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Artículos

Animals and Cities: Exploring theImpact of Human-Animal Interaction to Enhance the Quality of Life of Citizens [*]

Animales y ciudades: explorando el impacto de la interacción entre humanos y animales para mejorar la calidad de vida de los ciudadanos

Animais e cidades: explorando o impacto da interação entre humanos e animais para melhorar a qualidade de vida dos cidadãos

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Abstract:

The integration of animals in urban planning represents a new frontier for promoting inclusive health and well-being in cities. Drawing from the research activities of the European IN-HABIT project in Lucca, this study explores the potential impact of animals—wild, food-producing, and companion—as Animal-Nature Based Solutions (A-NBS) to improve urban quality of life. Through a participatory approach, the project aims to create an Integrated Human-Animal Urban Policy (IHAUP), highlighting how animals can represent a useful resource to improve the well-being of urban inhabitants and contribute to more regenerative and inclusive cities. The findings show that A-NBS can enhance various urban dimensions, including green spaces, social interactions, physical activities, and inclusiveness, offering new opportunities for urban planning. The case of Lucca underscores the importance of a paradigm shift that recognizes animals as active resources in urban regeneration, paving the way for a replicable model in other cities.

Keywords: Animals, Human-Animal Interaction, Nature-Based Solutions, Restorative Cities, Urban Planning.

Resumen:

La integración de los animales en la planificación urbana representa una nueva frontera para promover la salud y el bienestar inclusivos en las ciudades. A partir de las actividades de investigación del proyecto europeo IN-HABIT en Lucca, este estudio explora el impacto potencial de los animales (salvajes, productores de alimentos y de compañía) como soluciones basadas en la naturaleza animal (A-NBS) para mejorar la calidad de vida urbana. A través de un enfoque participativo, el proyecto tiene como objetivo crear una Política Urbana Integrada entre Humanos y Animales (IHAUP), destacando cómo los animales pueden representar un recurso útil para mejorar el bienestar de los habitantes urbanos y contribuir a ciudades más regenerativas e inclusivas. Los hallazgos muestran que las A-NBS pueden mejorar diversas dimensiones urbanas, incluidos los espacios verdes, las interacciones sociales, las actividades físicas y la inclusión, ofreciendo nuevas oportunidades para la planificación urbana. El caso de Lucca subraya la importancia de un cambio de paradigma que reconozca a los animales como recursos activos en la regeneración urbana, allanando el camino para un modelo replicable en otras ciudades.

Palabras clave: animales, ciudades restauradoras, interacción humano-animal, planificación urbana, soluciones basadas en la naturaleza.

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Resumo:

A integração dos animais no planejamento urbano representa uma nova fronteira para a promoção da saúde e do bem-estar inclusivos nas cidades. Com base nas atividades de pesquisa do projeto europeu IN-HABIT em Lucca, este estudo explora o impacto potencial dos animais —selvagens, produtores de alimentos e de companhia—como soluções baseadas na natureza animal (A-NBS) para melhorar a qualidade de vida urbana. Por meio de uma abordagem participativa, o projeto tem como objetivo criar uma Política Urbana Humana-Animal Integrada (IHAUP), destacando como os animais podem representar um recurso útil para melhorar o bem-estar dos habitantes urbanos e contribuir para cidades mais regenerativas e inclusivas. Os resultados mostram que os A-NBS podem melhorar várias dimensões urbanas, incluindo espaços verdes, interações sociais, atividades físicas e inclusão, oferecendo novas oportunidades para o planejamento urbano. O caso de Lucca ressalta a importância de uma mudança de paradigma que reconheça os animais como recursos ativos na regeneração urbana, abrindo caminho para um modelo replicável em outras cidades.
Palavras-chave: animais, interação homem-animal, soluções baseadas na natureza, cidades restaurativas, planejamento urbano.

Introduction

Urban planning focuses on how people live, work and interact in the urban spaces by designing the use of space and land, and all infrastructures that might support human needs and activities in an evolutionary way and taking into consideration the existing challenges affecting both the human and the non-human actants, nature in its diverse components, and the environment. The attention on, access to resources and the organization of the living infrastructures able to support the everyday urban life and to improve the health and well-being of people contributing to the maintenance of the environment and of the planetary boundaries are also part of the planning activities in urban areas. Urban planning considers the organization and the regulation of space as well as a set of rules and regulation to be followed according to specific programming plans. Due to the complexity of the topic, the planning activities are today with a greater extend linked to the participatory involvement of local actors towards bottom-up approaches able to co-design as much as possible the new solutions. After a long period of urban mainly quantitative development, today the attention on regenerative or restorative cities is growing as an attempt to improve the quality of the urban life and the correct use of everyday more scarce resources.

A regenerative approach of the urban spaces is also sustained by new knowledge in neurosciences that look with a greater attention to all stimuli that people might receive in the environment in which they live and that can contribute to a higher quality of their life. Under this new perspective the attention on enriched urban environment is increasing being related to green spaces, animals, relationships among humans and between humans and non-human animals as well.

From this point of view regenerative approaches are taking in larger attention the implementation of the so-called nature-based solutions (NBS) to reduce some of the urban challenges (related to climate, air and water management) and to increase a positive experience in the everyday life of urban dwellers. Among the NBS also animal can be considered to ensure their support to increase health and well-being in urban areas as Animal-NBS.

Part of the evolutionary process in the cities is linked to the increasing presence of animals in urban spaces. They are part of nature and the environment in which urban areas are embedded, but they are also growing in number and in relation to the increasing demand of specialized services and from the citizens to own animals and to increase their bonds for diverse societal purposes and needs. As part of this process and of a societal change in managing their relationship with them, animals are becoming part of the urban life involving de facto urban planning activities. According to scientific literature, human-animal interaction is considered to increase human health and well-being in different circumstances. In times of resource scarcity, the human-animal bonds can be valorized in the cities in the perspective to restore a better quality of life. In such respect, to consider animal and A-NBS to regenerate urban life can be part of a progressive evolution in urban planning.

The article, starting from the EU-IN-HABIT research activity in the city of Lucca, focuses on the presence of animals in the city and their potential impact to increase inclusive health and well-being for the humans themselves. The hypothesis is that cities should better consider the presence and the role of animals and their potential impact on the provision of public goods in urban areas, as well as, they should start introducing integrated urban human-animal policies able to better tackle this aspect in the perspective of urban regeneration.

About Urban Regeneration and the Restorative Cities

Urban regeneration refers to the transformation and revitalization of spaces (Ujang & Zakariya, 2015). This process involves initiatives aimed at enhancing the physical environment, fostering economic development, and promoting environmental sustainability, all with the goal of creating improved social opportunities and a better quality of life for individuals (Roberts & Sykes, 2000).

Urban transformation and the improvement of quality of life of disadvantaged groups is rooted in the principles of urban psychology and the concept of restorative cities. In an increasingly urbanized world, creating cities capable of co-designing, co-implementing, and co-managing harmonious and livable environments in everyday life is crucial. The arrangement of urban spaces significantly influences spatial and environmental wellness, personal well-being, and social cohesion, as well as the structuring of daily healthy habits.

One of the notable challenges in fostering a healthy urban environment is the growing emphasis on psychological well-being. Since the early 20th century, urban psychologists have concentrated their studies on the connections between urban living and the health and well-being of residents. There is an extensive body of scientific literature produced by urban psychologists dating back to the past century (Takooshian, 2005), continuing until the introduction of the concept of restorative cities (Hartig, 2004; Kaplan & Kaplan, 1989; Roe & McCay, 2021; Ulrich, 1993; Weber & Trojan, 2018). The discussion surrounding restorative cities centers on seven key dimensions designed to shape an environment that more effectively meets human needs at the urban scale (Roe & McCay, 2021):

- Green: The availability of green spaces and access to nature to reduce depression and stress, improve brain functions, and reduce anxiety, ADHD and dementia.
- Blue: About water availability, access, and cleanness that can reduce depression and stress.
- Sensory: Regarding the level of noise, smell and pollution or, on the contrary, positive soundscapes, sonic refugees and visual complexity that might exert positive human outcomes.
- Neighbourly: The impact of city organization and the presence of public spaces in the definition of social networks and social dialogue among ages, ethnicities, income, social classes and groups of individuals.
- Active cities: The possibility of having access to physical activities and different mobility ways—walking, running, biking, using transportation for diverse groups of people—women, elders, males, families, youngsters, children.
- Playable: Regarding the availability of spaces where it is possible to play and to foster mental, social, cognitive, and emotional development.
- Inclusive: Regarding spaces, activities, and services, able to reduce as much as possible diverse types of exclusion—linked to ages, ethnicities, genders, sexual orientation, physical and mental diversities and capabilities.

The seven dimensions can be implemented by looking to animals as nature-based solutions in urban planning.

Animals in Cities

In this chapter we would explore the interaction of animals with the idea of a restorative city and the ways that might be implemented to restore the urban life by giving value to the presence of animals and their interaction with humans. Animals in urban areas are increasingly present, leading to frequent interactions with both the environment and human populations (Kumar & Singh, 2014, 2018; Maroto, n.d.). These human-animal interactions can vary over time and across specific geographic contexts, influenced by cultural, environmental, historical, and social factors. The diversity in animal species, populations, and their varying levels of interdependency or dependency on humans reflects the complexity of these relationships in different settings. Although animals inhabit cities, they often exist on the periphery of public life and consciousness, with their presence largely overlooked except for their potential negative impacts on humans (such as car collisions, zoonotic diseases, and physical hazards) (Cunningham et al., 2017; Cupertino et al., 2020; Kock, 2014).

The presence of animals in cities can be categorized into three groups: wild animals, animals used for food production, and companion animals, as outlined below.

- Wild animals: Recent studies have explored the presence of wild animals, particularly mammals (Santini et al., 2018), focusing on their numbers and types of presence in urban settings. Expanding cities create opportunities for various species to adapt, influenced by traits such as body size, dietary range, reproductive timing and outputs, behavioral flexibility, and flying ability. These traits act as filtering mechanisms, enabling certain species to adapt and thrive in urban environments. The presence and behavior of these species are shaped by a combination of their inherent traits and the organization of urban spaces, including factors like green areas, green corridors, food availability, waste production and management, spatial constraints, levels of human acceptance, and the nature of human-animal interactions. Additionally, birds, small animals, and insects contribute to the urban ecosystem. Their presence offers opportunities for biodiversity, nature conservation, and wildlife observation while also serving as valuable resources for environmental monitoring activities (American Bird Conservancy, n.d.). Due to significant urbanization and the degradation of natural habitats, wild animals are increasingly crossing urban boundaries and entering cities, despite the challenges these environments pose for them. Living in or near cities offers advantages, such as reduced predator threats and easier access to food, leading urban areas to become habitats for various species. The search for food is a key motivation for wild animals to venture into urban environments, as cities can provide readily available food sources for animals such as wild boars, foxes, deer, wolves, monkeys, and more (Weber, 2022).
- Food producing animals: The historical relationship between cities and animals highlights that animals have always coexisted with humans, playing vital roles in family self-sufficiency through the production of eggs, milk, meat, and other resources, as well as serving as transportation. Food-producing animals continue to be present in contemporary examples, particularly in many rapidly growing cities across the globe (Butler, 2012; Canfield, 2014; Rossignoli et al., 2015). With urbanization and economic development, the migration from rural areas to cities led to the gradual decline of raising animals in urban courtyards, although this trend has not disappeared everywhere. Today, however, the desire to reconnect with nature, alongside new technological solutions, is driving the reintroduction of food-producing animals in cities (through methods like aquaponics, small-scale egg production, and urban goat farming). As a result, breeding animals in urban environments for food production is becoming more common. In this context, animals remain a source of food in certain cities and offer a means to access fresh produce. This trend not only draws on tradition but is also influenced by migration patterns, innovative techniques (such as aquaponics and

urban beekeeping), and evolving social behaviors. The growing demand for urban food is creating opportunities for producing fresh and nutritious food by keeping animals in densely populated areas, all while avoiding environmental and health risks (Lindahl, 2016).

- Companion animals: the number of companion animals is constantly growing on a world scale starting from western countries. Companion animals have always been present in cities; for example, there is archeological evidence that reports how approximately 14,000 years ago, domestic wolves, ancestors of the dog, lived in settlements with humans (Serpell, 2008). Traditionally present in the family life for specific use (hunting, protection), they are today covering a new space related to the relational sphere of the interaction with humans as well as the opportunity to establish in urban spaces a contact with nature. The growing number of companion animals on the one hand generate new demands to attend their needs in the urban management (from devoted spaces, to urban waste management, to the presence of new economic activities and opportunities, to the demands for transportation and access to services -also those normally devoted to humans), on the other hand, they can be valorized to enhance public services and inclusiveness in the cities for the quality of life for diverse target groups. The academic research on the topic connects the high number of companion animals to public health, considering both direct and indirect impacts. For the direct effects, for instance, studies indicate that individuals who own companion animals are more likely to survive a heart attack and tend to have lower blood pressure compared to those who do not (McNicholas et al., 2005). As for the indirect effects, researchers have observed that human-animal bonds influence both social interactions and health outcomes: regular dog-walking, for example, can foster positive interactions among strangers (Christian et al., 2013; Toohey & Rock, 2011) and supports maintaining an active lifestyle (Christian et al., 2013).

In all cases the animals are living in the cities, and they can be recognized as part of the evolutionary urban planning activities and as demanding new attention in urban rules, programming and initiatives with two side aspects:

1. To consider animals' needs in planning urban spaces and to better integrate the presence of diverse categories of animals and at the same time to avoid any negative interference with humans (in terms of hygiene, risks and whatever).
2. To promote human-animal bonds to make cities more interactive, playable, active, inclusive and able to stimulate well-being for citizens.

Integrating animals into urban planning involves several ethical facets that need to be considered. First of all, animal welfare is the most obvious ethical dimension to contemplate in different circumstances.

Urban planning must consider the fundamental behavioral needs of animals living in or passing through cities. This includes access to food, water, adequate shelter, safe spaces for movement and reproduction, and protection from hazards such as traffic and environmental toxicity. These aspects play an important role for all animals and notably for wild ones. In case of wild animals, planning should aim to preserve biodiversity, to minimize habitat fragmentation, create ecological corridors for animal movement, and protect existing natural areas within or near cities. Pets, also, have their needs by leaving the cities in a stricter interaction with humans and also in this case there is the demand for a greater attention in defining spaces and rules that can better integrate their life in active interaction with humans.

The Benefits of Human-Animal Interaction in Urban Environments

The relationship between humans and animals has evolved over thousands of years, influencing how we interact with the natural world. The relationship with non-human animals sinks its roots into prehistory,

about 50.000 years ago (Braje, 2011). According to Bulliet (2005) there are three distinct periods in the history of human-animal relationships: the pre-domestic era, when human societies were hunter-gatherers and did not see any distinction between themselves and other animals; the domestic era, when ideas about human superiority and difference developed; and the post-domestic era, when the majority of people have little firsthand experience with animals, especially the ones we eat. As a matter of fact, nowadays we perceived animals in different ways from loved ones or marvelous things to threats (Herzog & Galvin, 1992).

In urban environments, where daily life is often characterized by high population density, limited green spaces, and fast-paced routines, human-animal interaction (HAI) can play a significant role in enhancing the quality of life for city inhabitants. Some of the earliest studies within HAI research focused on how interactions with companion animals benefit human health (Friedmann et al., 1980, 1983). Pet ownership is linked to higher survival rates among myocardial infarction patients, with Friedmann et al. (1980) showing significantly lower mortality rates among pet owners. This association is reinforced by further research, which demonstrates that dog ownership contributes to survival independently of other social supports (Friedmann & Thomas, 1995). Dogs also correlate with lower blood pressure and fewer doctor visits (Friedmann et al., 2013; Siegel, 1990). Elderly dog owners engage in more physical activity, walking an additional 20 minutes daily and taking 2700 more steps than non-dog owners, aligning with physical activity guidelines (Dall et al., 2017; Mueller et al., 2018). The health benefits of pets are linked to the active involvement of owners in pet care, particularly through activities like dog walking (Bauman et al., 2001; Coleman et al., 2008; Curl et al., 2017; Ham & Epping, 2006; McConnell et al., 2011; Serpell, 1991; Thorpe et al., 2006). In terms of Animal Assisted Intervention (AAI), sessions with various types of species can increase physical activity during the period of intervention (Bert et al., 2016; Friedmann & Krause-Parello, 2018). Furthermore, pets contribute significantly to mental and psychological health. Early research found that companion animals, as well as interaction with pet during AAI, help reduce depression and loneliness, especially among the elderly, women living alone, vulnerable individuals, and those who are homebound (Bert et al., 2016; Friedmann & Krause-Parello, 2018; Garrity et al., 1989; Krause-Parello, 2008; McConnell et al., 2011; Rodriguez et al., 2019, 2021; Stallones et al., 1990; Zasloff & Kidd, 1994). Pets provide a buffer against stress, with dog walking shown to increase parasympathetic nervous activity more effectively than walking alone (Motooka et al., 2006). Additionally, pets enhance children's and preadolescents' psychosocial development, including autonomy, responsibility, and self-esteem, leading to greater overall well-being (Van Houtte & Jarvis, 1995; Vidović et al., 1999). For the homeless, dogs offer companionship and security but may also limit access to services due to concerns about hygiene and behaviour (Howe & Easterbrook, 2018; Lem et al., 2016; Rew, 1996; Scanlon et al., 2021; Wolch & Rowe, 1992). Another important effect pets might have on their owners, especially in urban environments, is to facilitate social interaction. Studies reveal that walking a dog significantly increases the likelihood of initiating conversations with strangers, acting as an icebreaker and enhancing social approachability (Messent, 1983; Rossbach & Wilson, 1992). Dogs facilitate human-human interactions regardless of their or their handler's appearance (McNicholas & Collis, 2000) with puppies eliciting particularly positive responses (Gazzano et al., 2013). Moreover, dog ownership fosters a sense of community and social support within neighborhoods, promoting friendships and a collective sense of safety (Bulsara et al., 2007; Wood et al., 2015). AAIs are another valuable form of HAI in urban areas. These structured programs, which involve interactions with animals to achieve therapeutic goals, have been shown to improve mental health, reduce stress, and promote social interactions. AAI programs in urban environments can be particularly beneficial in hospitals, schools, and elderly care facilities. Urbanski and Lazenby (2012) found that therapy dog visits significantly reduced stress and anxiety among hospitalized children. However, research on the effectiveness of AAIs remains mixed, with McCullough et al. (2018) reporting no significant differences in stress levels for children receiving therapy dog visits compared to those receiving standard care. For further insights about benefits of HAI (Borrelli et al., 2022; Friedmann & Son,

2009; Morrison, 2007). Human-animal bonds might significantly stimulate brain activities in humans—among the others—and make the living experience more stimulating and enjoyable.

Starting from the literature evidence to cope with animals in the cities might offer new opportunities to enhance the inclusive health and well-being of the population according to the idea of restorative cities.

A New Concept: Animals as A-NBS

In a large part of the debate on urban regeneration, also with the attempt to overcome climate change, there is a growing attention on the so-called Nature Based Solutions (NBS). The definition of nature-based solutions given by the European Commission in 2016 is,

> solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. Such solutions bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions. (n. d.)

They are normally seen as green solutions able to increase the quality of the urban spaces, to absorb CO2 and to freshen and reduce the pollution in urban settings (Cohen-Shacham et al., 2016). In other cases, the urban spaces are re-modelled in order to accumulate water in case of extreme rain, or to give attention to initiatives able to include and to facilitate interactions among citizens and to enhance social life or to qualify the spaces and their perceived quality and security. As reported by different authors (Albert et al., 2021; Frantzeskaki et al., 2019; Kabisch et al., 2022; Lafortezza et al., 2018), indeed, the NBS concept includes various types of approaches aimed at the implementation of natural elements in urban areas with the goal of adapting to both climate change and other societal challenges. Among the NBS animals are totally disattended in the urban debate, despite their existing and growing presence in urban areas. From both a scientific and operational perspective, even if they can't be considered neither green nor blue solutions, animal-NBS should be better understood and integrated in the debate, and they can be labeled as red solutions. So far, A-NBS (red solutions) can be considered all the innovative services that leverage the promotion of human-animal interaction to advance inclusive health and well-being across various dimensions (i.e., specific areas designed for human-animal interaction, observation and educational activities of animal wildlife, social dialogue and interconnections among different categories of people facilitated by pets in devoted public spaces, innovative services for specific target groups, etc.). From our point of view, Animal-NBS in urban areas could foster positive interactions with wildlife by enhancing contact with nature, promoting education about ecosystems and sustainability, encouraging exploration and observation of natural environments, and supporting coexistence with wildlife (Egerer & Buchholz, 2021; Wu et al., 2019). In this context, targeted urban planning initiatives can be implemented, such as creating dedicated pathways, organizing cultural and educational events, and engaging citizens in participatory scientific activities. Additionally, interest in food-producing animals is evolving within urban settings. Given the looming threat of future food scarcity, there may be growing attention to these animals, ideally framed within innovative urban agriculture initiatives. Food-producing animals could play varied roles in local urban communities, including participation in entrepreneurial ventures (such as aquaponics, small-scale husbandry in urban or peri-urban areas, or rooftop gardens) or as part of inclusive social innovation projects (Audretsch et al., 2022; Bonifacio, 2014; Murray et al., 2010; Nyseth & Hamdouch, 2019). Increasing attention should be devoted to companion animals as a significant and expanding category of non-human urban citizens (alongside wild and food-producing animals), recognizing their right to urban citizenship and the implications of their increasing presence in cities. While companion animals bring positive effects at both individual and societal levels, they also present challenges. Issues such as unattended dogs, dogs perceived as aggressive or unfriendly (Derges et al., 2012; McCormack et al., 2010), and potential risks —including bites, allergies, biosecurity concerns, and zoonotic diseases (Hinchliffe & Bingham, 2008;

Louzã, 2007; McClaskey, 2019; Sterneberg-Van der Maaten et al., 2016)—must be considered. Additionally, companion animals may contribute to physical injuries, vehicle collisions, and property damage (Conover, 1997; Conover et al., 1995; Hadidian, 2015).

Besides the still existing problematic aspects, A-NBS can support many policies at urban level such as:

o Educational activities: For young inhabitants as well as for adult ones, to better know, interact, and manage them and to better integrate human-animal interaction as a positive experience in urban setting and to facilitate psychological growth in young urban generations.

o Social-health policies: To valorize human-animal bonds to improve an inclusive health and well-being for all and mainly for the most fragile inhabitants like elders, people with autism and with disabilities, homeless, single individuals leaving alone, blinded people, to reduce violence especially for women, with many different possible services (with Animal Assisted Interventions) and initiatives devoted to stimulate and facilitate animal management for people with fragilities.

o Public transports: Improving facilities related to people moving with pets.

o Public spaces and buildings sector: to design and build devoted spaces to facilitate a safe and playable human-animal interaction also to facilitate human-human interaction via animal interaction.

o Culture and Sport: To organize events and activities related and including animals.

o Economy and tourism: To stimulate new business activities and services related to animal management and to attract specific targets of tourists interested in a touristic experience with their petsParticipatory and voluntary policies: that can be included in the co-design of a hum-animal city and in the organizational aspects of the innovative solutions organized at urban level.

By taking into consideration the transversality of the human-animal experience in urban planning, there is the space for introducing an integrated human-animal policy able to look to them as a new resource that can be mobilized toward specific transition process to enhance urban leaving.

Animals can be conceived as NBS and contribute to the seven dimensions of the restorative cities aiming at improving inclusive health and well-being for citizens, and among them the more fragile ones. In the IN-HABIT project in Lucca a specific effort was done to co-design towards citizen participation the first EU-city with an Integrated Urban Hum-Animal Policy (IUHAP) trying to consider animals as citizen with their specific rights and needs and to organize according to the idea of A-NBS restorative dimensions useful for the people themselves as indicated in the next chapter.

The Case of the City of Lucca

The city of Lucca, as part of the European Horizon2020 project IN-HABIT, "INclusive Health and wellBeing In small and medium size ciTies", aims at creating the first human-animal smart city in Europe, with an integrated human-animal policy able to mobilize the animal resources to increase local wellness for people who are less empowered and all citizens. The project addresses various dimensions of human-animal relationships to co-create innovative solutions that highlight the value of animals in urban environments and their interactions with people. Recognizing the significance of these relationships for citizens" well-being, the IN-HABIT project serves as a pilot initiative to develop an integrated framework of actions across multiple domains, including urban planning, social and healthcare services, culture, the economy, and tourism. Through a participatory approach involving municipalities, private individuals, NGOs, and the private sector, the project engages local stakeholders in a transformative process. This process aims to transform individual and private perspectives on human-animal relationships into a shared public vision and collective action on the subject.

Since the beginning of the project, particular emphasis has been placed on actively involving the local community and stakeholders through participatory processes. This approach ensures that solutions are collaboratively designed, implemented, and managed with and by the people themselves. In Lucca a participatory IN-HUB has been established aiming at involving local public and private stakeholders in a mindset shift process able to look to animals as a public resource. Along the process needs and opportunities were debated and some priorities established. According to the bottom up initiatives both *Hard VIS*: Animal Lines (a route that goes from the "Parco Fluviale del Serchio" from the north, arrives in the city passing through the urban walls and the "Spalti" (green areas that surround the walls) and then goes south to the "San Concordio" district and the "Acquedotto Nottolini", a path with both naturalistic-environmental and monumental value) (Figure 1) and relational areas (areas accessible to people and their companion animals; they are not simply fenced areas for the traditional "walking" of dogs, but spaces also equipped with benches and shade, where human-animal relationships and, consequently, social relations and inclusion of the most fragile subjects can be fostered and facilitated) and *Soft VIS* (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) has been piloted (Figures 2 and 3). *The Innovative aspects were related to the* introduction of the idea of A-NBS as a common good provider and of the opportunity of an Integrated Hum-Animal Urban Policy (IHAUP). The process involved also University degree and master students, training in primary schools with mindset change methods, among the others. *The expected actions were expected to cope with the restorative dimensions in the city*: with specific impacts mainly on green, sensory, neighbourly, active, playable, inclusive dimensions as indicated in table 1.

TABLE 1.
The complying opportunities of A-NBS with the 7 dimensions for a restorative city intervention in the Lucca case. Source: elaboration from the authors

Dimensions	Lucca State of the art	A-NBS
Green	Enough availability of green spaces: Serchio river park, the ancient walls, close hilly green areas easy to access for local inhabitants.	Re-design and increase the quality of existing spaces into areas for animal-human interaction. 15 km of Animal Lines (figure 1) + 2 relational areas (figure 2 and 3). Organization of innovative activities able to increase personal wellness and to reduce states of anxiety and depression.
Blue	Traditional and contemporary evidences of the Serchio river, internal small water channels (NGO operating to keep the water channel preserved and valorized), availability of public standpipes.	Serchio river and animal wildlife (observation and educational activities), water channels and small wild aquatic fauna (NGOs' initiatives).
Sensory	A silent city without cars inside the wall, with shadow in summer and protected from cold wind in wintertime, ancient walls as a refuge, availability of architectonic complexity and beauty. Some traffic and air/noise pollution around the walls.	Animal Lines as refugees from noises and space for personal engagement in nature, wild animal sound (insects, birds, etc.), possible negative sensorial outcomes of pets (beauty, greenery, air quality/temperature, noise).
Neighbourly	Good dialogue in the local community, with some tensions with newcomers. Risks of isolation for elders. Public spaces availability for social interactions both in open and close public spaces.	Social dialogue and interconnections facilitated by pets in devoted public spaces and Animal Lines. Social engagement in associations and groups devoted to specific animal-linked activities (animal-based NGOs and associations, informal group of pet owners').

Active cities	Large opportunities for physical engagement and activities, in 15/20 minutes walking people can reach everything they need.	Paths for walking/running with pets, specific designed paths for people with diverse abilities and demands, pets and elderly' mobility, pets and women security in their personal activities.
Playable	Quite good availability of spaces for sport and leisure, a wide range of national and international festivals organized very often (Lucca Comics and Games, among the others).	Training, education and gaming activities with pets, citizen science linked to animals, excursions linked to animals' observation, education in the school, board game with pets.
Inclusive	Good availability of social health services' provision at local/regional level, good social protection net (public and NGOs).	Social Inclusion in the co-design of innovative solutions along the IN-HUB activities, Innovative services for specific target groups: Animal Assisted Activities (schools), Animal Assisted Interventions (elders, people with dementia, people with physical disabilities), services for vulnerable people (Pet care services), Support for homeless people with pets, diverse cultural behaviors in pet management and interactions.

Source: Own elaboration.

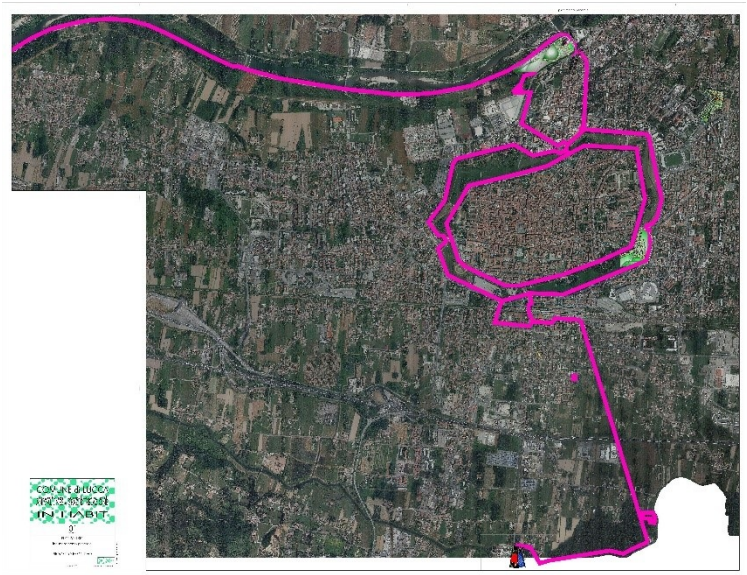

FIGURE 1.
Animal Lines path (in purple lines) (Source: IN-HABIT project)
Source: Own elaboration.

FIGURE 2.
Boards of the two areas along Animal Lines: the area behind the old hospital (Source: IN-HABIT project)
Source: Own elaboration.

FIGURE 3.
Boards of the two areas along Animal Lines: the "Parco Fluviale" area (Source: IN-HABIT project)
Source: Own elaboration.

Lesson Learnt

The paper starts from the evidence of the increasing presence of animals in cities to stimulate a reflection in urban planners for taking in higher consideration the demand for a specific attention in the contemporary urban plans. What is easy in the idea comes from the fact that animals are there and they ask for growing dedicated planned activities. What is more difficult to realize in terms of knowledge and attitudes is the fact that animals' active presence can be organized to improve the inclusive health and well-being for the citizens towards the organization of new devoted spaces, activities, services and initiatives. Unlike other NBS, the A-NBS are organized with active players—the animals—that are able to move, active, and they have specific behaviors and needs, contrastingly from the plants. This makes animals more effective in many circumstances,

but, at the same time, they demand specific and constant attention in their management that needs to be played with specific attention and professionalism.

In the Lucca case the discussion of the idea of Animal-Nature Based Solution was challenging not just because the attention to the animals -already high in the local society-, but mainly because the mindset shift needed looking to them as a public good provision to enhance the inclusive health and well-being toward restorative interventions. Such an idea has a transversal influence on many aspects of the municipality planning activities like education, social/health, public spaces, economy, tourism, participation, departments and policies. Due to the large involvement of many actors of the municipality and from the civic society, the opportunity to generate a convergent innovative vision necessarily requires a progressive process of negotiation and transition, also due to the multiple competences involved. At the same time, the social innovation process is needed to mobilize local -animal- existing resources in the perspective of the provision of A-NBS. Along this process the discussion on the possible hypothesis, the selection of specific priorities (i.e. the services for elders and young people were considered the most relevant target groups) was alternate with the organization of specific pilots to verify their effectiveness and to better understand the possible outcomes provided.

The lessons learnt form the Lucca pilot can advise other cities to address an issue and to promote a resource that animals bring with them and more specifically:

o Animals can provide innovative services that can increase inclusive health and well-being for all, and their mobilization can easily contribute to regenerating urban spaces.

o Cities might rethink urban planning by considering the needs as well as the potential of the human-animal interaction.

o The new perspective demands a mental shift in policy makers and in urban designers that can be accompanied with participatory processes.

o Being the topic able to crosscut many policy domains at urban level there is the space for a hum-animal urban integrated policy able to link different policies areas at municipal level.

o The organization of a hum-animal urban integrated policy might be supported by a urban pet policy manager able to integrate and facilitate co-design, co-deployment and co-management of the A-NBS put in place.

o The large number of possibilities can support flexibility and progressivity in up-scaling the A-NBS from both a geographical perspective (starting from some neighborhoods to progressively contaminate all urban spaces as well as to work on specific targets and policies).

As for any innovation, the Lucca case was able to start the process and the possibility to replicate and to transfer the concept and the solutions in other cities will offer the opportunity to reinforce and to amplify the possible application in the next future. What is clear today is that the cities and the citizens might take advantage from the promotion of animals as Nature Based Solutions and that more and more urban planners should take carefully in consideration the active presence of animals in the cities and the potential of their interaction with animals.

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Notes

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