s legacy and outline next steps for scaling and sustainability, **7f) These recommendations draw on lessons learned from the IN-HABIT project in Lucca and have been codified into manuals, templates, and guidance for other cities interested in replicating or upscaling the approach and outcomes, 7g) municipalities, like other institutions, are often structured around established routines and institutional frameworks**, which can slow or resist innovation. In this context, a **feedback loop between visionary concepts and tangible pilot results** proved essential in securing **political acceptance**, particularly in the early phases of the process, **7h) mobilizing local stakeholders** proved challenging in the early stages, as observed in several Lucca activities. However, engagement increased significantly as the benefits of the tested solutions became tangible, showing that even hesitant actors can be drawn into a positive feedback cycle when impact is visible and innovation is communicated accessibly, **7i) the transformation process** successfully defined and codified a replicable and scalable concept (the **hum-animal city and A-NBS**) which is already expanding: locally, through continued activities in Lucca; regionally, with new implementations in other settings such as nursing homes in the Pisa area and some prisons in Pisa and Livorno; and nationally and internationally, through scientific dissemination, participation in European clusters, and alignment with sister projects.

3.3. The participatory process and outcomes

As already explained in the previous chapter and in D3.3, the participatory process was structured following the principles of PAR, supported by the theoretical framework of Transition Management. To support this approach, a range of tailored facilitation tools were developed in collaboration with transversal partners (Design for Change and Tesserae). These tools played a crucial role in enabling inclusive and structured engagement throughout the process.



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A dedicated effort was made to progressively expand the range of stakeholders involved in the city’s strategic project, following the process described in the previous chapter and despite challenges such as the COVID-19 pandemic and the electoral phase. The cross-cutting relevance of the hum-animal topic in Lucca led to the involvement of a wide variety of public and private actors, reflecting the diversity of themes addressed. The heterogeneity of stakeholders also required the use of varied methods, pathways, and solutions, tailored to their levels of awareness, engagement, and availability.

A dynamic **stakeholder map** was created at the outset and continuously updated as the initiative progressed (Figure 20), incorporating inputs gathered during both online (mainly at the beginning of the project during pandemic situation) and in-person participatory sessions. Specific facilitation techniques were employed in these sessions to maximise the quality and effectiveness of the outcomes, ensuring that diverse perspectives were represented and actively integrated into the process.

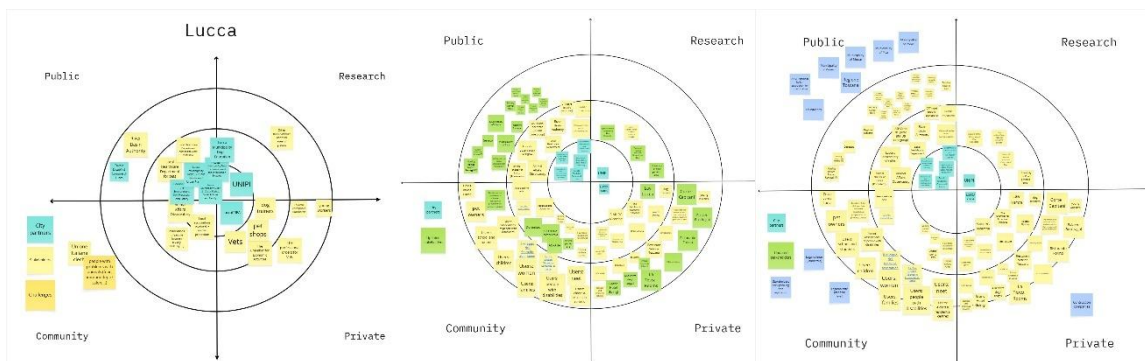


Figure 20. Lucca’s stakeholder map in 11/2020 (left), 03/2024 (middle) and 06/2025 (right)



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Methodology

A central element of this effort was the evolving **stakeholder mapping process**, designed to progressively involve a diverse range of public and private actors and align them with the project's objectives. This mapping was dynamic, continuously updated to capture the expanding network of participants and the evolution of their engagement over time. Stakeholder mapping proved to be a crucial strategic tool, enabling the WP3 team to identify key actors, understand their roles and interests, and prioritize engagement efforts. It also supported the design of tailored participation approaches, ensuring that each stakeholder group could contribute meaningfully according to their expertise and concerns. In a complex urban context, the mapping served as a diagnostic instrument, helping to anticipate potential conflicts (such as animal waste in public spaces, noise disturbances, or perceived misuse of shared green areas) and to monitor shifts in stakeholders' perspectives throughout the process.

Complementing the mapping, a **qualitative assessment** of stakeholder perspectives was conducted through targeted interviews and structured conversations. These interactions provided valuable insights into expectations, concerns, and potential contributions, enhancing the understanding of the project's social and political context.

As part of the PAR process, researchers also evaluated the stakeholder involvement process using a specific metric, as presented in Table 19. The individual scores were then averaged and are presented in Table 20 and Figure 21.

The **evolution of the IN-HUB** activities has been characterised by a high degree of adaptability, to respond in a flexible way to the sequential phases of the project as well as to emerging contextual changes. At the outset, the mapping exercise identified a wide spectrum of actors spanning the public, private, research, and community domains. Public institutions such as the Municipality of Lucca (partner of the project) and its various departments, Tuscany Region, and the River Basin Authority were particularly central in setting the initial framework (Stakeholder Map of 11/2020). Alongside them, the University of Pisa, as a research actor and partner of the project, provided scientific grounding, while local associations, user groups (children, families, people with disabilities, elderly residents), and cultural

organizations ensured that community perspectives were incorporated from the very beginning. Private stakeholders - such as veterinary professionals, pet shops, and operators from the hospitality sector - were also involved in the early discussions.



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Table 19. Evaluation metric for the stakeholders' involvement process. (elaboration from the authors)

Stakeholders' engagement
1-Knowledge and Awareness
<ol style="list-style-type: none"> 1. Few or no understanding of the diverse components of the more than human perspective and of the existing suitable solutions and norms. Attachment to specific attitudes and routines according to the entry points 2. A started understanding of some of the more than human components and solutions 3. Building a good picture of the potential outcomes emerging from a more than human perspective although not from all the possible dimensions 4. Large knowledge about potential opportunities and evidence
2-Participation & mediation
<ol style="list-style-type: none"> 1. Low level of interest/attitudes/engagement in participatory processes 2. Openness to some potential participatory consultative spaces but with low expectations 3. Good level of interest in co-designing activities 4. Active level of participatory involvement of local stakeholders in all the decisional and management cycle
3-Level of hum-animal integration
<ol style="list-style-type: none"> 1. No attention on a more than human perspective, attachment to specific entry points (protection/animal care/ environment) 2. Attention to open interest on some components 3. Interest for broader components/integration and to innovative solutions 4. High level of pro-active attention on innovative & integrated more than human approaches
4-Political engagement
<ol style="list-style-type: none"> 1. Political engagement is not an option to achieve specific interests 2. Claiming attention is a way to start solving specific issues relevant to the stakeholders 3. Building a political space can be supportive for further development of a hum-animal perspective 4. Pro-active participation is key to affirm and to support a process of innovation in a more than human perspective
5-Regulatory & planning
<ol style="list-style-type: none"> 1. Stakeholders don't think they can have an influence on existing rules and procedures 2. Stakeholders belief that they can try but complexity is far from their power of influence 3. Stakeholders believe that by participating and lobbying some innovative aspects can be achieved although in the medium/long term 4. There is the space for a new regulatory and planning approach that can be achieved in a participatory way



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In the subsequent **co-design phase**, the engagement process was deepened through thematic focus groups and participatory workshops. Here, after an internal process of participation inside the administration held by Pisa University, different branches of the municipal administration (environment, education, social affairs, urban planning) worked closely with citizens' associations, schools, NGOs active in disability and animal welfare, and local cultural actors (Stakeholder Map of 03/2024). Research institutions facilitated the translation of ideas into structured proposals, while private actors explored the opportunities of the project's hum-animal vision.

Finally, during the **co-deployment and monitoring phase** (Stakeholder Map of 06/2025), stakeholder involvement was oriented towards the practical implementation, co-management, and evaluation of the single pilot initiatives. Public institutions and municipal services provided institutional support and oversight, while research actors, particularly the University of Pisa, coordinated monitoring and evaluation activities.

During the **co-management phase** NGOs and community associations assumed direct responsibility for service delivery, ensuring continuity with the co-designed objectives, while private actors contributed through their participation in

tourism, hospitality, and pet-related services. Citizens themselves, including pet owners and vulnerable user groups, played an active role both as beneficiaries and as contributors to the monitoring of relational areas and services. In the **upscaling activities**, different stakeholders from other cities (i.e. Municipality of Pisa, Pesaro, Massa, Rome) were included. By engaging actors not directly involved in the initial co-design but strategically important for the

Narrative and discourses along the participatory process

Throughout the participatory process, discussions formed an evolving internal narrative, shaped by the collective knowledge built around the hum-animal concept.

The discourse began from a **broad perspective**: exploring the **role of animals in urban environments** (*wild, food producing, companion*), their potential to **provide both private and public goods** for local citizens particularly vulnerable groups, as well as key challenges in **urban animal management** and the **expectations** emerging from the hum-animal idea.

Subsequent discussions focused on identifying **potential A-NBS ideas and solutions** to be implemented in Lucca. These included innovative physical interventions (**Hard VIS**), such as Animal Lines and relational areas, as well as the definition of **target groups** and complementary **soft VIS** (*AAIs, Pet care, educational activities, gaming, events, economic initiatives and pet friendly tourism*) through which these solutions could be effectively introduced.

The dialogue also addressed clarification of the project's overarching objectives and unpacked its broader implications, particularly regarding strategy and governance.

A structured, stepwise, and progressively complex dialogue proved instrumental in shaping key decisions related to the **participatory process**, including the design of stakeholder engagement mechanisms and the coordination of co-creation activities supporting both tangible and intangible outcomes throughout the project's lifecycle.

All activities and their outcomes were regularly **communicated and disseminated** through multiple channels (Lucca IN-HABIT website, social media -Facebook and Instagram-, emails, WhatsApp, ecc) ensuring transparency and continuous stakeholder engagement.

Furthermore, selected phases of the participatory process - collection, discussion, and organisation of ideas and opportunities - actively involved university students at both undergraduate and postgraduate (master's) levels. Their contributions provided valuable perspectives and creative proposals, enriching the overall co-creation dynamic and fostering intergenerational dialogue within the project.



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dissemination and upscaling of the hum-animal approach, the process moved from a local pilot perspective toward the construction of a wider policy standpoint.

By the end of the project, approximately 150 stakeholders had been directly involved in participatory activities, in addition to the direct beneficiaries of the piloted initiatives.

A variety of **participatory formats** were implemented, including plenary meetings, thematic working groups, and focus group discussions. These formats facilitated the active involvement of both public and private local stakeholders and enabled deeper explorations of specific thematic areas.

In the Lucca case, the IN-HUB served as the project's central transition management arena to facilitate the necessary cultural transformation concerning Animal-Nature Based Solutions (A-NBS).

Table 20. Evaluation of the stakeholders' involvement during the PAR. (elaboration from the authors)

Stakeholders' involvement	1-Knowledge and awareness	2-Participation & mediation	3-Level of hum-animal integration	4-Political engagement	5-Regulatory & planning
stage 0 kick off	1,43	2,29	1,86	2,00	2,00
stage 1 electoral phase	2,29	3,14	2,71	2,86	3,14
stage 2 after vote	2,00	2,29	2,57	2,29	2,57
stage 3 reorganisation of the political frame	2,71	1,86	2,71	2,71	2,71
stage 4 by the end of the project	3,57	3,14	3,43	2,86	3,14

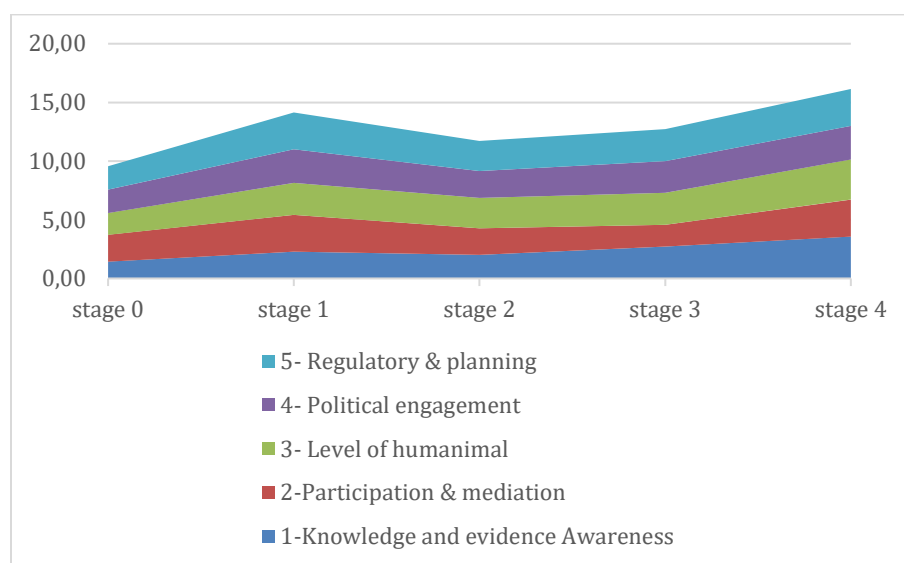


Figure 21. Stakeholders' process of change in Lucca IN-HABIT. (elaboration from the authors)



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Main results: due to the transversal nature of the hum-animal concept, the participatory process can be summarized in three main components: the general discussion around the human-animal idea, its challenges, potentials, and limits; and the discussion related to specific pilot initiatives. **A)** The first component can be organized into two parallel streams: one involving key city stakeholders, and the other engaging the municipality’s technical and political actors, **B)** in designing the IHAUP, it is crucial that these two streams progress in parallel, allowing ideas to be translated into practical interventions and, conversely, practical evidence to reinforce the participatory process, **C)** participation has inherent political implications, which become more evident when new topics are debated and carry potential risks. In this context, a combination of political will and a risk-taking attitude is essential to enable proactive, sustained, and effective participation along the transition pathway, **D)** transformative processes are time- and resource-intensive, requiring significant human effort and support, **E)** throughout the process, it is essential to maintain overarching goals, facilitate the convergence of visions, and remain open to incorporating new suggestions and perspectives, **F)** participation and the sense of responsibility increase as tangible results begin to emerge, **G)** translating participation into more structured and institutionalized forms is critical for long-term sustainability and requires ongoing political openness.

3.4. Monitoring of Hard VIS (platform, interviews)

In the Lucca case, the Hard VIS were implemented from the outset of the project, emerging directly from IN-HUB discussions. These installations encompassed the development of two

Methodology

These pathways were supported by the app developed by Book On a Tree in collaboration with Lucca Crea, incorporating gamification elements.

Additionally, a comprehensive monitoring system was implemented using a dedicated tool developed by Grayhats, which recorded pedestrian traffic near the relational areas through mobile phone cell data analysis. Data were collected every ten minutes and stored in a database for further processing. Available data, covering the period from May 14 to August 4, were analysed by day and timeslot and are presented in the dedicated results chapter.

From a qualitative perspective, in-person interviews and online questionnaires were conducted with area users at different stages of the project to collect information on both usage patterns and perceptions of the spaces, as well as feedback from participants. Complementary insights were obtained through monitoring a dedicated WhatsApp group organized by users of these areas. Furthermore, a specific survey with 34 respondents was conducted to better understand expectations and usage of Lucca’s green areas among pet owners. This survey was administered through direct interviews and online collection via a QR code linked to a dedicated form.

designated “relational areas”, providing spaces for individuals and their companion animals to engage in free play, activities, and social interaction. Concurrently, 15 km of "Animal Lines" were released on existing spaces and paths that link the Serchio River Park with the ancient walls circle and the Nottolini aqueduct, offering dedicated paths for walking, running, and



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fostering human-animal bonds, as well as social connections among people. The Animal Lines and the relational areas are well used since they were accomplished and inaugurated in 2023. As anticipated the monitoring of their use has been carried out through different methods indicated in the methodological frame.

3.4.1 Monitoring the use of the areas with ITC

The quantitative methods relied on data collected by the digital platform provided by the new project partner, Grayhats, which succeeded the previous partner that was unable to support the Lucca project. Quantitative data collection began relatively late, in May 2025, following the selection and installation of sensors near the hard VIS areas. Consequently, the data provide only a partial view of visitor attendance in the relational areas and require further analysis and valorisation. Figure 22 illustrates both the stable weekly frequency of visitors in the relational area and the upward trend observed in recent months, particularly during specific events organized in these spaces.

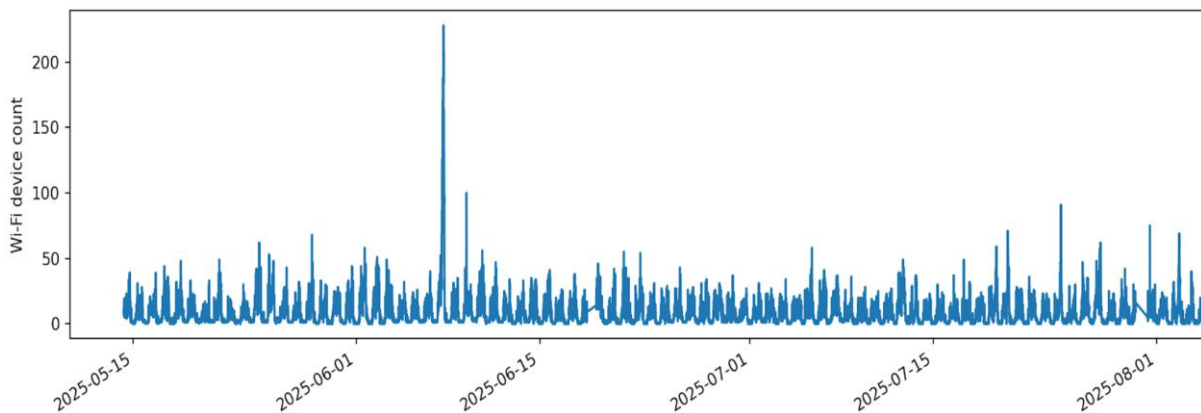


Figure 22. Daily visitor data collected by the platform (sum of the people registered in the relational area by day by the platform every ten minutes). (Elaboration from Grayhats)

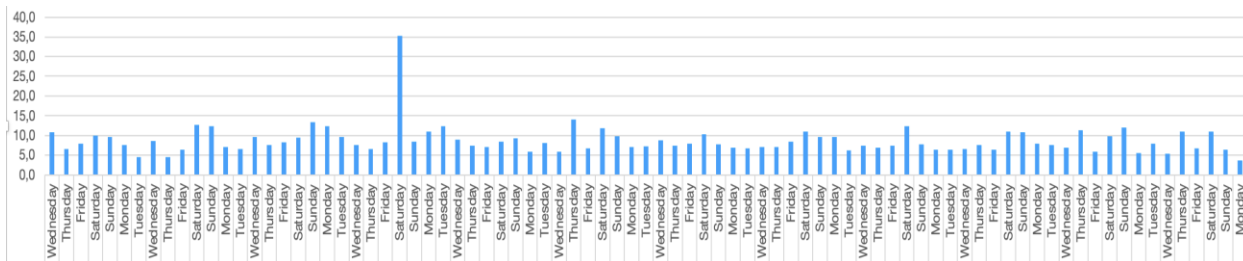


Figure 23. By day average visitor, data collected by the platform. (elaboration from the authors)



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Figure 23 presents the average number of people recorded by the platform every ten minutes throughout the weeks. As shown, visitor numbers typically peak on weekends, although weather conditions can influence the recorded data. The highest peak corresponds to a specific event organized by the IN-HABIT project on Saturday, June 7.

Table 21 reports the average presence of visitors in the relational areas by day and time slot. On average, 8.7 people use the areas across all days, with the highest attendance observed on Saturday afternoons (31.5 people on average across all Saturdays), followed by Sunday afternoons (24.6). The availability of free time allows dog owners to spend more time in the areas, enjoy activities with their pets, and interact with other visitors for longer periods. Saturdays generally show higher engagement across all time slots, as also reflected in the daily averages. Nonetheless, except for nighttime and late afternoon, the areas consistently host more than 10 people on average across most days and time slots.

Table 21. Distribution of the visitors in the relational areas by day and timeslot (average of people registered in the area - check every ten minutes). (elaboration from the authors)

Day/time slot	night (21:30-04:59)	early (05:00-08:59)	first morning (09:00-11:29)	late morning (11:30-13:59)	first afternoon (14:00-17:59)	late afternoon (18:00-21:29)	Average by day
Monday	1,2	8,8	13,3	11,4	16,0	6,6	7,8
Tuesday	1,3	10,8	10,0	9,9	14,7	5,9	7,6
Wednesday	1,4	9,5	9,7	9,2	18,0	6,3	7,9
Thursday	1,3	10,8	10,8	9,9	15,5	5,4	7,9
Friday	1,5	9,1	10,3	9,3	13,7	6,6	7,2
Saturday	1,5	14,4	16,7	14,5	31,5	9,5	12,7
Sunday	1,1	10,0	13,7	11,0	24,6	7,3	9,7
Average by slot	1,3	10,5	12,1	10,8	19,3	6,8	8,7

3.4.2 Monitoring by personal interviewing

Concerning qualitative monitoring, the in-person interviews and online questionnaires conducted with area users allowed us to collect data on people frequenting the areas, on the perception that people have on their use, as well as their feedback.

In-person interviews have been carried out during specific spot visits to the areas as well as during events organized there with the presence of dog owners. The analysis of the collected data identified 4 key themes:

- **Awareness and Discovery of the Areas**

A recurring theme in participant responses is the **informal nature of the relational areas**, indeed most people did not hear about the project through formal or institutional channels.



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Rather, **word-of-mouth and direct observation** were the primary means of awareness of the areas. For instance, one person (a 60+ woman with a small size dog) recalled:

“I found out from a lady in another park who told me there are fenced areas where dogs can be off-leash”, while others stated they “passed by during the construction works” or simply lived nearby and saw the building process going on.

As it often happens with citizens, despite the dissemination of information about the IN-HABIT project through media channels and on-site signage within the designated areas, there tends to be limited engagement with the broader objectives of the initiative. *People often benefit from the project's outcomes without necessarily being aware of, or actively engaging with, the full scope of the opportunities it offers to the community.* In some cases, indeed, people were not aware that relational areas were part of a larger European project involving academic institutions. Thus indicating still a gap in public communication about the initiative and how difficult it is to reach the citizens today in front of a massive media communication channel. This points to a need for improved outreach strategies in future implementations, especially for maximizing community engagement.

- **Frequency use of the areas**

Use of the relational areas is **both regular and highly appreciated** by the dog handlers. Most dog owners indicated **daily or near-daily visits**, one person even stated:

“We usually go at least once a day... sometimes even two or three times”.

People reported their duration of visits to the areas is flexible, depending on time availability (i.e. work commitments, etc) and **social dynamics created** among both humans and dogs. An interesting data resulted from a person clearly stating that the presence of specific dogs or people often extends their stay

“Sometimes we think we’re leaving, and then a friend’s dog shows up, so we stay a bit longer” (a woman around 40 y.o. with a large size dog).

The areas are described from the interviewed **not merely as functional spaces for walking dogs, but as multifunctional social environments**, providing outlets for dogs’ energy and opportunities for **human recreation**, as from the beginning they have been conceived. Several people noted how their dogs' behaviours at home improved after visits, becoming calmer and more relaxed, underscoring the functional and emotional benefits of these spaces

- **Interpersonal relationships**



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One of the most significant findings - as it was one of the central objectives of the areas - is the emergence of **new social relationships and sometimes friendships** facilitated by the shared space and activity. While some people engaged in more limited interactions

"I just make sure my dog doesn't get into trouble and exchange a few words"

others reported deep friendships forming:

"She and I met here, and it feels like I've known her forever" (two women - one about 30 y.o. and the other between 40 and 50 y.o. - with two medium size dogs).

The relational dynamic extended beyond the relational area itself, with people organizing **group walks, shared meals, WhatsApp chats, and even cultural exchanges**:

"I wrote a book, and now friends from the park are reading it" (a woman between 40 and 50 y.o. - with a medium size dog).

For several people, the dog area became a **primary site of socialization**, particularly valuable for those who previously experienced isolation:

"I didn't use to go out much. Now I socialize, and it's beautiful" (a woman between 40 and 50 y.o. - with a medium size dog).

And a retired man with a medium size dog, added:

"for myself is like going to the bar, where you normally go to meet people, in my case I prefer to come to the relational areas for this purpose".

These findings highlight the areas as social infrastructure, fostering both weak and strong ties among users, and reinforcing the **broader community-building potential of well-designed public spaces**.

- **Human-animal relational benefits**

People widely reported that the dog areas contributed to **strengthening the relationship between themselves and their pets**. The opportunity for dogs to interact freely with others was seen as crucial for behavioural development, especially in young dogs. One person said:

"He learned to socialize with other dogs here, and even with people. Now, when I walk him elsewhere, I can let him off leash because I trust him more".

Some owners spoke of a relational shift, where the shared experience of play in a communal space deepened mutual understanding and confidence. Others pointed out that while the dog may become more independent in the park, this led to improved dynamics at home:

"He's more relaxed afterwards and doesn't need my constant attention" (a 60+ woman with a small size dog).



The human relationships regard not only people living around the areas but from many different neighbourhoods and villages in the area as reported during a discussion with a group of dog handlers:

“people came here from diverse neighbourhoods in Lucca and also from other municipalities and this makes it possible to meet people that normally you could enter in contact with coming from different places, and from diverse generations and social strata”.

Importantly, the dog areas were also seen as sites where dogs could learn to manage conflict, this kind of situational learning appears to contribute positively to both dog behavior and owner awareness.

These narratives demonstrate how the **relational areas** built within the IN-HABIT project function as a **multipurpose urban environment - places** not only for pet exercise, but for **human interaction, social and emotional well-being, and civic connection**.

3.4.3 Monitoring by on-line interviewing

Online questionnaires conducted with relational areas’ users, even if a small number of answers, allowed us to collect additional info on the perception that people have on their use, as well as feedback from them.

Most of the respondents were women (83%), the age range is 22 to 75 years old (with the average of respondents being 53 years old), confirming that the areas are frequented by people from different age groups (as reported from the qualitative interviews). People who participated in the survey are both Lucca residents but also coming from outside of the city centre (i.e. Oltreserchio, Santissima Annunziata, Sorbano del Giudice) and outside the province (one is from Pisa and another one stated “I’m from another city but I’m often in Lucca”).

Starting from the investigation on how they came to know the presence of the relational areas, “word of mouth” is the method reported by most people (Figure 24). Other people stated, “Passing on the street near the area” and “Via press/media”, someone in other ways.

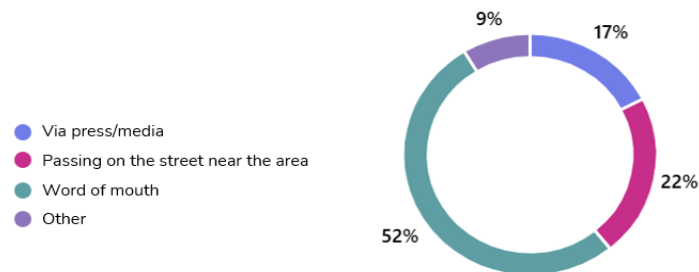


Figure 24. Frequency of answers to question “how did you come to know the presence of the relational areas?” (elaboration from the authors)



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Through the questionnaire we also investigated the **frequency of use of the areas**, both in terms of weekly visits to the areas and time spent there each time. The most common response is “2 to 4 visits per week”, suggesting that many users make regular but not daily use of the dog areas (Figure 25). A smaller group uses the area only once a week, while fewer respondents report almost daily use. Most users spend “30 minutes to 1 hour” in the relational area (Figure 26), showing that these spaces are used for meaningful interaction, not just brief stops. A notable portion stays “over 1 hour”, fewer people report to stay there “15 to 30 minutes” and nobody “10 minutes”, pointing to high social or recreational value of the area.

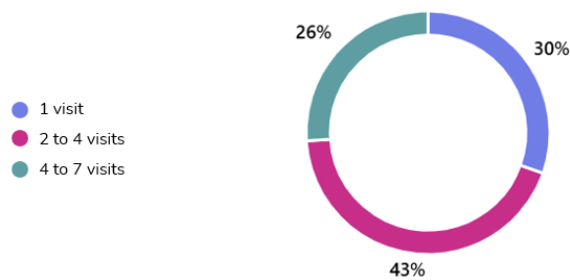


Figure 25. Frequency of answers to question “How often in a week do you visit the relational areas with your dog?” (elaboration from the authors)

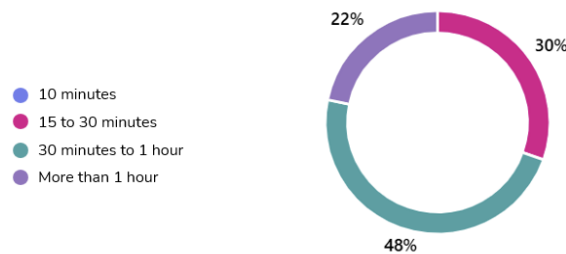


Figure 26. Frequency of answers to question “Each time you go to the relational areas, how much time do you spend there?” (elaboration from the authors)



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Interestingly, when we asked people how much the opportunity does to spend time with their dog in protected relational areas influence their personal behaviour, the distribution of responses suggests a **moderate to strong perceived impact of the areas on personal behaviour**. On a scale between 1 and 6, the most frequent rating is 5, with most of the respondents indicating that these areas significantly influence their personal habits, likely **fostering routines** with their dogs, **outdoor activity**, and **social engagement**. Less individuals rated the impact as 6 (maximum), reinforcing the idea that these spaces may play a vital role in users' **emotional well-being and daily routines**. Few respondents (ratings 2 or 3) see little effect, suggesting that while the benefits may not be universal, they are meaningful for a large part of the sample. Aligning with the broader goals of the hum-animal city concept, the relational areas resulted also from the users' perception as not only useful for the animals, but they also **positively affect human behaviour, promoting healthier, more socially and emotionally engaged lifestyles** (also according to the restorative cities dimensions). Going deeper on the analysis of the use of the areas with social objectives, when asked *"when you visit the areas, how many people do you usually meet on average?"*, most people answered that they meet 3

Indicator on use of hum-animal infrastructures

Monitoring hum-animal infrastructures can be carried out by focusing on several key areas, using specific indicators:

1. Use of the areas: this indicator assesses whether an area is actively used or underutilized, allowing evaluation of changes before and after interventions (ex-ante and ex-post) **and** measures how and how often citizens use a specific public area. Responses can be converted into numerical values, with the indicator calculated as the average frequency score per area: **A) frequency of visits** (data collection may include sensors; see p.68); **B) regularity of use** (daily 4, weekly 3, monthly 2, occasional 1, never 0); **C) time spent in the areas** (hours per visit); **D) preferred visit times** (early morning, during the morning, lunchtime, early afternoon, late afternoon, evening/night); **E) number of animals brought along per visit;** **E) user satisfaction with the infrastructure** (very positive 5, positive 4, fair 3, sufficient 2, unsatisfied 1).

2. Perceived Quality of Space: This indicator evaluates perceived improvements following interventions and allows comparison across urban areas using a common scale. It captures citizens' perceptions of comfort, maintenance, and accessibility. The indicator is calculated as the average score across all quality-related questions for each area, or as the average score for each quality-related question (**F) general quality;** **G) maintenance;** **H) usability;** **I) space availability;** **J) water availability;** **K) available games and circuits for dogs;** **L) comfortable for staying** (seat, tables, shadow, rain coverage); **M) other expected services and facilities**. Responses are converted into numerical values (very positive 5, positive 4, fair 3, sufficient 2, unsatisfied 1).

3. Perceived Safety and Liveability: this indicator identifies areas that may require additional soft interventions (e.g., lighting, activities, surveillance) and monitors perceived safety changes after structural improvements. Derived from questions connected to: **N) comfort;** **O) potential opportunity for meeting people;** **P) perceived safety;** **Q) usability at different times of day;** **R) level of interaction with people**. Responses are converted into numerical values (from very good 5, to good 4, fair 3, Poor, 2 Very poor 1)

4. Expectations/ perception from using the areas: the purpose is to identify the main aspects valued by users. The questions can be oriented to verify both expectation vs perceptions also to understand potential gaps. These indicators capture the main attractors for users. Key items include: **S) playable for pets;** **T) sensory and personal space for the users;** **U) meeting point with people;** **V) playable for people with pets;** **W) playable for users;** **X) enjoyable for free time**. Responses are converted into numerical values (absolutely true 5, true 4, fair 3, just few 2, not really 1).

Each group of questions produces a specific indicator, which can then be analysed individually or combined to provide an overall assessment of the hum-animal infrastructure.



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to 5 people per visit, indicating a rich social environment within the dog areas. Very few reports encountering large crowds or choosing solitude, suggesting a comfort zone around small-to-medium group dynamics. Then, we specifically asked them if they met new people thanks to the relational areas, 100% of respondents answered "Yes", affirming that these areas are **key spaces for expanding social networks**. This highlights the powerful community-building role of shared pet environments. Confirming what emerged from interviews and insights from the WhatsApp group, when we asked people if they have deepened relationships with people they met at the areas, 78% of respondents answered that they developed ongoing relationships beyond casual encounters.

Regarding the emotional response to the areas, to the question *"If you had to express your feeling in one word when visiting the dog area, what word would you use?"* respondents most often associate their experience with positive emotions such as **relaxation, tranquillity, and serenity**. **The atmosphere is perceived as calming, safe, and enjoyable**. Here following the WordCloud generated from the answers (Figure 27). Regarding the sense of security linked to the relational areas, interestingly most of the respondents (74%) answered "No" to the question *"Have you ever perceived any dangerous situations while visiting the relational areas?"*.

All respondents agreed on the fact that animals in cities can contribute to improving the quality of life.



Figure 27. WordCloud from answers to open-ended question "If you had to express your feeling in one word when visiting the dog area, what word would you use?" (elaboration from the authors)

Complementary insights were also obtained through the monitoring of a dedicated WhatsApp group, spontaneously established by more than 70 individuals frequenting the relational areas (people mentioned that more than 100 do normally frequent the areas and that not all are in the group on Whatsapp).

Within this group, participants actively exchange information and advice related to pet care/management and behaviour. More significantly, the group serves as **a tool for coordinating visits to the relational areas**, enabling users to arrange appointments in advance to ensure they are not alone, but instead have opportunities to interact with others - both human and dog. The group, which is predominantly composed of **women**, also serves a secondary yet important function: it enhances participants' **sense of safety**, particularly when planning visits during the



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late afternoon or evening hours. The **mutual coordination** thus contributes not only to social cohesion but also to the perceived security within these shared spaces.

Main results: the creation of innovative human-animal infrastructures provides tangible evidence of the potential of the hum-animal concept. Relational areas and Animal Lines address the needs of a growing number of citizens managing pets, while also expanding opportunities for play, sensory experiences, gaming, and inclusive social interaction. These spaces have become geographical hubs that facilitate dialogue across the city and between different social groups, beyond their role in dog management. The areas can also host innovative services and activities, enabling direct citizen involvement in their management and fostering civic engagement and proactive participation. The cost of establishing and maintaining these infrastructures can be integrated into the public green space budget. Effective integration of relational areas requires specific competencies to promote both human-to-human interactions and the coexistence of wild animals and pets. Additionally, innovative solutions can be implemented for waste management and the enhancement of green spaces.

3.5. Monitoring of Animal Assisted Interventions (AAI) in nursing homes

The evaluation of AAI in nursing homes with elders was organised by using qualitative and quantitative methods as presented in the frame.



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Methodology

Animal Assisted interventions (AAI) were conducted in two nursing homes, specifically targeting elderly residents and individuals living with diverse fragilities like dementia, and physical disabilities among the others. The execution of these activities was a collaborative effort, involving social professionals from the two respective nursing homes, as well as personnel from three NGOs expert in the field of AAI and properly trained following the Italian national guidelines on AAI (Ministero della Salute, 2015). These NGOs were formally selected via a public call and engaged through co-programming activities, adhering to relevant Italian legislation. All handlers and dogs' dyads were duly formed as expected by the Italian guidelines on Animal Assisted Interventions (Ministero della Salute, 2015). Specifically, handlers successfully passed a three-level training (197 hours in total with at least 32 hours of direct practice). Although the Italian guidelines do not prescribe specific training for animals involved in AAIs, as required by the guidelines all dogs were assessed for suitability in the project by a veterinarian specialized in Animal Assisted Interventions (Ministero della Salute, 2015). A comprehensive evaluation was undertaken, encompassing both quantitative and qualitative analyses of the intervention outcomes.

The AAI project took place from September 2023 to June 2024 (10 months, approximately 250 days) in two different nursing homes in Lucca (Italy). The three different NGOs working in the field of AAIs were involved in the activities following 2 groups of elderly people each, i.e. 6 groups; each group was composed of 10-14 people, for a total of 80 patients involved in the project. As not all people gave their consents, 30 out of 80 patients were monitored. Each group joined a one-hour dog educational activity once every two weeks for a total of 15 meetings per group (90 meetings in total in the whole project).

The residents were involved in different kind of activities, specifically: a) interaction activities (petting the dogs, giving them treats); b) observational activities (watching the dogs solve olfactory/object discrimination and problem solving activities); c) activity for the memory and the emotional control (exploring the non-verbal communication of dogs, evocation of memories and feelings through the reference to dogs); d) activities to elicit motor skills (walking the dogs, playing and performing physical exercises with the dogs, helping handlers in preparing olfactory and problem solving games for the dogs).

For the **qualitative assessment**, two Focus Groups were conducted in Lucca: one at an early stage (November 2023) and one at the end of the activities (May 2024) in the nursing homes, to monitor and to co-evaluate with the involved actors the process and the qualitative results of the AAI project and their effectiveness in the social innovation field. In the literature, the focus group approach is considered a valuable qualitative methodology to gather in-depth knowledge about a specific topic (Then et al., 2014) about a certain issue (Krueger & Casey, 2015). Results are reached through the gathering of a small group of people representative of a bigger community, which are convened by a moderator to debate together about a topic in a structured way (Corrao, 2002). The two meetings were held in Italian, lasting 1.5 and 2 hours, respectively. Each session was moderated by two representatives from the University of Pisa (UNIPi) and involved eight participants: three educators from the two nursing homes and five individuals representing the three associations conducting the activities. Technical staff from the Municipality of Lucca also followed the discussions. Subsequently, a third event was organized at a nursing home. This session involved political representatives and the nursing home director in a final practical AAI event, aiming to provide them with a direct understanding of the activities and their outcomes.

The **quantitative analysis** comprised the monitoring of both elders and handler-dog dyads involved in the activities collecting data through questionnaires as well as evaluating physiological and endocrine parameters with ITC devices and analytical samples. The monitoring protocol is further described in the IN-HABIT deliverable 3.3 (chapter 5.2.1.3.2 quantitative evaluation). Compared to deliverable 3.3, additional analyses have been carried out on the handlers of the dogs who were monitored for cortisol and oxytocin concentrations through saliva samples. Handlers were instructed to chew on a swab for approximately one minute to collect the sample. This procedure was conducted on the same days (three times during the project) as their dogs' sampling to enable direct correlation of the results between handlers and dogs, allowing for a more comprehensive analysis of how their interactions and stress levels might influence the outcomes of the interventions

3.5.1. Qualitative evaluation

We ran two focus groups - one at the beginning and another at the end of our activities - and they underscored various beneficial elements. These included positive aspects related to both program organization and the **beneficial effects of executed AAI on people's well-being**. The



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sessions also underscored the **necessity of formalizing these interventions** to systematize the mobilisation of the human-animal bond.

Care facility educators reported significant participation and **noticeable benefits among elderly residents** involved in dog activities. As shown in table 22, from educators' perceptions the activities had various impacts in different fields, improving the **quality of life** of elderly people involved both in the **mobility, psychological and social aspects**.

Table 22. Perceived impacts on elders due to the interactions with dogs (source focus groups with social professionals and association working in AAI)

Aspects	Description
Mobility	<ul style="list-style-type: none"> ● improvement of mobility skills for willingness to participate in activities and to interact with dogs ● improvement of the manual skills
Psychological	<ul style="list-style-type: none"> ● memory's improvement (the days in which they have activities and the names of the dogs) ● calm level improved as sessions progressed ● maintenance of the attention due to willingness of carrying out the activity with the dog
Social	<ul style="list-style-type: none"> ● indirect benefit in seeing other elderly people having interactions with dogs ● better interaction between older people and with educators and other practitioners ● improvement in the expression of emotions ● improvement of conflict reactions

The animal's presence acts as a catalyst for residents to take part in activities they would usually decline, often due to physical limitations or lack of interest. Educators shared that **physiotherapists observed improvements in manual dexterity**, attributing this to the practice gained through dog-related tasks (e.g. throwing a ball, brushing the dog, cutting paper for storybooks). Overall, educators identified a **lasting positive impact** on the elderly from animal activities. Residents developed **anticipation for the animals' return, and their memory was stimulated** (in those with better cognitive function) to recall activity days, groups, and dog names. The **calmness** achieved consistently deepened with each session, as did the ability to maintain attention, driven by the desire to engage with the dog.

The advantages in the social realm fostered **improved relationships**, both in terms of heightened interactions among elders and with educators and other staff. The project fostered **new dialogue between residents** who previously hadn't interacted, **including across genders**. **Emotionally**, the animal activities **deeply engaged the elderly**.

Even those who typically remained unresponsive, despite encouragement, expressed through body language and emotions **a desire to interact with the animal**. Conflicts, often seen in groups, were eliminated during activities thanks to the dog's presence and the desire to engage. While these reactions don't completely disappear on other days, they manifest less intensely. Finally, even elders who chose not to interact much with dogs still benefited from observing others' interactions. Social workers in the nursing homes declared a better use of the spaces in the structures. Particularly, the areas normally quite unused and involved in AAI become new



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meeting points among the elders living in different areas of the health residential, independently from the activities run with dogs. Also, the social workers presented the positive feeling received from the relative families of the elders involved in AAI. Finally, social workers and professionals involved in managing AAIs reported a positive impact of these practices on their daily professional routines. They highlighted the availability of new tools that support their work, making the institution more dynamic and interactive, in addition to the emotional benefits experienced personally.

3.5.2 Quantitative evaluation

Of the 30 elders that gave their consent to participate in the study, 19 were monitored from the beginning to the end of the project (5 of them retired from the study before the beginning of the monitoring, 4 retired halfway through the project and 2 died). Participants were mainly female ($n=14$, 73.7%), with a mean age of 81.74 years (min=50; max=94). Regarding information about presence of chronic disease 42.1% of elders did not reply, 21.1% were affected by Alzheimer and other diseases that were mentioned were depression (10.6%), senile dementia (5.3%), cognitive impairment (5.3%), mental impairment (5.3%), epilepsy (5.3%). Sixty eight percent of patients did not reply regarding their motility, while 21.1% referred to unspecified motility impairment; other mentioned motility problems were presence of knee prosthesis (5.3%) and fracture of the femur (5.3%).

The results of the quantitative analysis are reported in the IN-HABIT deliverable 3.3 (chapter 5.4.3.2 Quantitative evaluation of AAI). For clarity, we provide here a summary of the explained results and additional analyses conducted after August the 31st 2024.

Quality of Life, assessed through subjective scales, **improved significantly** during the project: both participants and nurses reported **better overall well-being and sleep**. Actigraphic data showed an increase in Total Sleep Time (TST) midway through the intervention, though this was not maintained at follow-up. Sleep Efficiency (SE) did not improve and even decreased, likely due to individual variability, reduced mobility, or age-related factors (chronic pain, sleep fragmentation, seasonal changes) (Chen et al., 2011; Mattingly et al., 2021; Mattis & Sehgal, 2016; Seidler et al., 2023; Zolfaghari et al., 2023). Nonetheless, SE values remained above the cut-off commonly reported for older adults (Desjardins et al., 2019). Endocrine findings were mixed. Oxytocin levels in participants showed an unexpected pattern, with elevated baseline values



followed by a post-session decline, possibly linked to anticipatory arousal (Brown et al., 2016; López-Arjona et al., 2023) or methodological challenges of salivary measurement (Carter et al., 2020; Engel et al., 2019; Horvat-Gordon et al., 2005; López-Arjona et al., 2023; McCullough et al., 2013; Tabak et al., 2023), which remains a feasible, non-invasive option. Regarding cortisol concentration we hypothesised that dog-assisted interventions are generally effective in reducing arousal and calming elderly individuals, though the precise biological and psychological mechanisms underlying the stress-reducing effects are not fully understood. Our findings align with other scientific studies conducted in nursing homes, indicating that **dog-assisted activities positively impact stress and mood in elderly individuals** (Berry et al., 2012; Gunes et al., 2018; Lundqvist et al., 2017). However, achieving statistical significance has been challenging in many studies (Lundqvist et al., 2017).

For dogs, cortisol levels decreased significantly after sessions, indicating not only absence of stress but potential stress relief, despite elevated pre-session values likely due to travel. Physiological measures (heart rate, blood pressure, temperature) showed no stress-related changes, suggesting that animal welfare was preserved. For handlers, oxytocin levels showed no

AAI indicators

To support the replication of Animal Assisted Interventions (AAI) with elderly people in other cities and care facilities, a set of indicators has been developed based on the experience of nursing homes in Lucca. These indicators are designed to monitor both human outcomes and animal welfare.

1. Perceived Quality of Life Indicator

This indicator assesses changes in elderly participants' perceived quality of life over time. It can be measured using validated self-reported or proxy-reported tools, such as the Psychological General Wellbeing Index (PGWBI) or visual analogue scales (VAS) adapted for individuals with cognitive impairment. The indicator is calculated as the difference between baseline and follow-up scores. Its replicability is ensured by the use of standardized instruments and proxy-based adaptations applicable across diverse care settings.

2. Sleep Quality Indicator

This indicator evaluates the impact of AAIs on sleep patterns, combining subjective assessments (VAS or Pittsburgh Sleep Quality Index) with objective measurements collected through wearable devices (e.g. total sleep time and sleep efficiency). The indicator captures changes in sleep duration and efficiency across the intervention period.

3. Endocrine Indicator

This indicator monitors changes in endocrine parameters, in elderly participants, primarily salivary cortisol and oxytocin concentrations measured before and after AAI sessions and across the project timeline. A reduction in cortisol levels is interpreted as a physiological marker of reduced arousal and increased calm in elderly patients, while oxytocin is evaluated to measure positive interactions with the animals involved. The indicator is replicable because saliva sampling is non-invasive, repeatable, and feasible in residential care environments.

4. Animal Welfare Indicator (specifically dogs)

To ensure ethical and sustainable replication of AAI activities, animal welfare is monitored through indicators combining physiological (heart rate, blood pressure, respiratory rate, body temperature), endocrine (salivary and hair cortisol, salivary oxytocin), and behavioural observations (frequency of stress behaviours). Stability or reduction in stress indicators over time shows acceptable welfare conditions. This indicator aligns with international (IAHAI) and national (Italian) AAI guidelines and provides a framework for safeguarding animals involved in interventions.

Replicability of indicators:

- non-invasive,
- rely on validated tools and biomarkers,
- are adaptable to different contexts,
- allow ex ante / ex post evaluation,

For further information on the AAIs protocol, see the box at p.77.



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significant changes, possibly due to limited direct interaction with their dogs during activities. Cortisol levels, however, decreased significantly, suggesting the sessions reduced physiological stress. No endocrine (cortisol nor oxytocin) synchrony was observed between handlers and their dogs, possibly due to the small sample of the study.

Limitations include the small sample size, limiting generalizability, and gender imbalance, as most participants and all dog handlers were female. Future research should explore gender differences and use larger samples.

Main results: The AAI pilot initiative was designed to address one of the key demands emerging from the participatory co-design phase, namely the focus on elderly people through the implementation of specific co-therapeutic solutions involving animals to support IHW. The pilot pursued a dual objective: on the one hand, to introduce a structured AAI within the municipality and to monitor and evaluate its outcomes for elderly participants and the animals involved; on the other hand, to test its contribution to institutional innovation. This included new agreements between health authorities and the municipality, the application of the Italian regulatory framework for co-deployment, internal reorganization of daily routines, and active support from social workers. The AAls had positive effects on the elderly participants, as well as on the professionals involved, and indirectly on the relatives of the elderly. This win-win solution was further supported by a cost-effectiveness assessment, which showed that each hour per person of AAI amounted to slightly less than €11. The positive outcomes achieved through AAls in Lucca confirm their strong potential for upscaling in other healthcare institutions, as further discussed in the dedicated chapter.

3.6. Monitoring of Pet Care services

In Lucca, an innovative Pet Care service was introduced to support vulnerable individuals (including those with temporary needs) who own companion animals. Two NGOs were formally selected through a public call and engaged via co-programming activities, in line with relevant Italian legislation. The service was co-designed with the explicit objective of reducing anxiety

Methodology

Monitoring and evaluation of results were carried out using the following methods:

- * Quantitative data on service uptake, including the number of requests received and the types of support provided
- * Analysis of questionnaires administered by the NGOs involved in service delivery to service recipients
- * Qualitative interviews with staff members of the NGOs engaged in the provision of Pet Care services.

and preventing potential neglect among owners experiencing difficulties in caring for their pets due to their personal circumstances. The relevance of this type of support became particularly evident during the COVID-19 pandemic, when vulnerable individuals living alone with pets often postponed accessing personal healthcare

services in the absence of adequate assistance. Consequently, this hybrid service provides dual



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benefits, addressing both animal welfare and the everyday needs of vulnerable individuals during periods of fragility. The co-deployment phase, carried out in collaboration with the NGOs, led to the identification of key operational requirements for the service and to the definition of three “macro-categories” of services to offer, namely:

- Domestic services: taking care of the pet, purchase of necessities for the pet
- Outdoor services with the owner: transport to the vet or walking the dog together with the owner
- Outdoor services without the owner: transport to the vet or walking the dog without the owner

In June 2024, the service was launched and disseminated to the public, and the involved NGOs initiated their activities by addressing the first wave of inquiries and providing aid to those requesting the service. The evaluation of Pet Care services was conducted using multiple methods; the following section presents the results emerging from the different monitoring actions.

3.6.1 Quantitative data on service access

During the year of implementation of the pet care service, the two NGOs participating in the initiative delivering the service, received 20 and approximately 80 service requests, respectively. After excluding applications that did not meet the eligibility criteria (criteria fixed elders and people with disabilities or people that find themselves in a situation of temporary impossibility or difficulty in taking care of their pet), 7 requests were taken on by the first association and 18 by the second. Each organization provided a total of 450 service hours during the year. Requests received by the first association mainly came from elderly or ill individuals who were unable to take their dogs outside for daily walks and to meet their basic needs. The second association delivered both *in-home services*—supporting pet owners facing temporary challenges in caregiving—and *out-of-home services*, involving the management of animals temporarily without an owner or caregiver. Both NGOs reported that there were no cases in which the pet care service was requested as a one-time intervention. In all instances, the service was delivered *repeatedly over time*, reflecting the ongoing nature of the beneficiaries’ needs. One of the NGOs specified that, among the 7 individuals taken on, 4 received approximately 14 hours of support within a one-month period. For the remaining 3 individuals, the service was provided on a daily basis, in some cases even twice a day. These findings highlight the **sustained demand for assistance** and the intensive nature of care required in many situations, emphasizing the importance of continuity in the support offered.

Main outcomes: the pet care service represented an innovative approach in Lucca, simultaneously supporting both pets and vulnerable individuals by mobilizing new human



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resources. While the service is currently provided by animal-oriented associations, it could also be delivered by socially oriented NGOs supporting both people and animals. Beyond caring for pets, the service helps fragile individuals reduce anxiety, receive daily assistance, maintain social connections, and prevent isolation, ensuring ongoing contact with service providers. The service is cost-effective and particularly relevant in cities with a growing number of single-person households, often composed of elderly individuals, offering a practical means to identify and support people at risk of fragility. Furthermore, the initiative strengthens social ties and social capital among diverse actors, reinforcing local support networks and relationships, as also highlighted during the second focus group in Lucca.

3.6.2 Analysis of recipient questionnaires administered by NGOs involved in service delivery

The questionnaires were analysed for frequencies of replies, results are reported below.

A total of 24 beneficiaries of the pet care service completed the questionnaire.

The vast majority were women (n=20; 83.3%), with only 8.3% men (n=2) and 8.3% (n=2) preferred not to reply. The mean age of respondents was 68.5 years old (min=67, max=90). Almost all respondents were Italian citizens (n=23; 95.8%), with only one respondent being naturalized.

The service was requested in most cases for 1 pet at a time (n=11; 45.8%) with 33.3% (n= 8) requesting the service for two pets, 16.7% (n=4) for 3 pets and just 4.2% (n=1) for 6 pets at a time. In all 24 cases the service was requested for dogs (100%), with very few cases also involving cats (n=3) living in the same household. This predominance is not surprising given that dogs require regular walks and outdoor activity, tasks which can be challenging for older individuals living alone or with health issues. In most cases (n=20; 83.3%) the respondent did not live with other animals apart from the one for which the service was requested.

Over half of respondents (n=13; 54.2%) reported managing their pet entirely on their own, while 25.0% (n=6) received occasional help from their sons, and the remaining ones were supported by friends, neighbours, or other relatives.

Regarding pet care routines, most owners provided food twice a day (n=14; 58.3%) and walked their dogs twice a day (n=12; 50.0%). Fifty-eight percent (n=14) administered medicines “when useful”. Regarding interaction with the pet, beneficiaries tended to play (n=16; 66,7%) and get involved in “other kind of interaction” (n=18; 75%) “every time the pet asked for it”.

When asked about their emotional attitude towards managing their animals, answers were almost evenly split: 25% (n=6) considered themselves *very anxious*, 29.2% (n=7) *somewhat anxious*, 20.8% (n=5) *calm*, and 25% (n=6) *fairly calm*. For elderly owners, this **anxiety often arises from concerns about the pet’s wellbeing**, the fear of not meeting its needs, or previous experiences of relying on others. Before using the service, 45.8% (n=11) of respondents stated



they had never experienced difficulties in managing their animals, 16.7% (n=4) had faced difficulties only rarely, 29.2% (n=7) often, and 8.3% (n=2) very often. These results highlight the fact that for many beneficiaries the service was addressing a recurrent need. **Feelings while entrusting pet care to others were mostly positive:** 37.5% (n=9) felt very calm, 29.2% (n=7) calm, and another 29.2% (n=7) somewhat anxious. Regarding the pet's condition after being looked after by others, the majority (n=17; 70.8%) found their animal as usual while only 20.8% (n=5) found their animal somewhat agitated. This suggests that the service was delivered in a way that safeguarded animal welfare and allowed pets to adapt well to the new situation, and this is an important factor in reassuring owners and building trust in the service.

Prior to accessing the service, 41.7% (n=10) resolved pet care challenges with “some difficulty”, and 37.5% (n= 9) with “difficulty” or “very great difficulty”.

Common coping strategies included paying someone for assistance (n= 8; 33.4%), delaying personal needs (n= 7; 29.2%) or help from family (n= 6; 25%).

Most respondents (n=15; 62.5%) requested *in-home pet care*, 25% (n=6) opted for *out-of-home services with the owner present*, and 12.5%(n=3) for out of home services without the owner. In case of the 25% receiving the *out-of-home services with the owner present*, the activity has allowed the mobilization of the owner with the pet, so increasing their personal mobility also. Regarding service satisfaction, 91.7% (n=22) of people were **very satisfied** and the same proportion also declared that the service was **helpful**. All respondents would recommend the service to others in a similar situation.

Overall, the results highlight the fact that the service was well aligned with its original purpose and highly valued by beneficiaries. In communities with aging populations, such service could become a **key element of the local support network, complementing health and social care and supporting wellbeing of both guardians and their pets.**

3.6.3 Qualitative interviews with personnel from the NGOs participating in the pet-care service provision

The results from the qualitative monitoring of the pet care service highlight a **positive impact on both beneficiaries and the volunteers involved**. Interviews with staff from the participating NGOs revealed that the **service fostered a strong sense of mutual exchange**: volunteers developed **emotional bonds** not only with the animals but also **with the people** they supported, forming **meaningful and lasting relationships**. Volunteers of the NGOs emphasized the **deep gratitude** expressed by the beneficiaries, who experienced the service as a **significant and timely form of support**. However, some initial challenges emerged in clearly communicating



Pet Care Indicators

To support the replication of Pet Care services for people experiencing temporary difficulties, a set of replicable monitoring indicators can be derived from the Lucca Pet Care service experience. Since different literature studies report how pets influence quality of life and emotional support in domestic care contexts (Reniers et al., 2023) and give evidence of psychological mechanisms through which pets can support owners (Li & Wong, 2025) and may be linked to reduced isolation (Kretzler et al., 2022); these indicators are designed to monitor user well-being, perceived service effectiveness, and animal care continuity, while ensuring adaptability to different social and territorial contexts. Moreover, scientific studies report that home-based services improve people adherence to treatment, satisfaction, and health-related quality of life (Lizano-Díez et al., 2021).

1. Perceived Management Difficulty Reduction Indicator: Dog-related factors may impact owners' well-being in different ways (Barcelos et al., 2023), some help in the management of the animals can assist in overcoming the onset of these problems. This indicator measures changes in users perceived difficulty in managing their animal(s) before and after accessing the Pet Care service. It is assessed through self-reported questionnaire items addressing frequency of management difficulties and perceived ease of coping in critical situations. The indicator is calculated as the change between pre-service perceived difficulty levels and post-service assessments. A reduction in reported difficulty indicates improved capacity to manage animal-related responsibilities. This indicator is particularly suitable for replication, as it relies on simple Likert-scale questions that can be easily adapted to different user groups and service models.

2. Owner Emotional Well-Being Indicator: This indicator evaluates changes in the emotional state of animal owners in relation to animal care responsibilities. It is measured through self-reported levels of anxiety or tranquility when managing the animal and during periods in which care is provided by others. The indicator captures variations in emotional burden associated with pet ownership and reflects the service's contribution to psychological relief and peace of mind. Replicability is ensured using standardized ordinal response options and non-invasive, self-assessment tools.

3. Continuity of Animal Care Indicator: This indicator assesses the continuity and regularity of essential animal care activities, such as feeding, walking, medical care, play, and social interaction. It is derived from reported frequencies of daily care practices. The indicator reflects the extent to which the Pet Care service supports the maintenance of adequate and stable care routines, particularly during periods of owner difficulty. This indicator is replicable across contexts because it relies on universally comparable animal care activities and frequency-based reporting.

4. Informal Support Network Integration Indicator: This indicator measures the degree to which the pet care service complements or substitutes informal support networks (family members, friends, neighbors, volunteers). It is assessed through questionnaire items identifying the presence and type of support used before and after service activation. The indicator helps to understand the role of Pet Care services within broader community-based care ecosystems and social support structures. Its replicability lies in its flexibility and applicability to diverse cultural and social contexts where informal care arrangements vary.

5. Perceived Animal Well-Being Indicator (Owner Perspective): This indicator captures owners' perceptions of their animal's emotional and behavioral state when care is provided by others and after reunification. It is assessed through reported changes in animal behavior (e.g. calmness, agitation, sociability). Stable or improved perceived animal well-being is interpreted as an indirect marker of acceptable care quality and animal welfare within the service. The indicator is easily replicable as it relies on owner observation rather than invasive measurements.

Replicability of indicators: non-invasive, self-reported tools, simple questionnaires, adaptable to different social, cultural, and service contexts, allow ex ante / ex post evaluation of service impact.

that the service focused solely on animal care and not on providing direct financial aid - although such requests were frequent, particularly concerning veterinary costs or pet food.

"At the beginning, people also asked for financial assistance; it wasn't easy to explain that the intervention was focused on helping the animals and the people as well, not covering expenses."

It is noteworthy that the new demands expressed by vulnerable beneficiaries, particularly regarding financial needs, were subsequently acknowledged by the Municipality

of Lucca that allocated part of its own budget to establish targeted support measures for



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individuals facing economic difficulties in managing pets. From this perspective, the initiative broadened the scope of the IN-HABIT project, further extending its focus on hum–animal needs.

While the initiative was originally intended for temporary needs - and the service had a beginning and an end -, several cases involved individuals with more permanent conditions, such as elderly people over 80 or those with serious health issues (i.e. people who rely on an oxygen machine to breathe, or with mobility difficulties). Despite some difficulties related to communication and managing expectations, the experience was described as “exceptional” by volunteers, who reported it as a deeply enriching and emotionally rewarding journey.

“We became friends with the people, and we developed an incredible relationship. These individuals are extremely grateful; they felt a great benefit because it was a significant help for them.”

It’s also worth mentioning that the **pet care service**, at the end, **integrated human and animal needs in a new and diverse perspective**, also by **facilitating human direct relationships among users and volunteers, outside the classical formalized social services and physical activities** for those people participating with the volunteers in the pet management outdoor. In a hum-animal and ageing society the provision of innovative services able to link human and animal needs can better integrate demands and offers of services and to mobilise existing resources (like animal association) in bringing attention also to humans (and vice versa for more socially oriented one) and to animals. The innovative solutions might be effective, not expensive and supportive for enhancing social capital and dialogue, besides prevention for IHW.

Main results: the service achieved three main results: **A)** it supported the growing number of single-person households with pets, helping to reduce isolation and anxiety while ensuring care for the animals, **B)** it created a new perspective in which services for humans and animals can be integrated to pursue shared goals of IHW, **C)** it mobilized local NGO resources in an innovative way, fostering collaboration and the co-delivery of services.



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3.7. Monitoring of educational projects in schools

One of the pilot initiatives of the Lucca IN-HABIT project focused on engaging young students from primary and secondary schools in educational activities. These activities partly incorporated a board game developed by Lucca Crea, aimed at raising awareness about responsible pet management. Concurrently, with the support of Design for Change Spain (DFC), tailored

Methodology

The first edition involved 3 different primary schools (5 classes, 75 children of 8-10 years of age) in the city of Lucca (Italy). The programme included in total 4 hours aimed at raising awareness among children about the correct management of and approach to dogs, as well as teaching them the basics on how to design a pet-friendly city, and how a dog can bring benefits to different categories of people. The programme included a lesson on the board game "City Pets" designed with Lucca Crea and the mindset activity prepared by DFC Spain. We chose to focus specifically on dogs because they are usually the most popular pets among children/families, and more relevant for urban planning. The second edition involved 7 schools (8 primary schools' classes and 7 secondary schools' classes) for a total of 287 children (from 8 to 13 years of age). The programme for this second edition included a 2h lesson on the board game and a mindset change activity organized by DFC Spain. For both editions a specific questionnaire was designed to assess children's knowledge about covered topics, filled up at baseline (before the starting of the programme) and at follow up (after the last lesson or during the last event of the board game tournament) by children; The survey included 13 questions, 5 about demographics and 8 about general information regarding dogs management pet friendly and how dogs can bring benefits to different categories of people.

activities were implemented to foster a mindset shift among students by involving them in a co-design process using dedicated forms. During the IN-HABIT project, two different editions of the educational programmes were held in 2024 and in 2025.

The results of the first edition of the educational programme are described in IN-HABIT deliverable 3.3 (chapter 5.2.1.5 Monitoring of educational projects in schools) and were the object of a scientific paper

published in the journal Dog Behavior (Borrelli et al., 2025).

In the second edition of the educational programme 190 children filled in the questionnaire at baseline and at the end of the programme.

More than half of the respondents reported owning a cat (35.7%) or a dog (32.4%), with smaller percentages reporting rabbits (4.3%), turtles (9.2%), birds (3.9%), or other animals (14.5%). Before the educational programme 70.8% reported not being afraid of any companion animals; this percentage remained almost unvaried after the programme (70.8%). Fear of dogs, cats, or other animals showed non-significant variation. Regarding attitudes towards animals, at baseline 66.3% reported they "love" animals and 33.2% said they "like" them. After the programme the percentages were almost the same (respectively 67.9% and 30.0%).

Almost all children replied that a puppy is a "friend who needs care" both at baseline (96.8%) and after the programme (97.4%).

The questions regarding general knowledge and behaviour of dogs reported a slight increase in numbers of correct replies from baseline to end of the programme:

- "Dogs can transmit diseases in some situations": increased from 50.0% to 54.2%.



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- “Dogs feel pain”: increased from 90.0% to 94.7%.
- “Correct behaviour with an unknown dog”: improved from 41.1% to 47.9%.
- “Correct behaviour with a dog behind a gate”: improved from 81.6% to 88.4%.

Part of the analyses done on the questionnaires aimed to identify changes in knowledge, attitudes and reported behaviours following the educational programme. Statistical comparison between baseline and follow up responses were conducted using Chi-square tests and Fisher’s exact tests applied where cell counts were small (a summary of significant results can be found in table 23). The programme generated statistically **significant improvement in different areas of canine knowledge and management**, like the **understanding of dog welfare**, or **practical knowledge** regarding dog needs.

In addition, the programme also improved **awareness** of characteristics that **make a city “a pet-friendly one”**. In fact, more children understood the importance of providing places where dogs can drink, dog waste bins, cleaning up after dogs, public spaces accessible to dogs and the availability of veterinary clinics.

Indicators for educational activities

To support the replication of educational anthrozoology programs in primary (or secondary) schools, a set of replicable monitoring indicators can be derived from the Lucca educational protocol. These indicators are designed to assess knowledge acquisition, attitude change, and civic awareness related to animal welfare and pet-friendly urban environments.

1. Knowledge Acquisition Indicator on Animal Needs and Responsible Care

This indicator measures children’s understanding of dogs’ basic needs and responsible management (e.g. food, water, veterinary care, exercise, social interaction etc). It is assessed through pre- and post-intervention questionnaires using closed-ended questions with correct/incorrect answers. The indicator is calculated as the proportion of correct responses and the percentage of improvement between baseline and follow-up. It is also reinforced by the use of the IN-HABIT board games, “City Pets”.

2. Pet-Friendly Urban Awareness Indicator

This indicator evaluates children’s awareness of pet-friendly urban characteristic, such as accessible public spaces, dog parks, water points, waste management infrastructure, and pet-friendly public policies. It is derived from questionnaire items assessing children’s ability to identify elements of a pet-friendly city. Changes in correct responses between pre- and post-program assessments reflect increased awareness. This indicator is also reinforced by the use of the IN-HABIT board games, “City Pets”.

3. Attitudinal Change and Empathy Indicator

This indicator captures changes in children’s attitudes toward animals, including empathy, fear reduction, and perception of dogs as sentient beings rather than objects. It is measured through questionnaire items exploring children’s feelings toward pets and their conceptualisation of dogs (e.g. friend, companion, responsibility). Improvements in positive attitudes after the intervention indicate the program’s effectiveness in fostering humanness.

4. Human-animal Interaction Awareness Indicator

This indicator assesses children’s understanding of the social role of animals, particularly their perceived benefits for vulnerable groups such as elderly people and individuals with disabilities. It is measured through questionnaire items and reinforced by qualitative outputs (e.g. participatory activities with children’s drawings and written reflections).

5. Active Citizenship Indicator

This indicator evaluates children’s ability to translate acquired knowledge into ideas, proposals, and solutions for real city contexts. It is assessed qualitatively through participatory tools (e.g. mindset change exercises, drawings, project ideas) that document creativity, and willingness to engage families, schools, and local institutions.

Replicability of indicators: easy to implement in schools, rely on simple questionnaires and participatory tools, allow ex ante / ex post evaluation of educational impact, integrate animal welfare, social inclusion, and urban awareness.



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Table 23. Educational activities and significant improvements from baseline to follow up (elaboration from the authors)

Question	Correct both times	Correct at end of the programme	Improvement	% improvement
Dogs can transmit diseases to people	74	103	29	30.5%
Dogs feel pain	165	180	15	78.9%
What is a puppy for you?	180	185	5	83.3%
How to befriend an unknown dog	62	91	29	25.9%
Meet dogs at home/relatives' homes	45	71	26	22.2%
Meet dogs in rural/natural areas	61	85	24	27.6%
Meet dogs in the city	31	56	25	18.2%
Dog needs – Walking	38	40	2	1.3%
Dog needs – Spending time with owner	34	36	2	1.3%
Dog needs – Going to the vet	32	36	4	2.5%
Dog needs – Different needs for different dogs	28	35	7	4.3%
Pet-friendly city – Places to drink	18	28	10	5.9%
Pet-friendly city – Dog waste bins	28	38	10	6.2%
Pet-friendly city – Cleaning up after dogs	32	37	5	3.2%
Pet-friendly city – Public places accessible to dogs	17	33	16	9.2%
Pet-friendly city – Veterinary clinics	28	36	8	4.9%

The table reports, for each question showing a statistically significant change (Chi-square or Fisher's exact test, $p < .05$), the number of children who gave the correct answer both times, the total number correct at follow-up, the absolute improvement (i.e., those who changed from incorrect at baseline to correct at follow-up), and the percentage of improvement.

Main results: A) Educational activities using the DFC methodology actively engaged students in dialogue and highlighted the importance of fostering better hum-animal interactions across different ages, levels, and contexts, **B)** from an observational perspective, the topic of animals was highly engaging across diverse classes and proved inclusive for students from different cultural and geographic backgrounds, including children in vulnerable situations, **C)** discussions around animals often stimulated intergenerational dialogue within families, particularly



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involving grandparents, **D**) in secondary schools, engagement was notably high; participatory methods promoted active participation and appreciation, with one class receiving a local prize for their work in an upscaling activity held in Pisa, **E**) educational initiatives focused on animals (wild, food-producing, and companion animals) proved effective in fostering dialogue among students, enhancing understanding of societal diversity, and promoting civic engagement, **F**) further structured initiatives and systematic evaluation could deepen these outcomes and provide additional insights.

3.8. Monitoring of activities in the economic sector

Methodology

The partner in charge of this WP was B4B, and the main results are detailed in their deliverable. This report provides a summary to offer a general overview.

In addition to B4B's activities, particular attention was given to the development of pet-friendly tourism initiatives. This included the organisation of dedicated focus groups, a series of webinars on the topic, and the preparation of two targeted reports - one for the hospitality sector and another for municipalities interested in developing pet-friendly tourism offerings.

As part of the IN-HABIT project, specific efforts were dedicated to promoting new forms of entrepreneurship related to the themes addressed by the participating cities (in Lucca the focus was the promotion of inclusive, well-being-driven entrepreneurship with a unique thematic lens: the human-animal bond as a vector for IHW). The economic focus of the IN-HABIT project in Lucca followed a two-sided approach.

On one hand, it involved activities carried out by B4B to support and stimulate private entrepreneurial initiatives by selected participants, with the aim of consolidating their business ideas for medium- to long-term sustainability.

In this regard, the year-by-year progress and the key achievements are reported in table 24.

Table 24. Overview of year-by-year progress and the key achievements

Year	Model	Results	Key outcomes
Year 1 (2022-2023)	Local in-person & online incubation	14 projects (24 entrepreneurs) → 21 entrepreneurs graduated (92.8% completion). Strong mentor pool: 14 engaged.	<ul style="list-style-type: none"> • Creation of a local community of entrepreneurs in Lucca. • High engagement of women (55%). • First ecosystem connections around animal-assisted well-being entrepreneurship.
Year 2 (2023-2024)	Fully online, expanded region-wide	9 projects = 14 entrepreneurs across Tuscany. 11 entrepreneurs graduated.	<ul style="list-style-type: none"> • Model scaled to regional level. • Maintained thematic focus on people-animal relationships. • Greater diversity of project types.
Year 3 (2024-2025)	Alumni support & community consolidation	15+ participants supported. Focus on training & ecosystem building.	<ul style="list-style-type: none"> • Shift towards sustainability & legacy. • 2 expert webinars co-hosted with alumna Barbara Bellettini, Municipality & UNIPI. • Strong institutional anchoring and public outreach.

Emerging from the B4B activities database, participants were mainly young to middle-aged women (75%), motivated to expand their business activities in the hum-animal field with specific projects and ideas. Some were already active in the sector and used the program to strengthen



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the organization of their ongoing initiatives, aiming to consolidate and scale them. The projects varied widely, ranging from educational activities for and with animals and their owners, to digital platforms and home-management services, innovative communication services (e.g. pet-owner photography), small-scale pet food production, and specialized social services involving animals for vulnerable populations.

Analysis	<p>On existing businesses offering pet-related services in the Lucca area (approximately 25, including pet shops, veterinary clinics, and service providers)</p> <hr/> <p>A review of declared pet-friendly tourism activities currently available in the Lucca area</p>
Engagement with key stakeholders, including:	<p>Tourism councillors of Lucca Municipality (both pre- and post-election phases)</p> <hr/> <p>Technical staff from the tourism department to develop communication & a database for local hospitality providers</p> <hr/> <p>Representatives from the Chamber of Commerce for the area (LU, LI, & PI)</p> <hr/> <p>President of the local association of tourism-related firms</p> <hr/> <p>Individual tourism enterprises</p>
Events and participatory focus	<p>Two focus groups with local enterprises and associations (one in person in Lucca Municipality and one online)</p> <hr/> <p>Three webinars with experts in pet-friendly tourism, providing detailed guidance and professional best practices</p>
Guidelines & manuals	<p>The production of 2 manuals - one targeting private businesses and the other public institutions - offering guidelines on developing pet-friendly tourist services</p> <hr/> <p>The creation of a <i>pet-friendly service map</i> for the Lucca area to support and welcome tourists handling animals during their travel</p>

Figure 28. Activities related to pet-economy & pet-friendly tourism in Lucca IN-HABIT. (elaboration from the authors)

On the other side, specific attention was devoted to the development of pet-friendly tourism initiatives. This secondary stream emerged early in the process - already during the initial IN-HUB activities - when the participation of local tourist guides highlighted the potential for organizing pet-focused tours and services in Lucca. Given Lucca's traditionally strong role in Tuscany's tourism flows, and the growing number of travellers accompanied by pets, the creation of a tailored offer appeared to address an emerging market segment. At first glance, organizing a pet-friendly tourism offer may seem straightforward. However, it proved to be more complex than initially expected. This complexity

arose from the specific needs and sensitivities of tourists traveling with animals - needs that span various aspects of the urban experience, including hospitality, daily itineraries, and the general attitude of residents toward animals. Developing such an offer requires coordination among a wide range of public and private stakeholders, each with distinct perspectives and roles. Building on this awareness, a series of targeted activities were progressively implemented, as indicated in Figure 28.

Municipality was engaged both politically (the dedicated Councillor participating in focus groups and webinars), and technically, providing support for communication and dataset preparation. Building on this input and the pilots carried out within the IN-HABIT project, a **Chart of services** was developed to inform both citizens and tourists about the services available in the city (Figure 29 a and b).



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Figure 29. a. Chart of services of the city of Lucca; b. Map of pet friendly services

While initially showing strong interest in the initiative, the Chamber of Commerce's engagement proved to be time-consuming and formal, with limited tangible follow-up or practical support. Representatives from the hospitality sector, including hotel owners, expressed **openness to discussing the topic** (they were present during the focus groups) and recognized the growing demand for pet-friendly services. However, concrete support for implementing such changes remained still limited. In response to these findings, the agreement was to organize a series of **webinars** focused on the **professional development of pet-friendly tourism services**. The three webinars on pet-friendly activities featured professionals operating in the sector and offered practical advice for structuring and delivering such offers effectively.

Given the relevance of the topic and the demand for specific support, specific **manuals** on how to develop pet-friendly tourism activities were also produced by the University of Pisa (UNUPI), in collaboration with professionals in the sector. These manuals were tailored to meet the needs of both private enterprises and public institutions. At the same time the agency for tourism at Tuscany Region has launched soon after a focus on this specific topic for further development. Manuals on the pet-friendly tourism has been exposed university' students as well as seminars were organised for the class in "Tools and methods for development of the human-animal relationships in contemporary societies" at Pisa University.

Main results: Throughout the different activities, the following aspects emerged: **A)** under the Italian system, municipalities face limitations in directly engaging with private economic activities, **B)** while municipalities play a key role in promoting the city and its attractions, their



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capacity to establish concrete partnerships with specific actors is restricted, **C)** nevertheless, the Municipality of Lucca recognised the **strategic importance of pet-friendly tourism** and the need to develop supporting facilities, **D)** pet friendly tourism require careful and professional planning due to their specific characteristics, **E)** effective pet-friendly tourism should integrate both private and public engagement under a shared and coherent policy, minimizing asymmetries and reputational risks, **F)** the pet economy can stimulate new ideas and attract young interest across diverse sectors, from ITC to innovative services and products, **G)** women consistently attracted to pet- and animal-related business opportunities.

3.9. Monitoring of the citizens' engagement

A restorative project should also aim to actively engage citizens through enjoyable and playful activities, fostering social interaction within the city and among individuals of different ages and social backgrounds. Following the initial co-design phase - and particularly after the change in local administration - targeted events were organized to engage citizens with the hum-animal concept. These initiatives gained momentum as the concept became more widely understood and political support increased. A detailed overview of these events is provided below.

19/09/2025 IN-HUB meeting at Real Collegio (Figure 30), provided an opportunity to present and discuss the state of the art and recent achievements of the IN-HABIT project in Lucca with IN-HUB participants, as well as to collect their insights and suggestions.



Figure 30. Flyer and photos of the IN-HUB meeting at Real Collegio

28/03/2025 IN-HUB meeting (Figure 31) with the presence of Federico Bertolucci, a well-known Italian cartoonist and author of the series “Love”, entirely dedicated to animals. The seminar highlighted the artistic process involving animals and their activities, and also explored the broader presence of both wild and domestic animals within the urban environment.



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Figure 31. Flyer and photos of the IN-HUB meeting with the presence of Federico Bertolucci

04-05-06/04/2025 Verde Mura (Figure 32): building on a well-established and highly attended event in Lucca, a dedicated space was organized to present the Hum-animal idea, gather viewpoints and suggestions, and share the board game with participants. Feedback was collected via a totem and post-it notes. Key suggestions included the demand for services dedicated to pet handling, improved access to public offices, clearer and improved rules for public transport, support and new services for pet management, involvement of schools, and fostering new habits in societal consideration of animals. Regarding the project itself, participants expressed very positive evaluations, describing it as a “*very nice initiative,*” “*a project able to positively affect the quality of life for both humans and non-human animals,*” and “*a lively and inclusive city.*”



Figure 32. Photos of Verde Mura event 2025

07/06/2025 “Festa dello sport” (Figure 33) event at the Serchio river park engaged participants through the “City Pets” Board Game and facilitated discussions, as well as the collection of information, related to the IN-HABIT project in Lucca.



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Figure 33. Photos of Festa dello Sport event

24/07/2025 event organized at Serchio river park (Figure 34) for children and their families (who also played the City Pets board game), dog owners who frequent the relational areas with their dogs, and various stakeholders.

A dog educator was present to answer owners' questions, and ice cream was offered to all participants. Simultaneously, a "speakers' corner" was set up to encourage direct involvement, giving attendees a voice through interventions from local NGOs, citizens, and users of the Hum-animal services installed by the project. Also, child with disabilities were involved in the event with a deep dialogue installed among parents, dog educator, prepared dogs, and especially one young boy, initially very scared and progressively attracted by the interaction with dog under the patient support of the educator.



Figure 34. Photos of the event at the relation area in the Serchio river park.



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Main results: **A)** the organisation of hum-animal-focused events proved engaging, even if challenging to manage, **B)** given the transversal nature of the topic, participants came from diverse neighbourhoods, social backgrounds, and age groups, **C)** families with children were consistently present, alongside older adults and middle-aged participants, with or without pets. These initiatives successfully captured attention and fostered dialogue among attendees. public was always transversally oriented in terms of neighbourhoods, social belonging, and ages, **D)** the events facilitated engagement and collaboration with NGOs and local institutions, creating opportunities for joint initiatives. Animals emerged as a crosscutting theme, serving as a catalyst and entry point for broader societal dialogue and networking.

3.10. Monitoring of biodiversity⁸

Urban green spaces are known to significantly improve health and well-being of urban citizens: research have shown that having access to green spaces boosts concentration capacity (Hussain et al., 2010), reduces health inequalities (Mitchell & Popham, 2008) and contributes to longevity (Takano et al., 2002) (Biodiverse cities Interreg project, 2024). Making green spaces more accessible and inclusive as it is the case in the IN-HABIT project means artificializing them and increasing their number of visitors, thus reducing the space available for biodiversity. To assess the impact of this change and make sure that green areas still fulfil their role as biodiversity preservers, it is necessary to provide project promoters with tools and methodologies aiming at assessing local biodiversity conservation status and identifying pressures. LEKO biodiversity detectors have appeared, in the framework of IN-HABIT, as very interesting tools and opportunities for equipping the City of Lucca with means of knowing which wild animal species inhabit the Fluvial Park and of understanding the eventual impacts that new urban elements (e.g. animal parks, new urban lighting infrastructure...) may have on them. The following section presents the information and results as communicated by Laborelec and LEKO.

3.10.1 Surveyed locations

The maps of the LEKO locations are reproduced below in Figure 36 and Figure 37. Their GPS coordinates are included in table 25. Due to the lack of sun exposure at the first location of the sensors, they had to be relocated as of March 2025.

⁸ This chapter has been made with the help of the partner Laborelec. The monitoring activity through LEKO sensors was carried out thanks to the close collaboration between the project partner Laborelec and the Municipality of Lucca, which jointly oversaw both the installation phase and the subsequent management and maintenance of the devices. The sensors were supplied and the data analysed by LEKO, responsible for data collection and processing.



Table 25. GPS coordinates of the two sensors in Lucca

Sensor/Period	January 2024 to March 2025	As of March 2025,
LEKO 100058	43.855429, 10.506238	43.853849, 10.503201
LEKO 100078	43.855245, 10.506691	43.854400, 10.504109

Methodology

LEKO biodiversity detectors (Figure 35) are fixed acoustic sensors that are recording sounds and ultrasounds in a wide range of frequencies and with a 100-meters range. They are powered by a system composed of a PV module and a battery, which ensures their autonomy and their ability to continuously record sounds and ultrasounds. Recorded sound data is regularly and automatically transferred to an online platform.



Figure 35. LEKO sensor description scheme (BIRDZ, 2025)

Using algorithms specifically developed by naturalist experts from the French Museum National d'Histoire Naturelle, a scoring system has been created by LEKO and audio data is analysed. This analysis results in the identification of animals belonging to several different species, including: 29 species of bats, 42 species of grasshoppers, 4 species of mammals, 8 species of birds, 9 other species, among which moths, glowworms and amphibians. The LEKO sensors record contacts of bat species and other animals, and bats data are mainly used for scores calculation regarding the main dimensions analysed. The amounts of specialist bat species and common bat species can be compared. According to the French ecosystem, there is a certain ratio of specialist species compared to "common" bats: this average has been attributed the grade of **10/20**. *When the ecosystem is degraded, the ratio of specialist species vs common bats is lower, so the grade is lower than 10/20. When the ecosystem is in good health, this ratio is higher and the grade is above 10/20.* Results of the identification analyses are uploaded on an online platform accessible to IN-HABIT WP3 project partners. The species identifications are presented in graphs displaying the amount of contact signals detected per date and are further translated into indicators aiming at characterizing the biodiversity conservation status in the area. These indicators especially aim at pointing the sources of pressure out, these pressures being: the pollution of surface water, the impact of light pollution, The quality of the tree cover.

An additional indicator, based on the diversity of detected species, aims at qualifying the ecosystem health. In January 2024, two LEKO sensors were installed in the Fluvial park of Lucca with the aim to assess the biodiversity conservation status in this area and the eventual impact of the dog park and additional lighting installed as part of the IN-HABIT project. For this objective, one LEKO sensor has been installed in the middle of the dog park while another LEKO sensor has been installed in a control area further away from the relational area and the light poles. The sensors have first been installed in trees to keep them inaccessible to the park visitors but due to the shade cast by the leaves that were preventing PV modules to load their coupled batteries, the sensors had to be relocated in 2025.



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Figure 36. Locations of the 2 sensors from 01/2024 to 03/2025 **Figure 37.** Location of the 2 sensors as of 03/2025

The surveyed site is an urban green area bordered by a busy road and surrounded by complex cultivation patterns area, discontinuous urban areas and residential areas. It also consists of a patchwork of water bodies, trees and hedges. The land covers maps are presented on figure 38. below.

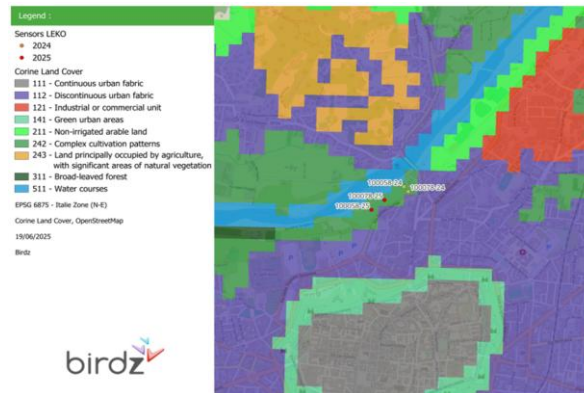


Figure 38. Land covers around the surveyed site

3.10.2 Surveyed Periods and species

Because of the installation time, the leaves growth during spring and the relocation process, the LEKO sensors have recorded data from January to May in 2024 and from March to June in 2025. Because the recordings took place in early spring, they mainly resulted in data about bats activity. Indeed, February to June are interesting months for capturing information about migrating bats in Europe. Over the two recording periods in 2024 and 2025, about twelve different bat species have been contacted in the Fluviale park of Lucca. Among those, two species (*Barbastella Barbastellus* and *Miniopterus Schreibersii*) are classified as vulnerable by the IUCN red list of threatened species (IUCN, 2025).

As a way to interpret the data recordings in terms of ecosystem health and environmental pressures, the LEKO platform displays some scores calculated by aggregating the abundance of



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some specific species over a certain time period. As indicated in methodology lower the score and lower the quality of the condition supporting biodiversity.

Especially, the light pollution score reflects the presence/absence of light-sensitive bat species. The surface water quality reflects the presence/absence of water-attracted bat species, and the tree cover score translates the presence/absence of forest bats. Globally, the ecosystem health score showcases the presence of specialist species. Placed at their first location, the two LEKO showed some differences in their scores, gathered in table 26 below.⁹

Table 26. LEKO recordings scores results - first recording period (January 2024 to March 2024)

LEKO number	Area installed	Scores (out of 20)		
		Ecosystem health	Light pollution	Tree cover
100058	Reference – dark isolated area	15.3	4.0	3.0
100078	Monitoring – dog area	16.6	4.9	3.5

These results could tend to reflect that **the lighting and trees coverage are the most impacting elements on the existing biodiversity in the monitored places.** The value of ecosystem health is in any cases over 10 (considered as the balance for negative -below- and positive conditions). **In all cases the ecosystem health presents a score that can be indicated as positive while the higher frequentation of the dog area has a limited negative effect on the biodiversity health, differences are not very high and should be confirmed by more recordings.**

During this period, the LEKO installed in the reference area recorded the presence of nine different bat species (confirmed recordings) among which *Miniopterus Schreibersii* while the other LEKO contacted five bat species and no vulnerable one. Placed at their second location, the two LEKO also showed some differences in their scores (Table 27). Once again, these differences could be explained with the proximity of the children playground with one of the two recorders although it seems to have an influence in terms of light pollution and tree cover, much less when ecosystem health is observed. Also in this case data would have to be confirmed with a longer time recording.

Table 27. LEKO recordings scores results - second recording period (March 2025 to July 2025)

LEKO number	Area installed	Scores (out of 20)		
		Ecosystem health	Light pollution	Tree cover
100058	Reference – south of the plains, near the playground	17.8	3.8	3.0
100078	Monitoring – north of the plains	16.6	6.7	5.1

⁹ Because the Serchio river is 150 meters away from both LEKO recorders, the surface water quality is not considered as a relevant indicator for differentiating the two locations.



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During this period, the LEKO installed in the area near the playground recorded the presence of eight different bat species (confirmed recordings) among which *Miniopterus Schreibersii* while the other LEKO contacted located further away recorded eleven bat species, among which both *Barbastella Barbastellus* and *Miniopterus Schreibersii*.

Early data from the LEKO activity provide initial evidence - although further evaluation is needed - of a potential trade-off between the presence of pets in dedicated areas and the wild animals (in this case, bats) inhabiting those spaces. Factors such as lighting and tree coverage appear to be the most influential for both dog areas and playgrounds. While the data are not yet conclusive, the observed interactions are understandable and **do not indicate any significant risk to the coexistence of wild fauna and human-pet activities.**

As with many human activities, the presence of companion animals interacting with humans requires careful harmonization within natural environments. Although the monitored trade-off does not provide definitive conclusions, it highlights the need to plan coexistence strategies in response to the growing presence of companion animals in urban areas. Concentrating pets in specific areas may help minimize their broader environmental impact, and regulated access to these spaces appears to pose no significant risks to wild animals. Conversely, allowing pets to enter wilder, less controlled areas may present challenges, which require further monitoring and study. Designing areas with trees, flourishing local vegetation, and innovative waste management solutions (e.g. dog waste disposal) can help preserve environmental quality, support insect and bird populations, and mitigate potential negative effects related to lighting and noise.

Main results: **A)** coexistence among diverse human-animal activities must be carefully considered, taking into account the presence of multiple animal species and the potential risk of biodiversity loss, **B)** planning dedicated areas for human-animal interaction allows specific measures to reduce noise impacts and enhance coexistence, including appropriate lighting and tree coverage. This applies broadly, including areas used by companion animals, **C)** special attention should be given to lighting systems designed to minimize light pollution, which can negatively affect biodiversity, **D)** compensatory measures can also be implemented to support a well-integrated hum-animal urban policy.



3.11. The upscaling process

Methodology

Upscaling was organised by following diverse directions as indicated below:

- Animal Assisted Interventions (AAI) carried out in nursing homes for the elderly were replicated, with additional efforts to engage local health authorities and explore institutional integration, leveraging existing local funding.
- Educational activities were extended to primary and secondary schools in the Pisa area, promoting awareness and engagement among younger demographics, primarily using resources from the UNIPi and local partners.
- Co-design activities: university students at both undergraduate and master's levels participated in co-design efforts, fostering academic involvement and cross-sector dialogue.
- A targeted effort was made to evaluate the potential for national and inter-city replication through meetings and interviews with national stakeholders and municipal councillors.
- Specific sessions engaged both private (for-profit) and non-profit actors to explore opportunities for broader partnerships, knowledge sharing, and dissemination.

The upscaling of the Lucca IN-HABIT project was structured around two main strategic directions (see also D.3.5). The first regarding the concept of a city able to adopt a diverse perspective looking at the human-animal bonds, the second involving the replication of individual pilot initiatives in different contexts. We already

outlined the main results achieved through the transformation process initiated by the IN-HABIT Lucca project. Beyond the outcomes of the individual pilot initiatives, the overarching concept of an *integrated hum-animal urban policy* - its defining features, pathways, and potential - was codified and compiled into a dedicated report/manual.

AAI in public institutions	AAI with elders in 5 specific nursing homes in Pisa area Research grounded activities in Florence area in collaboration with Careggi Hospital Intervention in Pisa centre for detention
Educational activities with schools	4-year editions with school in Pisa at Dept. of Veterinary Sciences with Associazione Ciardelli Seminars and direct involvement with secondary school in Pisa
University activities	Introduction of a specific degree course including the IN-HABIT project and the hum-animal concept Co-design involvement in classes at Dept. of Veterinary Sciences and Architectural engineering courses Specific classes with specialising master' courses in Education and in Sustainability in 3+3 editions and PhD transversal course PhD thesis + 1 bachelor and Master thesis discussed on the topic
Events & communication	Bright night presented to citizens in seminar and among cases VQR Pisa university case presented for national evaluation as third mission Seminars on AAI in Pisa, Milan and Padova Interest from Universitèe Loyola Paris
Engagement of public stakeholders:	Municipalities of Pisa, Massa, Pesaro, Latina, Rome, Bogotà, Medellin Tuscany Regional government ANCI Toscana Italia member of the Italian Senat, introduction of the topic in DDL 225/2025
Dialogue with private enterprises and NGOs	Legambiente Lombardia and national Architects & Private building companies involved in urban regeneration
Established agreement	National school for dog for blinded people Polo tecnologico Navacchio SSS Anna University for start-up in pet economy

The objective was at the same time to distil and consolidate the project's achievements (see D8.17 and D3.5) as well as to present the innovation to other potential stakeholders.

Transformative processes are inherently long-term and rarely linear. In many cases, innovation originates within a specific context - as in the case of the IN-HABIT hum-animal concept in Lucca - and can subsequently be adopted, adapted, and scaled to other cities and contexts. From this perspective, both redundancy and the ability to "seed" diverse environments can enhance the potential for successful upscaling.

Figure 39. Upscaling initiatives of the solution tested in Lucca IN-HABIT. (elaboration from the authors)

To assess the potential of the Lucca hum-animal city concept and A-NBS, the



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WP3 partners initiated an upscaling process through multiple complementary pathways (Figure 39).

The following section outlines the **main steps and activities** undertaken, followed by a presentation of the **key results that emerged**.

3.11.1 Upscaling in Health institutes initiatives

In the Pisa area, the Dept. of Veterinary Science research group initiated the upscaling process by **engaging NGOs and public health institutions** with the aim of replicating selected pilots from the IN-HABIT Lucca project.

A major milestone in this process was the **congress on AAI in healthcare institutions, organised by the Dept. of Veterinary Science** in Pisa on 15 November 2024 also under the frame of the IN-HABIT project (Figure 40 a and b). The event brought together actors active in both the human medical and AAI sectors at regional and national levels. **Presentations by social operators directly involved in the Lucca nursing homes** were particularly impactful, demonstrating the feasibility and potential of AAI, recognising the work carried out in Lucca. It also served to acknowledge the achievements in Lucca and to bring together many of the key national stakeholders in the field.

Upscaling in Health-Institutes

In organizing this activity, the research group leveraged parallel nationally funded projects, which provided additional support alongside IN-HABIT resources. A series of **meetings** and **initiatives** were conducted with both public and private actors. Particular attention was given to the local health authority, the *Società della Salute*, which in Tuscany acts as a bridge between social and health policies at the local level. Meetings were held with the Director of the *Società della Salute* for the Pisa area in June and July 2024.

Simultaneously, NGOs and local institutions managing nursing homes for the elderly were engaged. These dialogues highlighted certain institutional barriers, particularly in discussions with the Director of the *Società della Salute*. While fully supportive of implementing AAI in elderly care facilities, the Director reported being constrained by urgent political and budgetary challenges, as well as by a recent local reorganization of the health system. This situation underscored the gap between the potential effectiveness of interventions and the practical opportunities for implementation.



Figure 40. a. Flyer of the congress on AAI, b. Attendance at the event.



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Across all discussions, there was a shared recognition of the innovative potential of AAI in addressing health and social needs, particularly for vulnerable populations. and fostering convergence among national-level stakeholders - including the **National Institute of Health** (based in Rome), the **National Reference Centre for AAI** (based in Padua), and other active project leaders. The congress revealed strong interest in expanding AAI into diverse contexts, establishing a legal framework for the practice and its providers, and strengthening scientific research and evidence on AAI. The congress marked an important step toward new collaborations.

Table 28 provides a summary of the activities carried out, outlining the main organizational aspects and key achievements.

Table 28. Upscaling initiative in various Health institutions in Pisa and Florence area. (elaboration from the authors)

<p>Upscaling in daily centre for disabilities Between October 2024 and March 2025, in collaboration with “Do.Re.Miao – Associazione di Promozione Sociale” - one of the associations active in Lucca’s IN-HABIT project - a programme was implemented at a day centre for people with disabilities in the province of Pisa.</p>	<p>Twelve sessions (approximately 45 minutes each) involved around 12 young adult participants, always with at least one dog and its handler. Activities included: a) Interaction activities – petting the dogs and giving them treats; b) Observational activities – watching dogs perform olfactory/object discrimination and problem-solving tasks; c) Motor skills activities – playing with and walking the dogs, when possible.</p>
<p>Upscaling in nursing homes for elders From March to May 2025, AAI was replicated in three nursing homes in Pisa (“R.S.A. Matteo Remaggi”, “R.S.A. Casa Mimosa”, and “R.S.A. Umberto Viale” managed by PAIM Cooperativa Sociale). This project was carried out under the direct economic support of the institution themselves. In their case there was a clear interest in improving the activities offered to elders in their nursery homes, but also to receive the scientific support of the research time to better codify the activities and to monitor the results.</p>	<p>Across 48 sessions (equally divided between the three facilities), around 35–40 elderly participants were engaged, organised into four groups. Each facility hosted two weekly sessions lasting approximately one hour, always in the presence of the dog and its handler, with group sizes ranging from 5 to 15 participants. Dog welfare and participant outcomes were monitored by a veterinary PhD student and a researcher from the University of Pisa at the start, midpoint, and end of the project. Activities included: a) Interaction activities – petting the dogs, giving treats, and using adapted tables for bedridden participants; b) Observational activities – watching dogs perform tasks with their handlers, including problem-solving activities; c) Motor skills activities – walking the dogs and promoting arm and hand motor activity through the use of a grooming brush; d) Cognitive and emotional stimulation - exploring dogs’ non-verbal communication, evoking memories, and stimulating emotions.</p>
<p>Upscaling in nursing homes for elders Two additional nursing homes in Florence (“R.S.A. Il Gignoro” and “Residenza Anni Azzurri Beato Angelico”) were also monitored in AAI projects between February and June 2025.</p>	<p>The latter project was conducted in partnership with the “Scuola Nazionale Cani Guida per Ciechi”, with whom the University maintains an ongoing collaboration. Activities mirrored those of the Pisa nursing homes, with the addition of dog-care tasks such as preparing the dog’s water bowl. A total of 9 and 12 sessions, lasting 30 and 40 minutes each respectively, were conducted between 05-06/2025 and between 02-05/2025.</p>

The activities in the health institutions supported a line of research within the IN-HABIT project has laid the groundwork for new AAI projects, including one set to begin in September 2025 in the Rheumatology Unit of the “Azienda Ospedaliero Universitaria Careggi” in Florence.



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In Pisa, during the past year, an AAI project was implemented in a prison setting, involving both male and female groups, and coordinated by one of the associations engaged in IN-HABIT activities in Lucca.

Further discussion and agreement are on-going between the University of Pisa and the school that trains dogs for visually impaired individuals.

3.11.2 Upscaling in School initiatives

Some of the single pilot initiatives were replicated in different contexts, both within and beyond Lucca. This was the case for the educational activities, which were expanded in number and implemented in several primary and secondary schools in the Lucca area. In parallel, specific events in Pisa provided further opportunities for dissemination. In particular, the Ciardelli Association - organising each year a large-scale event involving all local schools and research centres - hosted activities where schools engaged in discussions and co-design exercises on the hum-animal city concept. These activities began in 2020 and continued annually through 2025, involving approximately 180 students over multiple editions. In the most recent year, secondary school students won an award for their proposals related to the hum-animal city.

The activities carried out in schools yielded different results depending on the target audience and the type of activity implemented. The upscaling process in the Pisa area proved fruitful and provided valuable insights into how students respond to innovative, animal-related initiatives—showing high levels of interest and engagement. In particular, the co-design activities organised with secondary schools using the Design for Change (DFC) methodology were especially productive, both in terms of outputs and participant experience, as reflected in student feedback.

The point of view of young students in participatory DFC activities

Following the 4-hours sessions participatory teaching with secondary school students, the main comments reported were as follows “*During the day we learnt a lot about the outcome we can build around a growing hum-animal relationship in terms of quality of life for all and for the provision of innovative services for humans. To actively work in well guided groups of us in a new environment took us to reflect deeper in a pet-friendly perspective but also to look with new eyes on the relevance of team-work for everyday life. Also the proposals emerging from each group were very well organised and presented, allowing us to growth personally ad as citizens*” (from the common report of the 3LN dell’Istituto Santoni - Gambacorti, Biotecnologie Sanitarie e Sistema Moda)



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3.11.3 Upscaling in University courses

University students were engaged in discussions on A-NBS and the hum-animal city at multiple levels. From the earliest stages of the idea (as described in Chapter 3.2.1), undergraduate students participated in mapping potential stakeholders for a (at that time) *hypothetical hum-animal city*. Since then, a **dedicated course** has been adapted to integrate the *methods, tools, pathways, and lessons learned from the Lucca IN-HABIT project*, and is now part of the **standard curriculum for a degree programme**. Moreover, two PhD students conducted their research directly based on the Lucca Hum-animal project and defended their dissertations in February 2025. Three students were involved in preparing their degree theses on the topic (today two already discussed), extending the A-NBS framework to include initiatives such as engaging autistic individuals in sporting activities with dogs and applying the hum-animal concept to rural communities. Additionally, the topic was introduced in several **master's programmes** - one on sustainability, another on One Health, and a third for educators in schools and the social sector - attracting approximately 160 master's students across different editions. The IN-HABIT case was also presented in 3 cross-disciplinary PhD training courses at the University of Pisa, as well as in other universities, introducing around 100 doctoral students to transdisciplinary approaches and Responsible Research and Innovation (RRI) concepts. University students were involved not only in classroom activities, but also in participatory processes, including the co-production of a manual for the hum-animal city and a charter of principles for municipalities. In addition, they carried out specific projects through group work at the local or firm level, with approximately five projects developed each year over the past four years.

An integrating and hybrid concept

Much of the hum-animal concept emerged through the integration of scientific and educational perspectives. Teaching socio-economic topics to students aspiring to work in the human-animal bond sector proved challenging, stimulating, and creative at the same time. The underlying idea was that there is considerable scope to expand the provision of public goods related to the hum-animal concept, and that young students (predominantly women in our case) could play an active role in this small-scale revolution. By combining diverse competences within an innovative framework, they could help mobilise human resources to improve inclusive health and well-being in urban settings, and beyond. From the outset, the project also aimed to identify new competences and professional roles for trained individuals in this field. This led to the proposal for a specialised **Urban Pet Policy Manager** - a professional figure dedicated to planning and supporting transformative processes at the urban (and potentially regional or national) level. Entry points into the topic can be highly diverse, ranging from social sciences to psychology, from urban planning and design to sustainability, and from in-depth knowledge of animal habits and behaviour to community engagement. This crosscutting nature allows the subject to be elaborated and enriched by a wide variety of skills and disciplines. This interdisciplinary approach was clear during master's-level activities, where students with very different academic backgrounds were able to examine the topic from complementary angles.

"As a teacher I remember there was a student in an online class who kept the camera on, and behind her was what appeared to be a fashion setting. When I asked about it, she explained that she was exploring ways to connect fashion and sustainability with the emerging needs of pet owners."

This anecdote illustrates the potential for multiple forms of cross-fertilisation, which can be harnessed by younger generations who are open-minded, skilled, and ready to innovate.



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Beyond formal teaching, the University of Pisa regularly promotes research through the “Bright Night” initiative, which fosters **open science and dialogue between citizens and researchers**. In this context, the Lucca hum-animal project was showcased and discussed, and the “City Pets” board game was played in public spaces in Pisa with citizens. Also, open seminar was offered to the public by UniPisa’ researchers. Finally, in the most recent national evaluation exercise for research and third mission activities (2020–2024), the University of Pisa selected approximately 10 **flagship cases**, among which the Lucca hum-animal IN-HABIT project was included, formally codified, and presented according to the existing forms and presented in a public event organised by Pisa University in the main historical university building (Figure 19).

3.11.4 Upscaling in prisons

In Pisa, during the past year, an AAI project was implemented in a prison facility, involving both female and male groups. The initiative was led by “Do.Re.Miao – Associazione di Promozione Sociale”, one of the NGOs active in Lucca within the IN-HABIT project. As a research partner, we were directly involved in planning and supporting the activities carried out by participating NGOs in prison settings in both Pisa and Livorno. In each case, trained dogs were introduced into group-based activities designed to facilitate social contact and dialogue among inmates, as well as between inmates and the educators supporting the interventions. In addition, targeted activities focusing on animals were organised to explore participants’ perceptions, emotional bonds, and interest in human–animal interactions with positive feedback from the participants involved.

AAA in detention centre in Pisa

Between October and December 2024, a total of 20 sessions were delivered, equally divided between the two groups (women and men) and involving approximately 20 participants overall. Each group attended one weekly session lasting about 45 minutes, always in the presence of at least one dog and its handler. The welfare of the dogs and the impact of the activities on participants were systematically monitored by researchers from the University of Pisa, including through participation in focus groups. The AAI sessions included: a) Interaction activities – petting the dogs and giving them treats; b) Observational activities – watching the dogs perform olfactory/object discrimination and problem-solving tasks; c) Physical and motor activities – playing and exercising with the dogs, as well as assisting handlers in preparing olfactory and problem-solving games for the dogs; d) Theoretical lessons – covering topics such as canine education, key aspects of canine behaviour, and the management of major veterinary emergencies in dogs. Focus groups were organized by first collecting individual reflections using post-it notes, followed by a structured discussion in which participants shared and debated their thoughts.

During the IN-HABIT project, three additional experiences were carried out in different prisons with distinct participant groups.

A dedicated focus group was conducted at Don Bosco Prison to evaluate the outcomes of the animal-assisted intervention project. Participants responded to three key questions through individual notes and group discussion. Overall, the project was described as positive, enjoyable, useful, and educational. Participants expressed nostalgia for their pets at home and valued the time dedicated to both them and the animals. The activity was praised both for its professional delivery and for its impact on interpersonal relationships, fostering dialogue and connection among participants. It also enhanced technical awareness of animal management and provided personal benefits, such as greater patience, emotional regulation, and reconnection with past positive experiences



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The prison experience, while brief, was not unique. In previous years, members of the research group had engaged with Gorgona Island, a prison where detainees participate in animal management activities. Within these specific environments, topics related to animals - including their care, management, and the detainees' personal experiences with pets - emerged prominently. In most cases, the presence of animals served as a central point of discussion. (Figure 41). Most of the people involved started by mentioning their relationship with home pets, their positive interaction with them and the attention they deserve to the pets. They also mentioned the activity run with dogs in the prison with the NGOs (with the members of the NGO they build an open and confident interaction as much as possible for the specific place in which the activities were run). Also, the activities with the NGOs and dogs represented an opportunity to have a space totally different from the existing hard routines of the prison, so useful to better accept their temporary situation in the jail. The project was perceived as a valuable resource for prison life organization, for connecting inside and outside the facility, and for building ongoing opportunities in volunteering and animal care.

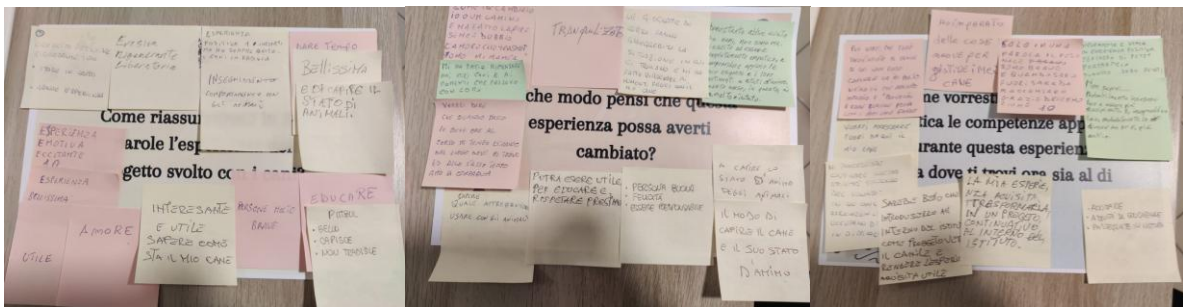


Figure 41. Key themes identified during the focus group

3.11.5 Upscaling with national stakeholders

One of the key objectives of the WP3 partners was to assess and understand the institutional response to the hum-animal concept, particularly from city- and regional-level authorities. In addition to this institutional focus, engagement was also extended to national associations and private enterprises through targeted online meetings. To pursue this objective, a range of activities were organised and are currently under development, including:



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- At city level with the municipalities of: Pesaro, Massa-Carrara, Pisa, Rome, ANCI (National Association of Cities in Italy) Toscana
- At regional and national level: Tuscany Region, ANCI Italy, Legambiente Lombardia, Legambiente Italy, Member of the Italian Senate, building private enterprises involved in cities regeneration plans, the National Institute for Health, the reference Centre for AAI.

Additional activities are planned and are currently in progress. A questionnaire has been developed to be distributed to Italian municipalities with the aim of assessing their awareness of, and openness to, adopting a human-animal policy. An English version of the

questionnaire has also been prepared for distribution to members of the sister cities network, to gather further comments and perspectives. The hum-animal concept had already been introduced to these stakeholders during a joint event held in Brussels.

Contacts with municipal councillors were established to explore their level of interest in the hum-animal city concept and to assess its potential adaptation and relevance in contexts beyond Lucca. Further institutional engagement included establishing a connection with ANCI Tuscany, which facilitated a meeting with the regional office for the environment, as well as organising a policy brief with the President of the Tuscany Regional Council. When discussing the possibility of introducing the hum-animal city concept into their own contexts, **regional-level actors expressed strong interest** in developing a specific policy to promote this new approach, as directly announced during the policy brief. The Tuscany Region had already supported similar community-oriented initiatives in the past, such as the “100 Gardens in Tuscany” programme to encourage social interaction in urban areas. At the national level, follow-up contacts with ANCI Tuscany and ANCI Italy are ongoing, along with initial exchanges with the Vice-President of the Italian Senate Commission for Health and Social Affairs. Most of these interactions were made possible either through the direct interest of the counterparts or via internal networking channels.

The dialogue with municipalities and public authorities

In some cases, individual councillors were interviewed (e.g. for Pisa and Pesaro), while in others, broader meetings were organised — such as with the Councillor for the Environment and the entire Environmental Commission of the Municipality of Massa-Carrara. In Rome, discussions were held with the staff of the Environmental Councillor, who engaged with UNIPI researchers on the topic.

An interesting difference emerged between contexts where politicians were directly involved (e.g. Pesaro, Massa-Carrara, and Pisa) and those where technical staff participated (e.g. Rome and the Tuscany Region’s Department of Environment). Politicians tended to adopt a broader, more strategic perspective - generally positive but conditioned by resource availability - whereas technical staff tended to focus on existing routines and current mandates.

Feedback from the Vice-President of the Italian Senate Health Commission was particularly encouraging: *“The idea is brilliant. We should implement a different approach to prevention and proactive engagement of people - not only in big cities, but also in small and medium-sized ones - and human-animal interaction has great potential.”* This statement was accompanied by an expressed interest in presenting the hum-animal concept and upscaling the project at national level, expanding the pilots to other cities.



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3.11.6 Upscaling with private for-profit and non-for-profit organisations

To better explore the potential of engaging private actors, three in-depth interviews were conducted: two with representatives of the environmental association Legambiente - one at the regional level (Lombardy) and one at the national level - and one with an architect specialising in urban planning at both national and international scales, along with a private construction enterprise operating nationwide in urban regeneration projects. From the outset, it was evident that the entry points and perspectives varied considerably among the interviewees. Nevertheless, the initial reactions from both the architect and the construction company were broadly similar: The position of Legambiente was notably different. Legambiente Lombardia was approached due to its proactive engagement in the “Parco Sud” area near Milan, while Legambiente Italy was selected because it has, for the past 5/6 years, organised an annual event to monitor and award the most pet-friendly cities in Italy. In both interviews, the hum-animal city concept was received with interest and curiosity, although their primary focus remains on animal protection rather than on A-NBS as potential public good providers. Nevertheless, particularly at the national level, there was clear openness to collaborate on the topic. Ongoing discussions include the joint launch - together with the University of Pisa - of a survey to investigate the potential of the hum-animal city concept at a national scale. The same survey is intended to be adapted for implementation at the EU level.

Meeting the hum-animal perspective some reaction

Architect: “indeed, there are also animals. We have never considered them in our building plans, but it is true that we should take them into account more carefully”

Building company: “We are designing many green spaces as part of our urban regeneration plans, but we have overlooked the inclusion of animals in our public”

A similar reaction emerged during the final event in Córdoba, where a representative from a private company was invited to present their monitoring methodology for assessing the quality of urban planning - considering environmental and quality-of-life parameters - but without having ever considered animals in cities, unless explicitly requested.

Main results: **A)** across all engagements, **interest in the topic was consistently high.** **B)** the management of companion animals, and of animals more generally, is receiving increasing attention from both citizens and local administrations, **C)** the hum-animal city concept and the idea related to A-NBS attracted strong interest from all participants in the activities, **D)** while most municipalities currently focus on aspects related to the management of pets and wild animals, and on providing services for private owners, less attention has traditionally been given to the idea of A-NBS as providers of public goods, although the novelty of the concept clearly captured their attention, **E)** at the municipal level, administrations are more directly involved in the implementation of an integrated hum-animal policy. Their stance combined genuine **interest with concerns about the need for dedicated resources,** **F)** however, discussions revealed that



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beyond the question of additional funding, there is considerable potential in rethinking existing urban policies through a hum-animal lens. Examples include designing new green areas to incorporate human-animal interactions, adapting waste management systems to allow innovative disposal of pet waste, establishing dedicated spaces on beaches, and integrating AAI into social policy frameworks, **G)** the primary barrier identified was not the lack of resources, but rather the complexity of developing an integrated policy and achieving alignment across all municipal departments, **H) targeted funding policy from regional, national, or EU sources could facilitate the innovation process**, particularly in its initial stages, **I)** all actors expressed openness to the idea of establishing a specific professional role (an **Urban Pet Policy Manager**) to guide and support this transformative path. In the case of a large city like Rome, the complexity naturally increases due to the greater number of spaces and intervention areas, **I)** some measures aligned with a hum-animal policy are already underway there, such as the creation of a public veterinary hospital for residents in need, and the redevelopment of certain spaces for human-animal interaction. However, these actions remain framed within a traditional, fragmented vision rather than a coherent hum-animal city policy.

4. Discussion

This chapter presents the key themes that emerged from the IN-HABIT Lucca project, focusing on its main outcomes and expected impacts.

The IN-HABIT project in Lucca represented a long (also if not enough) journey, spanning from the initial concept and first co-design initiatives to stakeholder consensus-building, pilot implementation, and subsequent monitoring and evaluation activities. This journey addressed a highly crosscutting and innovative topic, as illustrated in the following diagram (Figure 42).

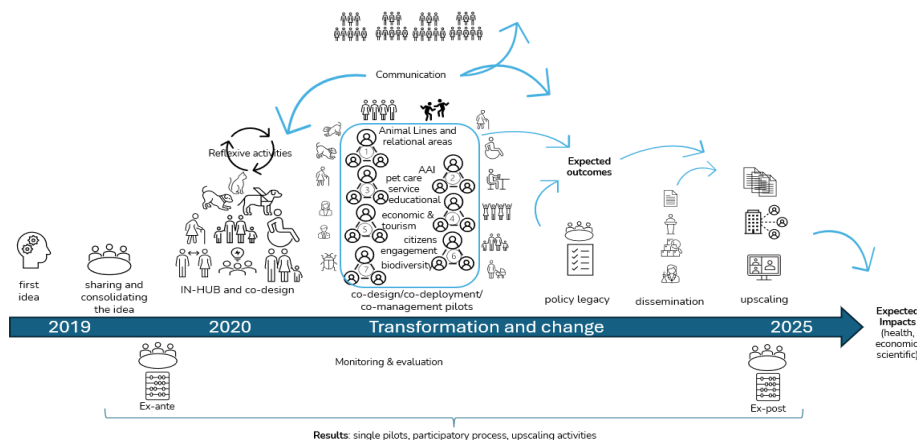


Figure 42. Overview of the IN-HABIT process in Lucca (elaboration from the authors)



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Given the pioneering nature of the hum-animal and A-NBS concepts, the project evolved significantly, from a preliminary idea proposed by the University of Pisa research group to a shared and enriched vision. This was made possible through the direct involvement of the local WP3 partners (Lucca Municipality and Lucca Crea) and further supported by the continuous engagement of the IN-HUB throughout the project. The piloting activities, and their corresponding outcomes, provided concrete evidence of the concept's relevance, potential benefits, and scientific value. These results enabled dissemination through local and national media, participation in national events, and contributions to international scientific platforms (such as journals, conferences and seminars). While previous chapters have focused on specific pilot results and outputs, this section highlights how the Lucca experience established a transferable and scalable framework that can continue to inform similar initiatives in other cities and contexts.

4.1 Lessons learnt from the Lucca case

There were many key lessons learnt from the IN-HABIT journey in Lucca:

- **Animals in the cities:** they are always present although in diverse cultural and geographic contexts, ranging from wild animals and food-producing animals to companion animals. In an integrated hum-animal urban policy, all these aspects should be considered together to ensure balanced coexistence and policy coherence.
- **Relevance of animals as actant:** according to actor network theory, animals in cities can be considered actants. While they cannot directly advocate for their rights and needs, they can influence the debate and be integrated into an agency perspective. Stakeholders can participate in the process while recognising the different agency roles that animals implicitly occupy.
- **The transformative process:** the IN-HABIT project, in line with the objectives of the EU call, activated transformative processes across the four cities, including Lucca, by implementing long-term experimental interventions in real-life environments. This approach enabled the establishment of five-year Living Labs, offering a unique opportunity to learn directly from the process and to assess, on-site, both the achievements and the challenges arising from the introduction of radically new solutions, along with the associated constraints and potential strategies to advance the implementation pathway.
- **Achieving results:** the final activities, solutions, results, and outcomes were inherently influenced by administrative, cultural, and societal contexts, as well as by unexpected events such as the COVID-19 pandemic and inflation triggered by geopolitical crises. In this context, only those hypotheses and pilot actions that were collectively accepted could be implemented, reflecting a process of constant negotiation among stakeholders. The Lucca experience showed that all solutions were shaped through a collaborative process grounded



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in local knowledge and contextual conditions. As a result, other cities might achieve different results - whether positive or negative - depending on their unique circumstances.

- **The research activities and groups:** the participatory and negotiated framework have implications for the design and implementation of research activities. Since pilot actions were defined progressively together with stakeholders, organizing the necessary expertise for evaluating expected results and outcomes often required significant coordination across multiple disciplines, as well as negotiation and consensus-building among researchers from diverse fields. In Lucca, particular efforts were made to involve medical scientists for the evaluation of AAls, and to support the co-design of hard VIS. The composition of multidisciplinary expertise within the research group is key like in the Department of Veterinary Sciences (UNIFI), which organised collaboration between veterinary, socio-economic, and engineering competences.
- **The potential of a restorative city with A-NBS:** the IN-HABIT Lucca pilot made it possible to test for the first time in Italy and in EU the potential of the A-NBS as tools to improve public goods provision in urban contexts. There was no evidence in the scientific literature at international level. From this point of view, it opens avenues for further reflection of how cities might be restored through A-NBS, and how they can contribute to the vision of the New European Bauhaus in different ways, by reshaping green and blue public spaces, making cities more playable, active, open to dialogue among inhabitants, healthy, inclusive and sustainable, facilitating coexistence among diverse animals (wild, food-producing and companion) and human activities.
- **The interest from different parties about animals:** what clearly emerged in Lucca is the transformative potential of the animal-based approaches to generate win-win solutions throughout the urban transition process. Initially, a demanding cultural shift occurred to look at animals as a potentially public (and public goods providers) resource. Once this perspective was internalized, it becomes easier to build consensus around specific initiatives and activities.
- **Political rewards** for the municipality cannot be given for grant and evolve along the process. In Lucca the hum-animal vision was embraced at the very beginning as an opportunity, it was then seen as not politically advantageous during the elections phase by the candidate of the coalition governing the city. After the vote, and thanks to incoming evidence of the pilots it progressively increased, contributing to the continuity and legitimacy of the innovation process.
- **The participatory process:** sustaining attention over a long-term process is inherently difficult. In Lucca, this challenge was compounded by the COVID-19 pandemic and the local election period. To overcome such obstacles, and to move deeper in the co-deployment phase the participatory process was fragmented into thematic stakeholders' clusters (i.e.



AAI, pet care, education, tourism), each contributing to distinct project components. While this approach introduced some fragmentation, it ultimately enabled the development of a broad array of initiatives that together constituted the foundation of the hum-animal city concept.

- **Two-sided participatory process for an integrated hum-animal urban policy:** the participatory process should be understood from a broader perspective. In the Lucca case, participation was essential not only among the city's diverse stakeholders, but also, thanks to the "icebreaker" role of the proposed solutions, among councillors and technical staff across different municipal departments. From this perspective, the innovation had two dimensions. On one hand, the **social innovation** process allowed the mobilization of unexpected resources by engaging diverse stakeholders around the new hum-animal/A-NBS concept. On the other hand, **institutional innovation** played a key role in supporting and stabilizing these solutions, laying the groundwork for their future upscaling.
- **Enabling institutions:** in the case of Lucca, the participation of the municipality was key, and it was integrally part of the research process. This final evidence was the result of a continuous process of negotiation and mediation among the three local partners involved. A process also able to progressively converge from the starting - sometimes diverse - entry points of the research-public-private partnership members.
- **The high potential of animals for humans:** the Lucca project tested some of the solutions that might enhance the inclusive health and well-being for both humans and animals. A scientific literature review conducted by the project underscored the flexibility and potential of what we introduced in the scientific debate as A-NBS.
- **The uncovered potential of A-NBS:** In Lucca the mediation process necessarily chose some of the suitable existing possibilities. However, the range of potential solutions remains much broader and can be tailored to different city circumstances based on local needs, cultural and administrative attitudes, as well as the actors involved. From this point of view, the hum-animal city might explore different potential resources to fit existing societal demands and needs according to the way the local process can take shape. This is not new of course, but in the case of the hum-animal city and the A-NBS solutions, due to their cross-cutting perspective, they might be adapted to very different people and types of solution.
- **Hum-animal cities vs hum-animal solutions:** the project began focusing on smart cities, how to redesign public spaces and participatory processes to promote inclusive health and well-being for the citizens, particularly for vulnerable groups. The Lucca hum-animal city, with its results and outcomes, offered some insights also useful for other cities and public and private stakeholders operating at various scales. In Italy, big cities are becoming a less favourable environment for the everyday life of many people due to their costs of living, access to housing, security and sustainability concerns. Medium and small cities, like Lucca,



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are still maintaining - and in the next future might grow - interest in terms of affordability and quality of life for the citizens. Because of their crosscutting and adaptable nature, hum-animal/A-NBS solutions might be meaningfully implemented across various contexts both urban, periurban and rural one, as illustrated by an ongoing thesis project of a student from the Dept. of Veterinary Science, which is trying to demonstrate by applying the hum-animal concept in a rural area close in the mountains of the Lucca province. This underscores the flexibility and adaptability - *mutatis mutandi* - of the hum-animal concept and A-NBS.

- **Upscaling initiatives:** it proved easier to replicate individual pilots and secure agreement around them than to address the topic at a broader, city-wide scale. Activities in schools, universities, and nursing homes for the elderly were relatively straightforward to implement. By contrast, engaging with cities, health authorities, and regional administrations proved more challenging, given the broader implications and perceived risks associated with investing in new ideas and solutions.
- **Scale of action:** it plays a crucial role in upscaling the hum-animal city and A-NBS concepts. This is understandable, as the level of decision-making power is closely tied to the scale of intervention and control over the activities to be implemented. However, the complexity of institutional innovation and the governance adjustments required to integrate urban policies can significantly affect the ability to valorise and promote innovation on the ground.
- **Two potential pathways** for further development emerge: a bottom-up approach and a top-down approach. In Lucca, the Hum-animal city concept and the use of A-NBS to enhance IHW in line with the NEB principles were introduced, tested, and evidenced. The process required sustained efforts to support both the mental shift and the innovation journey among the diverse stakeholders involved. Interaction with external stakeholders in other cities and contexts highlighted a clear gap between the potential of the hum-animal/A-NBS concepts and their current level of understanding and recognition.
- **To summarize,** engaging with an unfamiliar and unexpected concept requires “wearing new glasses” - and crafting those new glasses involves a fundamental shift in mindset and framing. The broader debates on urban regeneration, NEB, and NBS have largely overlooked animals as members of society and as contributors to the solutions being sought and tested. When stakeholders such as councillors, technicians, builders, or architects were introduced to the potential of animals in cities, the most common reaction was: “Yes, I had never considered them from this perspective.” This reflects an existing gap in the framing of public debate, which in turn shapes perceptions and ways of thinking. Addressing this gap is a



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change process that requires time, resources, and strategic action. Given these factors, disseminating the hum-animal city and A-NBS concepts broadly - and embedding them into strategic European policy documents - emerges as a key step for accelerating the process and mobilising A-NBS at city level.

- **The Lucca experience** was, at different times, exciting, frustrating, rewarding, and ultimately positive. It demonstrated the potential for expanding the concept across different urban domains, even though the timelines for innovation and transformation processes extend beyond the duration of a typical research project. Nevertheless, the Lucca IN-HABIT project clearly showed the potential and positive impact of redesigning hum-animal cities and valorising A-NBS for inclusive health and well-being. The foundation has been laid for new activities and processes to build upon this work, both in Lucca and in broader contexts.

4.2 The outcomes in Lucca

In terms of outcomes, medium-term effects differ according to the specific components and solutions implemented. Some outcomes are also contingent upon the willingness and capacity of the Municipality of Lucca to sustain the process over time, particularly in relation to the availability of local resources and funding.

For the different aspects/solutions, we can resume the main outcomes as follows:

1. **Hum-animal concepts and A-NBS:** The IN-HABIT project in Lucca introduced and tested transformative ideas, not only through individual pilot actions but also as the foundation for an integrated hum-animal policy at the urban level and its potential applicability. The hum-animal concept is now embedded in the understanding of Lucca's municipal administration and among a segment of its citizens. More broadly, at regional and national levels, the hum-animal/A-NBS concepts are gaining recognition. The project has increased stakeholder awareness, fostered new collaborations, and has already enabled the upscaling of hum-animal solutions in other cities, particularly in the fields of AAI and educational activities.
2. **Participatory process and citizen engagement:** Citizen participation in Lucca proved challenging due to multiple factors, including the COVID-19 pandemic at the project's outset, the municipal elections in 2022, and a general difficulty in engaging citizens consistently in the project and for interviews and data collection. Nevertheless, over time, local residents have become more aware of their aspirations and of the benefits linked to the hum-animal city vision and the solutions introduced. Both individual citizens and local NGOs involved in the participatory process are now more willing to collaborate with the municipality on future initiatives, ensuring the project's legacy.



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3. **Animal Lines and relational areas:** The implementation of the hard VIS in Lucca demonstrated tangible physical solutions that enhance human–animal interactions at the city level. Word-of-mouth promotion has already expanded the use of these facilities beyond the city, attracting visitors and their pets from neighbouring municipalities such as Barga and Capannori, as mentioned by the frequenters of the areas. Tourists travelling with pets have also noted the scarcity of comparable spaces in their own cities. In addition, through the dedicated mobile app presenting various hum-animal routes, both the frequency of visits and the associated positive outcomes are expected to increase.
4. **Animal Assisted Interventions (AAI):** The AAI activities conducted in the nursing homes were highly valued by all actors involved, including municipal authorities, nursing home management, social operators, and NGOs delivering the interventions. Stakeholders also took part in the congress organised by the Dept. of Veterinary Science of UNIPI, where they received recognition for their contributions. As a result, awareness of the potential benefits of AAI has grown, as has the intention to continue and expand these activities.
5. **Pet Care service:** This service was a novel initiative, strongly supported by the municipal councillor for the environment and by NGOs engaged in co-management. Awareness of its broader implications is now high, alongside commitment to ensuring its continuity. The service had a notable impact on vulnerable individuals, who received additional support in daily life management and increased human contact during challenging times. This outcome was particularly emphasised by NGO members directly involved in managing the Pet Care service.
6. **Educational activities:**
 - a. **In schools:** Involving many primary and secondary school students in Lucca - and, through upscaling, in the Pisa area - helped raise awareness and knowledge among younger generations about the hum-animal vision. Students already demonstrated strong interest in animals, often linking them to intergenerational relationships (especially with grandparents). Fragile youth appeared particularly engaged, and the topic also fostered intercultural dialogue. The use of a dedicated board game proved effective; some students sought it out independently through commercial and online channels. While it is difficult to measure long-term retention of this interest, the positive impact was evident in the reflections of students:

“We reflected in groups on different solutions related to the hum-animal city, the risks bonded to experiment with animals, the potential of interaction with animals in schools, with elders, and with vulnerable people, and the need for policy support for the hum-animal idea. All these reflections increased our awareness of the importance of considering animals in our lives to build a better future. The educational experience helped us learn new things, explore new ways of co-working among mates, and grow personally into responsible, sensitive, and



aware citizens in our interactions with both people and animals” (from the 29th of April 2025 students’ report -3LN Santoni-Gambacorti Institute- about the educational activities run the in the DSV-UNIFI for the solidarity day in Pisa organised by Ciardelli Association).

- b. **In the University:** The introduction of a hum-animal planning course at degree level has educated and trained university students in the hum-animal/A-NBS concepts, preparing them for future professional roles (e.g. **urban pet policies manager**). The course will continue in the coming years, ensuring continuity in higher education. At the master’s level, seminars have involved students from diverse disciplines (including economics, engineering, political science, biology, and veterinary/agricultural sciences) exposing them to the concepts and enabling them to transfer these ideas to other contexts at national level. Several degree theses are in preparation on the topic, which will further disseminate the ideas and solutions developed through the IN-HABIT Lucca project.

4.3 Long-term impacts

The expected long-term impacts of the hum-animal/A-NBS approach are closely linked to the upscaling and dissemination activities carried out during the project and already planned for the post-project phase. Ongoing dialogue with other cities, city associations, the regional government of Tuscany, and the Italian Senate, together with coverage in national newspapers and media, will progressively increase collective awareness and understanding of the hum-animal and A-NBS concepts. Both Italian and international audiences are demonstrating growing sensitivity to human–animal bonds, and the adoption of innovative solutions related to these connections is likely to be positively received.

The pet economy itself is expanding rapidly at both national and global levels, including in Eastern countries. The research group at Dept. of Veterinary Science of UNIFI has recently received requests from Chinese PhD students interested in the IN-HABIT hum-animal concept. Moreover, Dept. of Veterinary Science of UNIFI is exploring the possibility of involving selected Chinese cities in replicating the experiment, with the support of the Scientific responsible at the Italian Embassy in Beijing.

From a scientific perspective, the project introduced, for the first time at the global level, the concepts of the hum-animal city and A-NBS. Prior to this initiative, the scientific literature contained only two articles calling for greater attention to the role of animals in cities. The IN-HABIT Lucca project can therefore be considered a pioneering contribution to a “hot topic” that is likely to evolve over time and remain open to diverse interpretations and applications. If the upscaling process proves effective in the coming years, public health - according to discussions with the Vice-President of the Italian Senate Health Commission - could benefit from the hum-animal/A-NBS approach through improvements in both relational and physical well-being, as well as through enhanced access to healthcare.



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Relational goods associated with the hum-animal perspective - and the human-human relationships facilitated by animals - are already contributing, and could increasingly contribute, to urban dialogue and prosperity over the medium to long term, thereby fostering more inclusive health and well-being for citizens.

In terms of scientific knowledge, the IN-HABIT project acted as an icebreaker on this topic and is already attracting growing academic interest. The project was recently presented in a dedicated session (“Animals as a Nature-Based Solution to improve people welfare”) in the frame of Human-Animal Interaction webinar series of the APA (American Psychology Association) division, where it generated strong interest among researchers from a wide range of Countries.

On the economic side, a continued increase in activities related to pet management, services, and the broader pet economy is expected, as already evidenced by the B4B initiatives. Interest in pet-friendly tourism is also rising rapidly, and the IN-HABIT project has, for the first time, developed targeted activities and manuals to support the expansion of related knowledge, services, and job opportunities, particularly for young professionals trained in this emerging field.

5. Dissemination strategy

The results of the IN-HABIT project in Lucca have been disseminated through scientific publications (journal articles and conferences) and training/educational activities as described above.

- **Manuals**

2 Manuals on hum-animal urban planning	Dedicated to municipalities willing to introduce a hum-animal urban policy Manual 1: 10.5281/zenodo.1694980 Manual 2: 10.5281/zenodo.16950563 .
2 Manuals on Pet friendly Tourism - one targeting private businesses and the other public institutions -	Created with the support of professionals in the sector, offering guidelines on developing pet-friendly tourist services for public administrations: 10.5281/zenodo.16961411 and for private firms: 10.5281/zenodo.16961774
3 Policy Briefs	“Le Città Humanimal Nuova Frontiera Delle Smart Cities Per La Qualità Del Vivere Urbano”, 10.5281/zenodo.16950219 . “Disegnare città innovative a misura di persone e animali: rigenerare città per migliorare la qualità di vita delle persone” 10.5281/zenodo.16950430 and “Valorizzare le interazioni persone-animali per produrre beni pubblici nelle società contemporanee: una proposta di lavoro per soluzioni



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	intelligenti a forte accettabilità e utilità sociale” 10.5281/zenodo.16950484 .
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- **Lucca city events**

30/10-03/11/2024 - Lucca Comics&Games 2024	City Pets board game stand at Real Collegio
14/11/2024 Twin Cities event	A culturally and socially significant event that brought together representatives from Colmar, Schongau, Abingdon, and Sint Niklaas. The Lucca IN-HABIT project was presented as a virtuous example of animal welfare policies, sparking the interest of twin cities due to its innovative approach
22-23/03/2025 “ Lucca Collezionando 2025 ”	Event at Polo Fiere di Lucca involving a total of approximately 380 visitor people in 2 days
04-05-06/04/2025 “ VerdeMura 2025 ”	Event at Mura di Lucca involving a total of approximately 840 visitor people in 3 days
07/06/2025 “ Festa dello sport ” event	Event at the Serchio river park involving a total of approximately 350 visitor people
23/05/2025 “ City Pets board game - final event ”	Event at Polo Fiere Lucca, involving a total of approximately 287 children and 14 teachers
24/07/2025 event at Fluvial Park relational area	The event, organized by WP3 partners at the relational area in the Serchio river park, involved a total of approximately 60 participants including children and their families (who also played the City Pets board game), dog owners who frequent the relational areas with their dogs, and different stakeholders. During the event a dog educator was present to answer questions from the owners and ice-cream was offered to all participants

- **National events**

18/10/2024 “ Pet Welfare forum ” in Milan	Presentation of Lucca IN-HABIT project at the Pet Welfare Forum “Stati Generali del Pet”, an annual event dedicated to creating a platform for discussion and exchange among the leading experts in the pet sector.
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<p>15/11/2024 “Interventi assistiti con gli animali e qualità della vita degli anziani: servizi innovativi per il benessere degli ospiti nelle RSA” conference</p>	<p>Conference organized in Pisa by the Department of Veterinary Sciences, University of Pisa, together with the National Reference Centre for Animal Assisted Interventions, within the PNRR project Tuscan Health Ecosystem – Spoke 10. During the conference the experience of AAI project in nursing homes in Lucca has been presented</p>
<p>19/11/2024 in Pisa and 05/12/2025 in Lucca presentation of the documentary on human-animal bond “Mr. Beau”</p>	<p>A heartfelt exploration of the intimate and complex relationship between a human and her dog. Directed by Claudia Tosi, this documentary provides an emotional yet scientifically grounded narrative, delving into themes of animal communication, attachment, and the responsibilities of pet ownership</p>

- **Scientific congresses**

<p>29/11/2024: Presentation of results from the project during the event “Game of research” done at the University of Pisa, Department of Veterinary sciences</p>	<p>Presentation entitled “Exploring the Effect of Animal-Assisted Interventions on dogs and people: A Study in Lucca Nursing Homes” and poster entitled “Animals and Cities: The potential of the human-animal bond in a New European Bauhaus dimension”</p>
<p>28-30/08/2024 63rd ERSA congress “Regional Science Dialogues for Peace and Sustainable Development” in Terceira Island, Azores, Portugal</p>	<p>Oral presentation entitled “Social innovation in urban spaces: shifting the human-animal bond into a nature-based solution”</p>
<p>3-4/10/2024 EVCBMAW2024 conference in Paris, France</p>	<p>Oral presentation entitled “Exploring the Effects of Animal-Assisted Interventions on dogs and people: A Study in Lucca Nursing Homes”</p>
<p>5-7/11/2024 Urban Transitions 2024 “Integrating Urban and Transport Planning, Environment, and Health for Healthier Urban Living” in Sitges, Barcelona, Spain</p>	<p>Poster presentation entitled “Animals and Cities: the potential of the human-animal bond in a New European Bauhaus dimension”</p>
<p>28-30/04/2025 IEEE MeAVeAS 2025 in Pisa (Italy)</p>	<p>Oral presentation entitled “Impacts of Animal Assisted Intervention on elderly wellbeing and Canine Welfare: a multiparametric assessment” who won the prize for “Best conference Presentation by a Woman Award”</p>



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18-19/09/2025 7th European Veterinary Congress of Behavioural Medicine and Animal Welfare in Helsinki (Finland)	Poster entitled “Investigating Dog Welfare in Different Animal-Assisted Intervention Settings”
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- **Online and Hardcopy newspapers**

“Lucca prima città smart in Europa amica degli animali”	https://www.unipi.it/news/lucca-prima-citta-smart-in-europa-amica-degli-animali/
“Lucca, prima città smart Humanimal in Europa. Prof. Di Iacovo (UniPi): «Valorizzare le relazioni con gli animali per una migliore qualità di vita»”	https://onehealthfocus.it/lucca-prima-citta-smart-humanimal-in-europa-prof-di-iacovo-unipi-valorizzare-le-relazioni-con-gli-animali-per-una-migliore-qualita-di-vita/
“Lucca, con 15 chilometri di percorsi dedicati agli animali si favorisce l’inclusione sociale e il dialogo tra i cittadini	https://www.greenplanner.it/2025/07/15/lucca-percorsi-dedicati-animali/
“«Animabile» Lucca dove cani e gatti trionfano”	Article on “Il Venerdì di Repubblica” newspaper (25/07/2025)

- Besides the ones already presented in the previous deliverable (D3.3), **scientific articles** about Lucca case study on open access, indexed journals

Borrelli C., Granai G., Di Iacovo F., Luengo Pierrard M., Gazzano A., Mariti C., 2025, <i>Promoting animal welfare and pet-friendly urban design: an educational program to foster knowledge and responsibility in primary school children</i> . Dog Behavior, 10 (2). https://doi.org/10.4454/db.v10i2.192	Published
Granai G., Borrelli C., Vecchione C., Breviglieri B., Di Iacovo F., Moruzzo R., <i>Exploring a business incubator process: evidence from different European cities in the IN-HABIT project</i>	Under review (second round) on Cities Journal
Di Iacovo F., Moruzzo R., Catena L., Granai G., <i>Invecchiamento attivo e pratiche di agricoltura sociale: Interventi Assistiti con Animali per anziani in Residenze Sanitarie Assistenziali</i> , Welfare e Ergonomia, Fascicolo 1/2025 – “L’agricoltura sociale tra nuove e vecchie pratiche di lavoro sociale, prospettive teoriche e innovazioni di policy”	Accepted by the journal, in publication
Granai G., Borrelli C., Mariti C., Di Iacovo F., <i>Animals and Cities: exploring the impact of</i>	Accepted by the



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<p><i>human-animal interaction to enhance the quality of life of citizens</i>, Cuadernos de Vivienda y Urbanismo Special Issue “Health and Wellbeing in Cities”, vol. 18</p>	<p>journal, in publication</p>
<p>Borrelli C., Granai G., Di Iacovo F., Turco F., Corsi S., Moruzzo R., Mariti C.: <i>Exploring the effects of Animal Assisted Intervention on dogs and people in Lucca nursing homes</i></p>	<p>Under review on Scientific Reports Journal</p>

- 10/07/2025 **webinar** entitled “**Animals as a Nature-Based Solution to improve people welfare**” presented by Chiara Mariti and authored by her together with Di Iacovo, Borrelli and Granai. Invited by Prof. Lori Kogan for Human-Animal Interaction- APA (American Psychology Association) division <https://www.human-animal-interaction.org/events/> Webinar available here: <https://www.youtube.com/watch?v=bL4Z7A3TP-4>
- 2 PhD thesis on IN-HABIT theme: “**Social innovation in the Hum-Animal field: animals as a support for the quality of urban life**” and “**Management of human-animal bond in the urban environment: ethological aspects**”
- 29-30/01/2025 **educational activities** carried out jointly with project partner DFC Spain: in the 2 days the mornings were dedicated to activities in schools in Lucca (co-design activities with 14-16 years old students in an agricultural high school and children from a primary school), while the afternoons the University of Pisa hosted activities with students from high school for a project of “school-work experiences” (PCTO in Italian) on human-animal relationship topic and a workshop with researchers from the Dept. of Veterinary Sciences.



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6. Shortcomings, difficulties and next steps

The journey of the Lucca project, as previously noted, was long (though perhaps not long enough) at times frustrating, yet ultimately exciting as an overall experience. Throughout this research voyage, several difficulties were encountered for various reasons:

- The mediation/negotiation effort required was greater than initially anticipated and took place within a fixed local setting involving a limited group of actors whose composition could not be altered. This is a normal condition when managing change, yet when such change is tied to a specific research project, these dynamics can have a direct influence on the outcomes and overall achievements. Temporary misalignments between the pace of the process and the project's timeframe occasionally generated frustration, particularly due to delays caused by the COVID-19 pandemic at the project's outset.
- The alignment between the city administration and the transversal partners in the project was also challenging at the beginning. Managing both the local pilot-related dialogue and the transversal exchange among partners proved complex. Each city was testing different solutions and facing context-specific issues. The initial reliance on online-only interactions - necessitated by the pandemic - further complicated the establishment of a shared understanding and delayed agreement on activity planning and coordination. In addition, changes in some project partners hindered early dialogue. While these issues were largely resolved during the project's progression, they required significant additional effort.



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- Within a living lab environment, few preconditions remain stable enough to provide a constant framework for research activities. For instance, measuring the results and outcomes of the AAI pilot involved a sequential set of steps, each dependent on the previous one: 1) Achieving a general agreement in the city on target groups (e.g. elderly residents) and the proposed solution (AAI in elderly care homes); 2) Securing participation from nursing homes and obtaining support from their directors and social operators; 3) Launching a public call from the Lucca Municipality and managing the co-deployment phase (in accordance with Italian co-planning legislation with NGOs); 4) Co-planning and co-organising the activities; 5) Submitting the research plan to and obtaining approval from the University of Pisa's Ethics Committee; 6) Securing written consent for research activities from all relevant parties (participants and/or their families); 7) Establishing agreements with additional scientific experts as needed for the research; 8) Procuring the necessary equipment to monitor relevant parameters; 9) Conducting the activities, including the research, in collaboration with selected NGOs, participating nursing homes, and available participants; 10) Adapting the research plan to unavoidable contingencies (e.g. death or relocation of elderly participants, arrival of new participants interested in the pilot), followed by data collection and analysis. Because each step relied on the successful completion of the previous one, and many could not be fully planned, the process was extremely demanding within the given timeframe. The need for ongoing adjustments to address bottlenecks and unforeseen challenges added to the complexity.
- The project combined socio-economic dimensions (the transformation process, the social innovation pathway, the living lab activities) with specific technical research in a multidisciplinary approach. This dual structure was not always immediately clear to all scientists involved, sometimes necessitating further mediation within the transformative process itself.
- An additional difficulty stemmed from the topic's transversal nature, both in terms of research focus and disciplinary engagement. The innovative strength of the project lies in the fact that the hum-animal/A-NBS concepts operate in a shared space between diverse disciplines (veterinary science, socio-economics, medicine, architecture, community psychology, engineering, among others). This interdisciplinarity made the proposal particularly stimulating and original, yet at times challenging to have fully accepted within today's highly specialised scientific publishing landscape.

Despite the challenges faced, several initiatives are planned beyond the formal conclusion of the project.



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From a scientific perspective, the IN-HABIT project has paved the way for a broader reflection on human–animal relationships and the role of cities in fostering them. The data already collected will be further analysed and contextualised to provide more robust evidence within the scientific community.

Many of the lessons learned and operational advances will soon be incorporated into the educational programmes at the University of Pisa (including undergraduate courses, theses, specialised seminars, and open science initiatives) with some activities scheduled to begin as early as September 2025.

In the medium term, the upscaling process will also be strengthened through: targeted data collection involving municipalities across Tuscany and at the national level; presentation of the concepts at a national political meeting hosted by the Italian Senate planned on 26 January 2026; preparation of informational materials and dissemination tools for both Italian and international media.

The Dept. of Veterinary Sciences at the University of Pisa has established a partnership with an innovation incubator dedicated to animal-based solutions, aimed at supporting a broader innovation process. Collaboration with professionals who have accompanied the project over time has expanded the potential for creating a dedicated spin-off in this field. A booster activity on that is currently underway.

Additionally, the Dept. of Veterinary Science has independently launched, using its own resources, a public call to recruit a young researcher to continue research, educational, and third-mission activities after the conclusion of IN-HABIT. This initiative aims to ensure lasting impact by building on and further developing the hum-animal and A-NBS concepts introduced through the project.



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