IN-HABIT – INclusive Health And wellBeing In small and medium size ciTies

D7.7 – Report on IHW-1

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VERSION HISTORY

Version	Status	Date	Contributor/partner	Summary of changes
1	Final	07/12/2023	UNITO, CCA	
2	Final	18/06/2024	UNITO, CCA	

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Changes implemented in the revised version	
Section 3.1	▪ More focus to individual health factors has been given
Section 3.2	▪ A number of figures have been eliminated and/or moved to the Appendix A ▪ A footnote has been added to refer to the materials moved in the Appendix ▪ Relevant text has been highlighted in bold in a number of tables
Section 4	▪ The paragraph about the limitation of the analysis has been extended
Various parts	▪ Analysis clarity has been improved, results discussion has been deepened, textual analysis of participants' feedback has been summarized

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LIST OF ACRONYMS

CA	Consortium Agreement
DECO	Dissemination, Exploitation, Communication & Outreach
DC	Dissemination & Communication
EC	European Commission
EU	European Union
GA	Grant Agreement
GDEI	Gender, Diversity, Equity, Inclusion
H2020	Horizon 2020 projects
IHW	Inclusive Health and Wellbeing
KLC	Key Local Contact
LCA	Local Community Activator
PC	Project Coordinator
PP	Project Partner
RTD	Research, technology and development
SMSCs	Small and medium sized cities

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WP	Work Package

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PARTNERS' SHORT NAMES

AVUE	Neighbourhood Association of Las Palmeras
BOT	Book on a Tree
BSC	Baltic Studies Centre
B4B	Bridge for Billions
CCA	Collegio Carlo Alberto
CORD	Ayuntamiento de Córdoba
DFC	Design for Change Spain
HIDE	Hidepark Civic Association Triptych
KQ	Kalnciema Quarter
LABORELEC	Engie Laborelec
LCREA	Lucca Crea
LUCCA	Comune di Lucca
NITRA	Mesto Nitra
PUJ	Pontificia Universidad Javeriana
RIGA	Riga Planning Region

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SUA	Slovak University of Agriculture in Nitra
TSR	Tesserae
UCO	University of Cordoba
UNIPI	University of Pisa
UREAD	University of Reading
UNITO	University of Turin
CCA	Collegio Carlo Alberto
WTG	WellnessTechGroup

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FOREWORD

The Deliverable 7.7 of the IN-HABIT project presents the results of the ongoing impact assessment of the implemented VISs on inclusive health and well-being in the cities involved in the project. This document has been prepared by the research team at the University of Torino (UNITO) and the Collegio Carlo Alberto (CCA).

UNITO and CCA joined the consortium as of May 2023, after an amendment procedure started in October 2002 following the withdrawal of the partner ISIM and the incorporation of UNITO as a project partner. The Grant Agreement amendment has been accepted on April 2023. The administrative and formal steps to allocate the resources to UNITO and to officialize the involvement of the CCA as a linked third party have instead been completed on July 13th, 2023.

The original submission deadline for the Deliverable 7.7 was month 36 (end of August 2023). In view of the sequence of the events described above, the Officer granted an extension of the submission deadline to month 39 (end of November 2023).

To prepare this deliverable, extensive discussions through a series of one-hour online meetings with all four cities were organized on July 12th, 2023. These meetings aimed to gain knowledge of the status of the planned VISs. During the meetings, a number of obstacles have been underlined by the researchers from each city. Most of these were related to the delay in starting the activities due to the pandemic. These have now been overcome but have significantly delayed the implementation of hard and soft VISs. Consequently, the ongoing impact assessment that has been carried out to complete the deliverable D7.7 Report on IHW-1 focuses on a small number of implemented VISs.

Besides pandemic-related delays, the city members reported important delays due to changes in city governments in some cities (Lucca and Cordoba) and, more generally, to the slowness of

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bureaucracy. Several hurdles have been encountered at the public administration level during the co-development and co-deployment of VISs, including a lack of interest by cities' town halls.

During the on-line meetings, it has also been stressed that in some cases delays are due to the recent sudden surge of inputs' prices. This has seriously hit the budget allocated to the implementation of both soft and hard measures, calling for changes in the original projects to adapt to the new situation.

To implement the methodology envisaged by the partner formerly involved in the assessment of VISs (ISIM), UNITO-CCA should have carried out (i) short surveys, (ii) storytelling, and (iii) focus groups, with no involvement of control group at this stage (see "WP7 task 7.4 Ongoing impact assessment on IHW Guidelines for LCAs" for each city).

According to the methodology and time plan proposed by the former partner, data should have been collected between summer or fall 2022 (depending on the city) and February 2023. This should have been followed by a data analysis period. However, no data has been collected nor analyzed in that period. Indeed, the data collection period coincided with the negotiation stage of the incorporation of UNITO-CCA in the consortium. Therefore, engaging in the project activities was impossible before the amendment was accepted.

The UNITO-CCA team has identified a backup strategy to address these issues. This strategy has been based on the preparation and distribution of a multiple-choice and open-ended questionnaire addressed to a set of local stakeholders through the local activators, to collect data that could help us assessing the ongoing impact of the VISs on the local population. The data collected has been analyzed through a mix of qualitative and quantitative methods. By interviewing local stakeholders (both public and private ones), we intended to get a comprehensive picture of the current situation in each city, hence allowing to assess the ongoing impact of the implemented VISs.

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Overall, the activity has been articulated in four steps. The first step concerned the drafting of the questionnaires and the collection of feedback from the city partners. The second step consisted of the involvement of city partners and local activators to identify a set of local stakeholders to whom the questionnaires could be submitted. During the third step the questionnaires have been distributed by city partners and local activators. During the fourth step the UNITO team has collected and analyzed the responses.

The answers to the questionnaires have been analyzed by implementing qualitative and quantitative methods. The most original approach concerns the implementation of text analysis of the interviewees' open-ended answers through text mining and natural language processing (NLP). As we explain in detail in the methodology section, written interviews have been analyzed to find patterns of the emotional meaning of communications (sentiment analysis), hence allowing to ascertain the ongoing positive/negative/neutral attitudes of the respondent.

This report presents the results of this analysis and highlights strengths and weaknesses associated to the ongoing implementation of the VISs. Though no empirical analysis is free from limitations, we believe that the evidence about how stakeholders perceive the implemented activities could provide useful guidance to appreciate the best practices and to address the criticalities.

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EXECUTIVE SUMMARY

The Deliverable 7.7 “Report on IHW-1” presents the results of the ongoing impact assessment of the implemented Visionary and Integrated Solutions (VISs) on inclusive health and well-being (IHW) in the four cities involved in the IN-HABIT project (Cordoba, Riga, Lucca and Nitra).

The first section of the document describes the impact assessment framework that provides the background for the deliverable and the methodology employed to carry out the evaluation. The assessment framework has been detailed in the Deliverable 7.1 “Inclusive impact assessment plan” and is hence adapted and expanded for the need of the ongoing impact assessment. In particular, the ongoing impact evaluation builds on three primary dimensions, as documented in Section 1.1: social well-being, physical and mental health and economic well-being. The methodology is presented in Section 1.2 and consists of a qualitative-quantitative approach implemented on the data collected through a survey targeting a set of local stakeholders in the four cities (Section 1.2.1). The qualitative-quantitative approach includes standard statistical techniques and advanced text analysis techniques, as described in Section 1.2.2.

The second section of the document describes the survey in details, including the drafting of the questionnaire and the selection of respondents. The survey has been drafted by the UNITO-CCA researchers and has been administered by the city partners in each of the four cities. The stakeholders have been selected by the city members. The questionnaire includes both multiple choice and open-ended questions.

The third section of the document presents the results of the analysis of the questionnaire’ responses. Firstly, the sample is described in terms of characteristics of the respondents and the results of the statistical analysis of the responses to the multiple-choice questions are presented and discussed (Section 3.1). Secondly, the results of the text analysis carried out on the open-ended questions are presented and discussed (Section 3.2). The use of tables, charts and graphs allows to visualize and better appreciate the findings of the analysis. Lastly, the summary statistics by city are presented and discussed (Section 3.3).

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The fourth section of the document is dedicated to the overarching conclusions of the deliverable, including a brief summary of the main results, limitations of the analysis and future plans for the ex-post evaluation of the IN-HABIT activities.

The results show that the respondents agree that the proposed VIS affected the 12 social and physical and mental health well-being dimensions evaluated through the questionnaire and suggest that the ongoing impact of the IN-HABIT VISs is generally positive, notably as far as the individual physical and mental health is concerned. Specifically, the strongest level of agreement was for the item "represents a solution for a long-lasting positive physical and/or emotional feeling". Some respondents appeared to be dissatisfied, mostly in the cities of Lucca and Nitra. It is possible that the biggest issues were found in the VISs on animal-human relationship in Lucca and in the activities concerning schools in Nitra, i.e., the activities with the highest participation.

The IN-HABIT initiatives also had a positive impact in terms of community-level economic well-being, as nearly 40% of the respondents declared that the VISs provided opportunities to find a job or to improve current job position. In addition, a number of respondents found the VISs useful to enrich professional networking relationships within the community, learn new vocational skills useful in finding a job, or find new vocational training opportunities.

Interestingly, many other individuals were indirectly involved in the project, suggesting that the scope of the VISs was broad enough to ensure sufficiently heterogeneous participation in terms of age, gender, and even professional background. For these subjects we collected mostly positive feedback on the proposed VISs, although in this case the feedback is only indirect. There were some critical responses, but overall the topic modelling shows that positive feedback tends to prevail over negative ones.

It must be underlined that the small sample size limits the generality of this analysis and that a larger number of responses would be helpful to draw more reliable conclusions.

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1. IHW evaluation

1.1 Background: the IN-HABIT impact assessment framework

The IN-HABIT impact assessment framework for IHW aligns with the OECD and WHO guidelines, detailed in deliverable D7.1. The ongoing impact assessment of IHW relies on and expands such framework, with the aim to identify dimensions in line with the assessment evaluation plan, prioritizing approaches aligned with the IN-HABIT objectives.

Recognizing the complex links between health and well-being with economic, natural, human, and social capital, the framework operates on the principle that these are co-created common pool resources (CCPR), requiring community-wide investment for effective governance. Common pool resources (CPR) are owned, managed, and used by the community, presenting challenges of low excludability and high subtractability, typical of common goods. CPR embodies social relationships grounded on interdependence and cooperation, guided by clear rules (Ostrom, 2002). While a unified definition of well-being remains elusive, consensus exists on its elements, encompassing positive emotions, life satisfaction, fulfillment, and positive functioning. Public health emphasizes the role of physical well-being, such as feeling healthy and energized, in overall well-being. Researchers, spanning various disciplines, extend well-being dimensions beyond the physical, covering social well-being (economic well-being, domain-specific satisfaction, engaging activities, and work) and psychological or subjective well-being (emotional well-being, life satisfaction, development, and activity) (Kaplan et al. 1993; Diener 2000; Frey and Stutzer 2002; Keyes, 2002; Kahneman et al. 2004; Strine et al. 2008; Veenhoven, 2008).

The IN-HABIT impact assessment framework for IHW also examines interdependencies between well-being and social, institutional, and economic factors, incorporating the WHO determinants of mental health and well-being. It covers participation, social network, social

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support, trust, safety, working opportunities, social inclusion, equality, physical environment, discrimination and financial security. Such holistic approach aims to unravel the nuanced dynamics influencing individual and community well-being comprehensively.

Three primary dimensions that are central to the ongoing impact assessment of health and well-being are scrutinized.

The first dimension focuses on social well-being, likely to be influenced by the IN-HABIT VISs, tied to the concept of well-being as a common pool resource per Ostrom's theory. Social beings require not only favorable material conditions but also a sense of value, appreciation and the fulfillment derived from meaningful work. Deprivation of these elements heightens susceptibility to depression, drug use, anxiety, hostility and feelings of hopelessness, impacting physical health (WHO, 2012). Social well-being profoundly affects mental health and overall well-being, emphasizing the crucial role of interpersonal relationships. Key components include social cohesion, social inclusion, discrimination, and equality, acknowledged by studies in psycho-social and socio-anthropological domains.

The second dimension, vital to health and well-being, encompasses physical and mental health. The framework acknowledges subjective well-being, encompassing general psychological well-being, life satisfaction (positive measures) and mental distress (negative measure). The subjective well-being, highlighted in extensive research, is underscored as a human right by the European Pact for Mental Health and Well-being (2008) and WHO. It integrates into an individual's capacity for a fulfilling life, impacting relationships, education, work and daily decision-making. Within the physical and mental health dimension, the framework also incorporates healthy lifestyles, recognizing individual behavior's role in health outcomes. Positive changes in behavior can reduce chronic disease rates, with physical activity, engagement with nature, relaxation, and social interactions considered major pathways to health (EEA 2019). Studies exploring the link between culture and well-being highlight cultural

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activities' positive correlation with life satisfaction and self-esteem. Cultural professions, despite economic challenges, exhibit higher job satisfaction than other occupations.

Economic well-being stands as third fundamental determinant of health and well-being. Existing studies indicate that anxiety related to financial, housing, or work situations can adversely impact mental health. Job and skills satisfaction, along with employment perception, positively correlate with well-being. The WHO asserts that job security contributes to health, well-being, and job satisfaction. The health impacts of unemployment extend beyond psychological consequences to financial problems, including debt. Notably, unsatisfactory or insecure jobs can be as detrimental as unemployment, emphasizing the importance of job quality in safeguarding physical and mental health.

In essence, the comprehensive analysis integrates social, physical, mental and economic dimensions, emphasizing the interconnected nature of health and well-being. By aligning with established frameworks and addressing heterogenous aspects, the ongoing assessment strives for a holistic understanding of the factors shaping individual and community well-being.

The ongoing assessment is thus centered on three main dimensions: social well-being, mental and physical health, and economic well-being. The first two dimensions target both individual and community aspects, while the third dimension exclusively focuses on the community.[1] Table 1 reports the IHW dimensions and targets on which the ongoing assessment is focused.

Table 1 IHW Dimensions and Target

Dimension	**Target**
Social well-being	Individual
	Community
Physical and mental health	Individual
	Community

[1] More details on this are provided in the Section 2.

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Economic well-being	Community

1.2 Methodology

1.2.1 Survey to local stakeholders

The ongoing evaluation of the IN-HABIT actions presented in this deliverable is based on a survey to local stakeholders located in the four cities. There are several reasons to choose to implement such methods, notably compared to a wide survey directed at citizens, which is left for the ex-post evaluation exercise to be carried out at the end of the project.

Firstly, focusing the ongoing IHW evaluation on the local stakeholders' perception is in line with the Practical Participatory Evaluation (P-PE) methodology, which is precisely characterized by the stakeholders' participation in the evaluation process. According to Cousins and Whittmore (1998), P-PE has three primary uses or effects: i. instrumental, i.e. the provision of support for discrete decisions; ii. conceptual, as in the educational or learning function; and iii. symbolic, i.e. the persuasive or political use of evaluation to reaffirm decisions already made or to promote a particular agenda. Stakeholders' participation will hence increase the evaluation's relevance and objectiveness.

Secondly, the ongoing evaluation aims at taking a snapshot of the VISs implemented in the cities at a specific time during the project. In so doing, the evaluation process must account for the different paces of co-development, co-deployment and implementation of the VISs in the cities. As a matter of fact, the four cities showed a rather heterogenous extent of implementation of their VISs as of July 2023, when extensive on-line meetings have been carried out by the UNITO-CCA researchers with the city members. In order to account for that, hence with the aim of (i) not underestimating the potential of VISs not yet implemented and (ii) not overestimating the ongoing impact of already implemented VIS, we opted for collecting the perception of local

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stakeholders with respect to both individual and community level impact of the IN-HABIT actions.

Thirdly, given the different extent of VIS implementation and, as a consequence, the likely challenging comparability of results across cities, we opted for asking relatively broad questions on the IN-HABIT actions, leaving the respondents the possibility to mention a specific VIS (see Section 2 for the details). While doing so, we also took into consideration the city teams' suggestions to keep the survey as general as possible with the aim of allowing comparability of the results. Clearly, the best respondents for such a typology of survey are not people that may have individually participated to VISs, but individuals who represent a specific group/category, hence that may speak as spokesperson for the people/interests they represent.

Against this background, we opted for a qualitative-quantitative approach based on the administration of a questionnaire to a group of stakeholders per city, which includes both multiple choice (likert-scale) and open-ended questions. The results will be analyzed through standard statistical techniques and advanced text analysis techniques. While standard statistical techniques employed to analyze the multiple choice likert-scale question are widespread and well-known, text analysis techniques deserve an in-depth description, which follows.

1.2.2 Text analysis

An important purpose of text mining and natural language processing is to discover the most important words/topics in a document. One measure of a word's importance is its term frequency (*tf*), that is a measure of how frequently a term occurs within a document. This is usually calculated after removing the so-called "stop words" that recur several times in a text but are not important for identifying topics or sentiments, such as "the", "is", and so on. An additional measure used in text analysis is the inverse document frequency (*idf*), which allows to decrease the weight of commonly used words and increase the weight of little-used words in a set of documents. Mathematically:

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$$idf(term) = \ln\left(\frac{no.\,documents}{no.\,documents\ containing\ the\ term}\right)$$

In other words, *idf* is the natural logarithm of the ratio of the total number of documents divided by the documents in which the word appears.

The *tf-idf* statistic, obtained multiplying the *tf* and *idf*, allows to measure the importance of a word within a document in a collection (or corpus) of documents. Although information theorists have struggled to reconcile this approach with the available theory, *tf-idf* has proven to be a formidable tool in many applications, such as search engines and recommender tools (Beel et al., 2015).

The *tf-idf* statistics can be used to rank words by importance but also by *n*-grams. An *n*-gram is a set of n successive elements in a text document that can include words, numbers, symbols, and punctuation. *N*-gram models are useful in many text analysis applications where word sequences are relevant, such as in sentiment analysis, text classification, and text generation. In our analysis, we compute bi-grams (or simply, bigrams), namely word pairs, where couples of terms are ranked by importance through the *tf-idf* measure.

Topic modelling is a branch of unsupervised natural language processing that is used to represent a text document throughout different topics, which can better explain the underlying information in a particular document. To find these topics, we use the Latent Dirichlet Algorithm (LDA). This is a machine learning algorithm that finds topics that are not know *a priori* and are hidden in the data. It is based on the Dirichlet distribution and assigns topics to documents and document words to topics. In fact, the algorithm considers each document as a mixture of topics and each topic as a mixture of words. The three stages of the algorithm are:

Step 1. The term distribution b is determined by

b ~ Dirichlet(d).

Step 2. The proportions θ of the topic distribution for the document *w* are determined by

q ~ Dirichlet(a).

Step 3. For each of the *N* words w_i the algorithm

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(a) chooses a topic $z_i \sim$ Multinomial(q)

(b) chooses a word w_i from a multinomial probability distribution conditioned on the topic z_i: $p(w_i | z_i ; b)$, with β being the term distribution of topics and contains the probability of a word occurring in a given topic.

The purpose of the algorithm is to estimate unknown parameters using data (text), that is, to estimate which words are important for which topic and which topics are important within a given document. We use the LDA-Gibbs algorithm that is based on Gibbs sampling. The algorithm examines each document and randomly assigns each word in the document to one of the *K* topics using Gibbs sampling. For this reason, we set a seed before running the algorithm in order to reproduce the results. The seed used in this word is 1, using the *R* function *set.seed(1)*. All the elaborations are produced using the programming language *R*.

2. The questionnaire for ongoing evaluation

2.1 The questionnaire

The questionnaire has been drafted by researchers at UNITO and CCA after consultations with the city partners, which occurred in July 2023 after UNITO officially started its activities within IN-HABIT. The questionnaire takes stock of discussions with the cities as well as of past project deliverables, as documented in the previous subsection of this deliverable. The questionnaire has been administered between October and November 2023 by the city partners, who first selected, under the supervision of UNITO, the list of stakeholders to be interviewed (Table 2) and then took care of collecting, anonymizing and translating the responses, before sending them to UNITO and CCA researchers.

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Table 2 List of stakeholders interviewed in each city.

Stakeholders in Cordoba (9 interviews):	AVUE - Neighbourhood Association of Las Palmeras (n. 2) Foster home Madre del Redentor (n. 1) Neighbours (workshop group) (n. 2) Neighbourhood residents (not participants in the workshop group) (n. 2) Community Social Services Centre – City of Córdoba (City hall) (n. 1) Red XXI Association (n. 1)
Stakeholders in Lucca (12 interviews):	Active citizens of Lucca (n. 4) Student from UNIPI enrolled in Veterinary Science (n. 1) Educator at a nursing home in Lucca (n. 1) INHUB member, social working group (n. 1) INHUB member, tourism group (n. 1) INHUB participant, tourism group (n. 1) Hotel owner and manager in Lucca (n. 1) NGO ANPANA (n. 1) NGO LAV (n. 1)
Stakeholders in Nitra (12 interviews):	Principal of segregated school (n. 1) Teaching of segregated school (n. 1) President of civic association (n. 1) Hidepark visitor (with disabilities) (n. 2) Workshop lecturer (n. 1) Representative of civic association (n. 2) Dražovce neighbourhood resident (n. 1) Dražovce neighbourhood resident from ethnic minority (n. 1) Gardener in the community garden in Hidepark (n. 1) Visiting artist member of a civic association (n. 1)
Stakeholders in Riga (10 interviews):	Āgenskalna Neighborhood association (n. 1) Network for foreign nationals (n. 1) NGO focused on health and healthy diets (n. 1) Local creative/artist (n. 1) Entrepreneur resident of Agenskalns (n. 1) Public official project coordinator within the municipality (n. 1) NGO focused on accessibility and disability (n. 1) Waste minimization local vendor (n. 1) Members of the City council (n. 2)

The questionnaire includes three sections (see Table 3):

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A. personal information
B. likert scale questions
C. open ended questions.

Section A includes questions about the respondents: gender, age, city of residence, belonging to ethnic minority, form(s) of disability. Section B includes multiple choice questions aimed at collecting the respondents' perceptions with respect to a specific VIS that they mentioned at the beginning of the section.

Questions from Section B follow the theoretical dimensions previously identified: social well-being, physical and mental health, economic well-being (see Table 4). In particular, Section B.I includes 12 questions with 0-5 likert scale responses (where 0 = strongly disagree and 5 = fully agree) aimed at investigating the ongoing impact of the solution on social well-being and physical and mental health at the individual and community level, while Section B.II (questions 13 and 14) refers to the ongoing impact on community-level economic well-being of the VIS mentioned by respondents. The ongoing impact on the economic well-being is investigated at community level only because the interviewed local stakeholders, while being in a better position to provide insights in the community, may be advantaged with respect to individual economic outcomes, given the role they have in the community. Consequently, their personal experience may not be well-representative.

Section C includes 2 open ended questions aimed at gathering the respondents' perceptions with respect to IN-HABIT activities where they have been both actively involved (question 1) and indirectly involved (question 2). The last question (question 3) asks respondents to tell about the feedback received by other people in the community.

Table 3 Questionnaire for ongoing evaluation.

IN-HABIT Questionnaire for ongoing evaluation
Introduction

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We would be grateful to you if you could assist us by participating in answering the following questionnaire. The results will be analysed by the University of Turin (Italy) for the purposes of assessing the ongoing impact of the IN-HABIT project.
Completing the questionnaire takes around 20 minutes.
IN-HABIT is a research and innovation project coordinated by the University of Cordoba. The objective of the project is to foster Inclusive Health and Wellbeing (IHW) in four small and medium size cities (Cordoba, Lucca, Riga, Nitra) through visionary and integrated solutions, based on the mobilisation of undervalued resources (culture, food, human-animal bonds and environment), with a focus on gender and diversity. The project has received funding from the European Union's Horizon 2020 Programme under Grant Agreement n.869227.
Your participation in this survey is completely anonymous and voluntary.

Local partner
Date: [DD/MM/YYYY]
Partner City: [Cordoba/Lucca/Nitra/Riga]

Section A. Respondents' data

1. Are you: [male] [female] [non binary] [other] [prefer not to say]
2. Age: [ ]
3. City of residence: [same as IN-HABIT solutions' location] [other]
4. Do you belong to any ethnic minority in your city? [YES] [NO] [prefer not to say]

   If [YES], please select which of the following:

[White] [Mixed or Multiple ethnic group] [Asian] [Black or African or Caribbean] [Roma or Gipsy] [Other]

5. Do you have any form of disability? [YES] [NO] [prefer not to say]

Section B. Respondents' perception
Please answer all questions in both sections (**B.I** and **B.II**). When answering the questions, please think about a specific INHABIT visionary implemented solution (VIS) that has been carried out in the past 12 months in your city/neighbourhood
Please indicate which VIS you are considering: ____

Section B.I
Please report to what extent you agree with the following 12 statements on a scale from 0 to 5, where 0 = strongly disagree and 5 = fully agree.

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The implemented solution:

1. Increased the extent of the social interaction between people in the city/neighbourhood

   [0 1 2 3 4 5]
2. Improved the quality of social interaction between people in the city/neighbourhood

   [0 1 2 3 4 5]
3. Contributed to improve willingness of people to engage in similar social activities

   [0 1 2 3 4 5]
4. Endowed the local community with the capability to propose more inclusive activities

   [0 1 2 3 4 5]
5. Helped reducing the discrimination of any kind (gender based, ethnicity based, age based, etc.)

   [0 1 2 3 4 5]
6. Provided opportunities to foster the organization of similar social activities

   [0 1 2 3 4 5]
7. Has been associated with a positive and emotional feeling within the community

   [0 1 2 3 4 5]
8. Has been associated with physical wellness

   [0 1 2 3 4 5]
9. Represents a solution for the long-lasting positive physical and/or emotional feeling

   [0 1 2 3 4 5]
10. Provided the community with more opportunities to participate in healthy activities

    [0 1 2 3 4 5]
11. Created a more positive social environment around the city/neighborhood

    [0 1 2 3 4 5]
12. Endowed the local community with the capability to propose further healthier activities

    [0 1 2 3 4 5]

Section B.II

13. Does the implemented solution provided opportunities for job finding/upgrading?

    [YES] [NO] [Not sure]
14. If YES:
    a. It provided the opportunity to learn new professional skills useful for finding a job

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b. It helped finding new professional training opportunities

c. It enriched the professional networking relationships

d. Other: ____ (please indicate)

15. If NO: go section C

Section C. Respondents' open questions

1. Did you actively participate to one or more of the IN-HABIT actions? [YES] [NO]

If YES:

- Which action/s did you participate to?
- Tell us your overall perception
- Tell us something specific that you remember, either positive or negative, in relation to the solution/s.

If NO: go to question 2

2. Have you been involved indirectly in the IN-HABIT solutions? [YES] [NO]

If YES:

- Which solution/activity have you been indirectly involved to?
- Tell us your overall perception.
- Tell us something specific that you remember, either positive or negative, in relation to the solution/activity.

If NO: go to question 3

3. Did you receive any direct/indirect feedback from someone in the community who participated to one or more implemented solutions? [YES] [NO]

If YES:

- Could you tell us something about the people involved (individuals; business owners; young people; kids; elderly; etc.)?
- Did you receive positive or negative feedback? Could you tell us about them?
- Tell us your overall perception.

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If NO: end of questionnaire **End of questionnaire** **Thank you!**

Table 4 Dimension of IHW evaluation and questionnaire's questions from Section B.

Dimension	Target	Questions from section B
Social Well-being	**Individual**	1. Improved the social interactions between people in city/neighbourhood. 2. Enriched the diversity in the quality of social interaction between people in the city/neighbourhood. 3. Contributed to improve willingness of people to engage in similar social activities.
	Community	4. Endowed the local community with the capability to propose more inclusive activities. 5. Helped reducing the social discrimination. 6. Provided opportunities to foster the organization of similar social activities.
Physical and mental Health	**Individual**	7. Has/have been associated with a positive and emotional feeling 8. Has/have been associated with physical wellness 9. Represent a solution for the long-lasting positive physical and/or emotional feeling
	Community	10. Provided the community with more opportunity to participate in healthy activities. 11. Created a more enthusiastic environment around the city/neighbourhood. 12. Endowed the local community with the capability to propose further healthier activities.
Economic well-being	**Community**	13. Does the implemented solution/s provided opportunities for job finding/upgrading? [YES/NO] 14. If YES: a. It provided the opportunity to learn new professional skills useful for finding a job. b. It helped finding new professional training opportunities. c. It enriched the professional networking relationships.

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3. Analysis of the results

3.1 Questionnaire sections A and B

Section A aims to collect basic information about our respondents. The whole sample includes 43 interviews completed by 25 female respondents and 18 male respondents, the youngest being 26 years old and the oldest being 77 years old, with an average age of 46 (sd = 12). Only five respondents do not reside in the city where the VISs took place; only one respondent has identified herself/himself as being part of an ethnic minority (Roma or Gipsy); and four respondents declared having some form of disability. A detailed analysis of the summary statistics of the basic information by city is presented in section 3.3.Section B aims to understand the impact of the proposed solutions on social, health and economic factors. The first question of this section aims to identify which IN-HABIT activities the respondent was actively involved in. We summarize this information in Table 5. To extract this information from the interviews, we constructed bigrams from the question "Which action/s did you participate to?", and ordered the replies by tf-idf (term frequency, inverse document frequency, see section 1.2.2). In Cordoba, respondents who actively participated in the actions took part to socio-cultural visits and dancing activities; respondents in Lucca participated to city visits and used the animal lines created for pet owners; Nitra's respondents participated to art activities and school workshops; respondents in Riga participated in the community kitchen activity.

Table 5 "Which action/s did you participate to?". Bigrams ranked by tf-idf.

City	Bigram	Frequency	tf-idf
Cordoba	Socio-cultural visits	3	0.119
Lucca	pet friendly	3	0.109
Riga	community kitchen	4	0.0804
Cordoba	bailar mi	2	0.0792

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Cordoba	barrio dancing	2	0.0792
Cordoba	dancing activities	2	0.0792
Cordoba	mi barrio	2	0.0792
Cordoba	milla race	2	0.0792
Lucca	animal lines	2	0.0730
Lucca	city visit	2	0.0730
Lucca	friendly services	2	0.0730
Nitra	art residency	3	0.0730
Nitra	primary school	3	0.0730
Nitra	school workshops	3	0.0730
Nitra	hidepark art	2	0.0486
Nitra	industrial park	2	0.0486
Nitra	participatory art	2	0.0486
Nitra	pecha kucha	2	0.0486
Nitra	sunday chill	2	0.0486
Riga	empty jars	2	0.0402

To retrieve the precise activity, the questionnaire included a question that asked which VIS the respondent was considering, and using again our approach with bigrams we produced Table 6. It appears that the activities with the highest participation rate are the community kitchen and the outdoor market in Riga, Campo di Marte and animal lines in Lucca, la Milla race in Cordoba, and the primary school workshops in Nitra.

We repeat this analysis for those who were indirectly involved in IN-HABIT activities (see Table 7). In this case, the activities showing the highest participation rate were Campo di Marte in Lucca, May's cross in Cordoba, pecha kucha, primary school, school workshops and Sunday chill in Nitra, and āgenskalns market in Riga.

Finally, we also asked the respondents if they received any direct/indirect feedback from someone in the community who participated in one or more implemented solutions. In Cordoba, feedback came mostly from neighbors, kids, business owners, young people and seniors; in

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Lucca, feedback were received from business owners, elderly people, NGOs professionals, pet owners, social media and social operators; feedback in Nitra came from NGOs professionals, children, and civic associations; lastly, feedback in Riga arrived from commercial activities. However, the frequencies are very low (n = 1) to draw any useful considerations.

Table 6 "Please indicate which VIS you are considering". Bigrams ranked by tf-idf.

City	Bigram	Frequency	tf-idf
Riga	community kitchen	3	0.416
Riga	outdoor marketplace	3	0.416
Cordoba	milla race	4	0.396
Lucca	campo di marte	7	0.294
Nitra	primary school	5	0.267
Nitra	school workshops	5	0.267
Lucca	habit relational	6	0.252
Cordoba	christmas party	2	0.198
Cordoba	foster home	2	0.198
Lucca	animal lines	4	0.168
Nitra	art residency	3	0.160
Nitra	participatory art	3	0.160
Riga	creation kitchen	1	0.139
Riga	facilities lift	1	0.139
Riga	hard solution	1	0.139
Riga	indoor facilities	1	0.139
Cordoba	cross event	1	0.0990
Cordoba	event weekly	1	0.0990
Cordoba	la milla	1	0.0990

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Table 7 Which solution/activity have you been indirectly involved to?". Bigrams ranked by tf-idf.

City	Bigram	Frequency	tf-idf
Lucca	campo (di) marte	2	0.277
Cordoba	may's cross	3	0.189
Lucca	animal assisted	1	0.139
Lucca	animal lines	1	0.139
Lucca	assisted intervention	1	0.139
Lucca	inhabit relational	1	0.139
Lucca	nursing homes	1	0.139
Lucca	tourism sector	1	0.139
Cordoba	christmas party	2	0.126
Cordoba	mile race	2	0.126
Nitra	pecha kucha	2	0.0894
Nitra	primary school	2	0.0894
Nitra	school workshops	2	0.0894
Nitra	sunday chill	2	0.0894
Riga	āgenskalns market	3	0.0671
Cordoba	activities dance	1	0.0630
Cordoba	cross neighborhood	1	0.0630
Cordoba	cross parties	1	0.0630
Cordoba	cross workshops	1	0.0630

To measure respondents' perceptions of VIS, they were offered 12 statements to be ranked on a 0-5 scale (where 0 = strongly disagree and 5 = completely agree). Summary statistics are shown in Table 8. The general perception of the respondents is positive, as both median and mode are always 4 and 5, but the presence of 0 as the lowest value also shows the strong disagreement of some respondents. The highest level of agreement was on the item "represents a solution for the long-lasting positive physical and/or emotional feeling". Focusing our attention on physical and mental health indicators, we can analyze items 7 to 12 in Table 8 to extrapolate

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some results of implemented solutions on health factors. Items 7 through 9 measure individual health factors. The implemented solutions seem to have a great positive impact on individual health factors, as the most recurrent score (mode) is 5, the highest possible score, and on two items we have the highest median of the entire Section. Items 10 to 12 measure the impact of the proposed solutions on community health factors. Again, the results are positive, although not as positive as for individual health factors.

Another purpose of the questionnaire was to assess the relationship between the implemented VIS and the labor market (Section B.II). For 39.5% of our respondents, the VIS represented an opportunity to find a job or improve their current job position, while 34.9% were unsure and 25.6% answered negatively. For 5 respondents it enriched the professional networking relationships, for 5 of them it provided the opportunity to learn new professional skills useful for finding a job, while 7 respondents declared that it helped finding new professional training opportunities. In light of these figures, we can say that the effectiveness of the proposed solutions on economic well-being is rather limited and that more questions and a larger sample size would be needed to study properly this relationship. Finally, the lowest modes are observed for items 3 and 5. These are items belonging to the category of social well-being, which might be the least influenced factor by the proposed solutions.

The remaining part of the questionnaire was focused on open-ended questions, which we analyzed using text mining. The summary statistics for each city are provided in Section 3.3.

Table 8 Summary statistics of Likert scale questions 1-12 (0 = strongly disagree, 5 = fully agree).

Question	Min	Mode	Median	Max
1. Increased the extent of the social interaction between people in the city/neighbourhood	0	5	4	5

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2. Improved the quality of social interaction between people in the city/neighbourhood	0	5	4	5
3. Contributed to improve willingness of people to engage in similar social activities	0	4	4	5
4. Endowed the local community with the capability to propose more inclusive activities	0	5	4	5
5. Helped reducing the discrimination of any kind (gender based, ethnicity based, age based, etc.)	0	4	4	5
6. Provided opportunities to foster the organization of similar social activities	0	5	4	5
7. Has been associated with a positive and emotional feeling within the community	0	5	4.5	5
8. Has been associated with physical wellness	0	5	4	5
9. Represents a solution for the long-lasting positive physical and/or emotional feeling	2	5	4.5	5
10. Provided the community with more opportunities to participate in healthy activities	0	5	4	5
11. Created a more positive social environment around the city/neighbourhood	0	5	4	5
12. Endowed the local community with the capability to propose further healthier activities	0	5	4	5

3.2 Questionnaire section C

3.2.1 Overall perception of those who *actively* participated in one or more IN-HABIT actions

After removing all stop words, the texts collected on this question in the four cities were analyzed to find the most recurrent words. Table 9 shows that the most recurrent words were "people" in Nitra, "project" in Lucca, "market" in Riga, and "positive" in Cordoba. Riga also had the highest number of respondents who did not actively participate in the actions.

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Table 9 Word ranking per city. "Total" indicates the total number of words collected per city in the responses to this question considering all respondents.

City	Word	Frequency	Total
Nitra	people	20	482
Nitra	dražovce	10	482
Lucca	project	9	121
Nitra	activities	8	482
Nitra	children	7	482
Nitra	project	7	482
Riga	market	7	73
Lucca	animal	6	121
Nitra	hidepark	6	482
Riga	NA	6	73
Cordoba	positive	5	78
Lucca	lucca	5	121
Lucca	city	4	121
Lucca	human	4	121
Nitra	contact	4	482

Before proceeding with the text analysis models, we checked whether these texts followed the usual empirical facts of language to work with the usual machine learning tools. This analysis is reported in Appendix (Figures A1-A2).

To rank the words, we calculated the tf-idf (term frequency, inverse document frequency) statistic, used to measure the importance of a word in a document in a collection (or corpus) of documents. In our application we intend to check the importance of a word in the four cities. The results are shown in Figure 1.

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It emerged that the most relevant words predict the VIS that was implemented in each city. For example, in Cordoba the proposed VIS were perceived relevant to the local community, as the words with the highest tf-idf were “relationships” or “neighborhood” and were mainly focused on physical activity. In Lucca, where the VIS focused on animals, there are words such as “animal”, “human” and “bond”. The VIS seems to influence the local community as many words recalling the idea of groups are present in each city.

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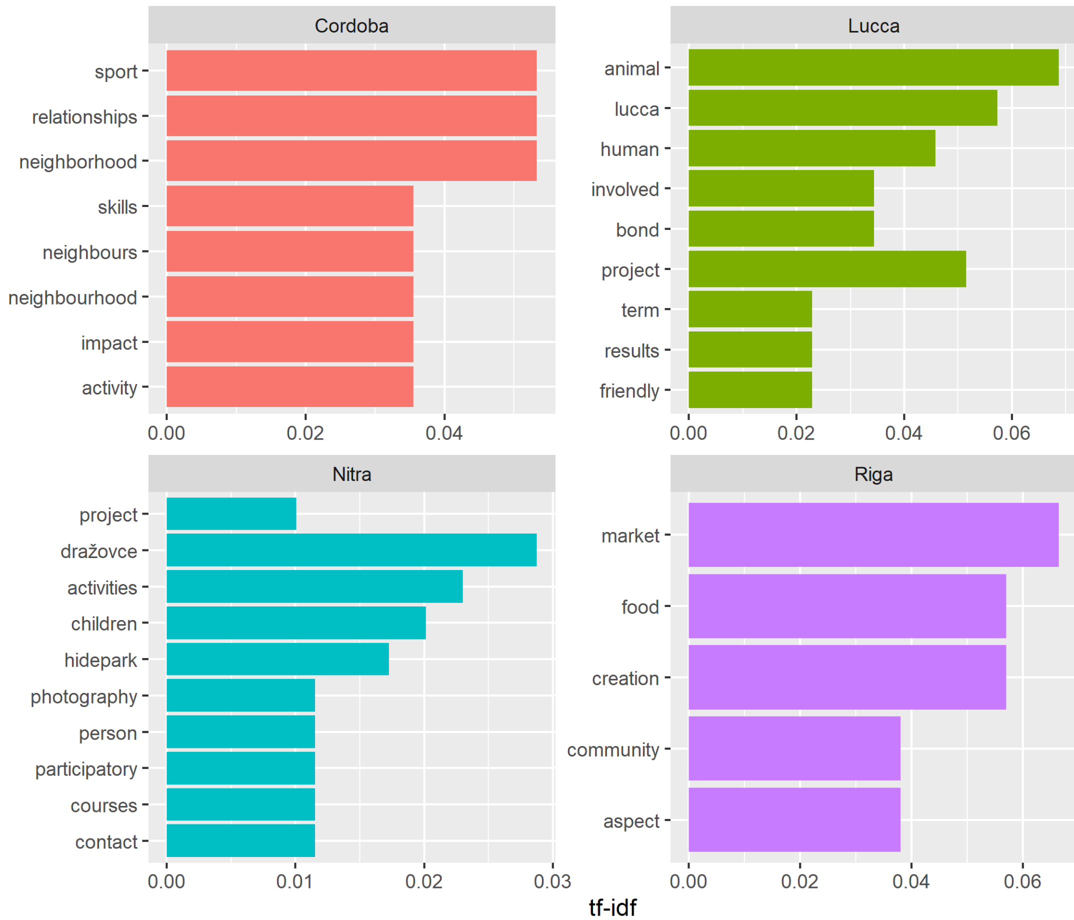
Figure 1 Top words by tf-idf statistic for each city.



To better understand the relationships between words, we proceed to analyze bigrams. The analysis of higher *n*-grams is of limited usefulness due to the small sample size. In Table 10 these bigrams are ordered by tf-idf. There are interesting patterns emerging from the analysis of bigrams. In Cordoba the community is at the center of the experience, as bigrams such as “collaborate relationships”, “hopeful experiences” or “improving relationships” clearly indicate that the VIS influenced the capability of individuals to build ties with other members of the community. In Lucca the core is represented by the relationship between humans and animals

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and the city, with most bigrams pointing towards a positive perception of the VIS. For Nitra it is difficult to isolate a clear sentiment, while for Riga the territory appears to be the common denominator between the different bigrams.

Overall, the sentiment seems to be positive, but to double check we also performed an additional sentiment analysis on the most frequent words that were preceded by “not” and were associated with a sentiment. Sentiment analysis is used to determine if the emotional tone of a text is positive, negative, or neutral. The three bigrams obtained using this analysis are “no criticism”, “not restricted”, and “not stop”, which do not denote any negative sentiment (in fact, “no criticism” is a very positive bigram).

Table 10 Bigrams ranked by tf-idf. In bold bigrams commented in the text.

Cordoba bigrams	Lucca bigrams	Nitra bigrams	Riga bigrams
acquiring skills	human animal	participatory photography	āgenskalns market
collaborate relationships	animal bond	pecha kucha	brings residents
free time	friendly city	habit project	city districts
healthy relationships	actively involved	language courses	creation aspect
homeless people	animal coexistence	primary school	creation kitchen
hopeful experiences	citizenship it’s	10 people	creative ideas
improving relationships	completely involved	15 graduates	districts visit
lacking hopeful	due energy	15 received	food distribution
neighborhood neighbors	energy basically	20 participants	food people
neighbors participate	entities actively	5 stalls	ideas technical
people acquiring	european city	8 photos	kitchen brings
people lacking	growing human	accessible language	market bestows
positive impact	improving services	age categories	market team
promotes health	initial rush	age simply	market territory
skills knowledge	institutions involved	arrive late	market widens
vulnerable people	intercultural exchange	art residency	nordic folks
positive impression	lucca started	artistic activities	peoples perception

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organic policy	attend regularly	quality regional
perfectly set	attractive benches	regional market
	bike path	residents closer

It is also interesting to see how all the words in the four cities eventually relate to each other. For this reason, we built a network using our bigrams to check the existence of potential linkages between the words. In Figure 4 we keep only the most common combinations ($n \geq 2$).[2] If we restrict our attention to words that are more common (they appear at least twice), the only meaningful links are those emerging from the VIS of Lucca that allowed to strengthen the bond between humans and animals, and the fact that the general impression is positive.

Finally, we used the Latent Dirichlet Allocation-Gibbs (LDA-Gibbs) topic model to individuate if there is some common topic in our data. This is important because it makes it possible to highlight common ideas or feelings among the respondents. Given the few texts in the dataset we opted for the minimum number of topics ($k = 2$). Despite this choice, the two topics end up overlapping, so we must carefully interpret the importance of each word, which depends on which topic it was assigned to. The results are shown in Figure 3 in the form of word clouds. The most important words in the text are "people" and "project". We can also see that in both topics positive words are recurring and important. This indicates that our respondents were mostly satisfied with the project in which they were involved.

[2] In this section we focus on the most significant results; the Appendix provides additional elaborations;

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Figure 2 Graph of the bigrams (n ≥ 2) of the four cities.

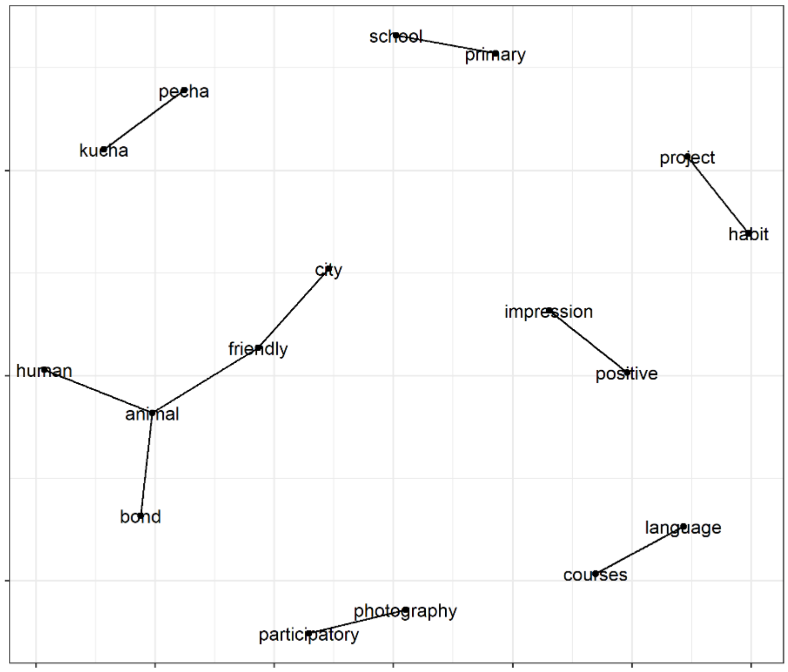

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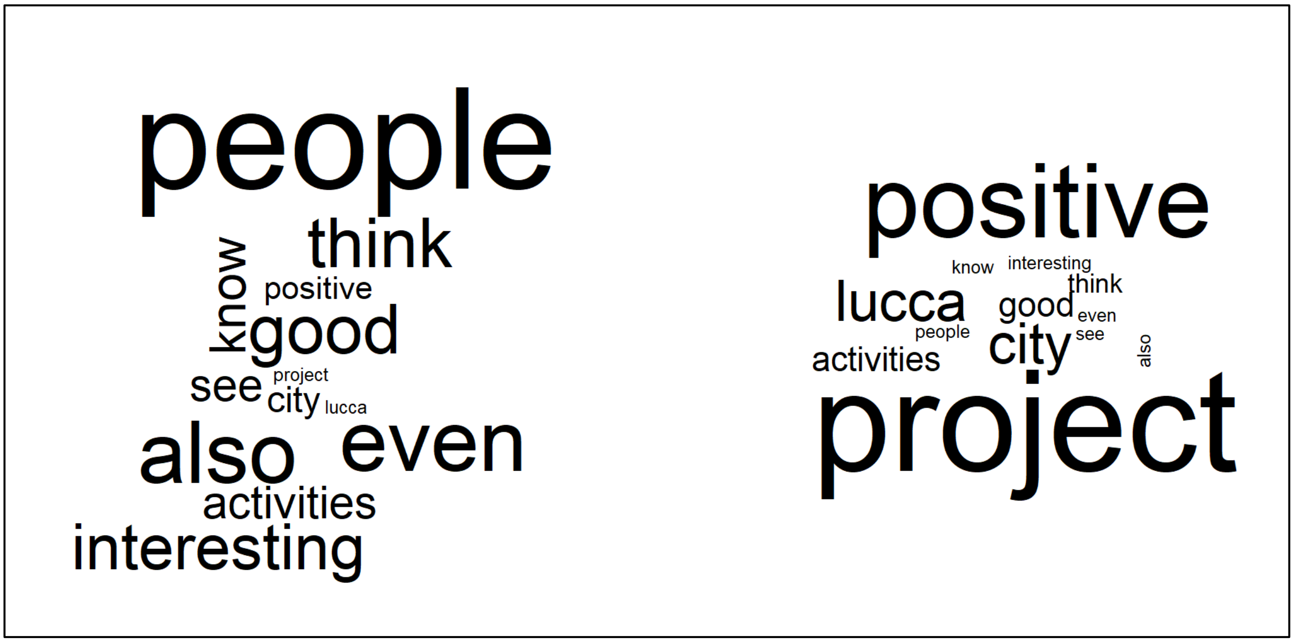
Figure 3 Word clouds of the two topics (topic 1 on the left, topic 2 on the right) obtained with the LDA-Gibbs algorithm. Bigger words indicate more important words.



3.2.2 Feedback from those who *actively* participated in one or more IN-HABIT actions

We repeat the analysis for the feedback received by those who were directly involved in the IN-HABIT actions. Table 11 shows many of the words already discovered in the previous section. In Lucca there seems to be the highest number of unsatisfied respondents as the word “negative” appears four times. However, we cannot exclude that the word appears in positive sentences such as “I have nothing negative to say”, so we need to check this result with a proper sentiment analysis.

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Table 11 Word ranking per city.

City	Word	Frequency	Total
Nitra	children	9	237
Nitra	people	6	237
Riga	NA	6	96
Lucca	project	5	116
Lucca	negative	4	116
Lucca	people	4	116
Lucca	positive	4	116
Lucca	NA	4	116
Nitra	activities	4	237
Nitra	community	4	237
Nitra	inclusion	4	237
Nitra	school	4	237
Nitra	workshop	4	237
Nitra	NA	4	237
Riga	association	4	96

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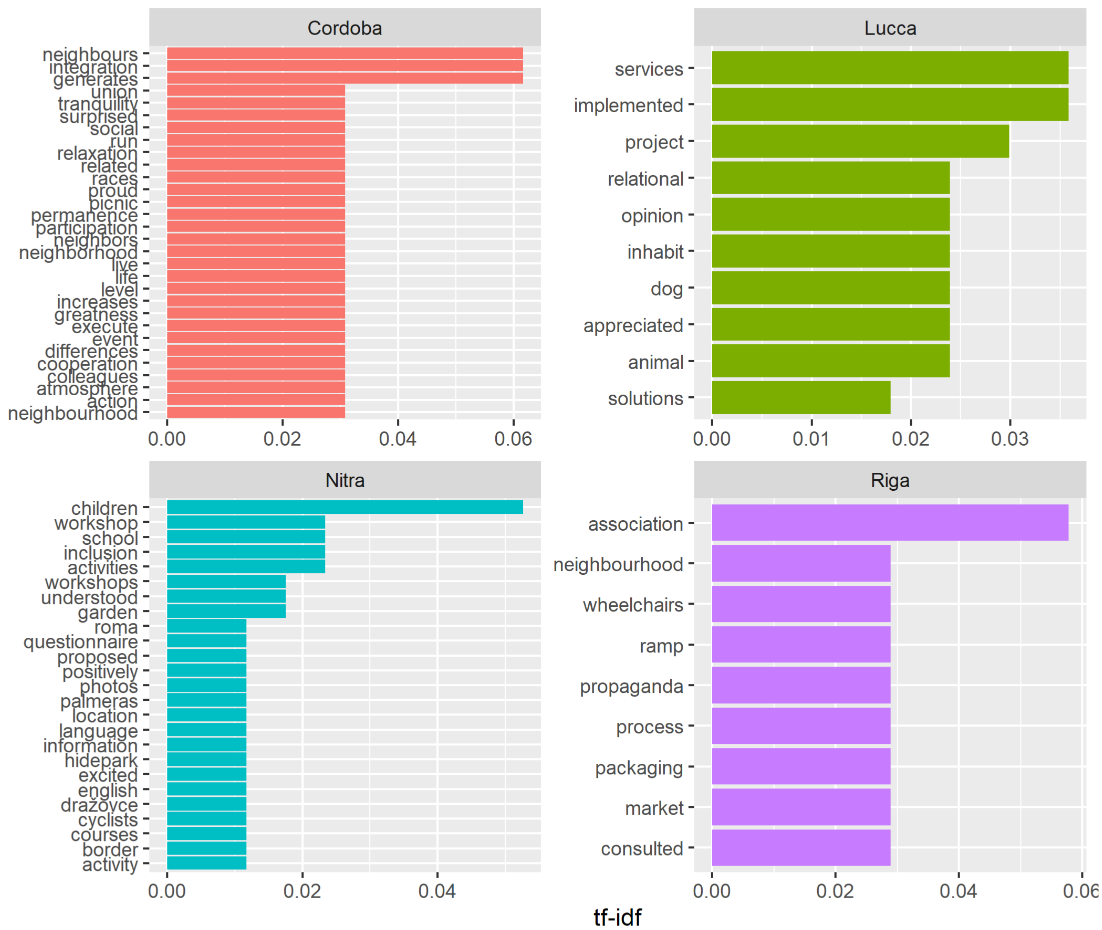
Figure 4 Top words by tf-idf statistic for each city.



The analysis of tf-idf (Figure 4) shows that in Cordoba, once again, the dominant words are in the domain of sense of community, while in Lucca they are related to the relationship with animals. In Nitra the feedback was centered around children, while in Riga the sense of community, with particular care for people with disabilities, was the topical sentiment.

The bigrams in Table 12 show that, coherently with the previous comments, in Cordoba the VIS had an impact over the community favoring integration. In Lucca the word "negative" is also on

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top of bigrams, and it appears also in Riga with the word “experience”, highlighting that there may have been negative or ambiguous feedback. In Nitra nature was the central theme as it appears in many bigrams with words such as “garden”, “environment” or “gardening”.

The analysis of graphs (Figure 5)reveals that if we focus on the most recurrent words there are no relevant connections to comment.

Table 12 Bigrams ranked by tf-idf. In bold bigrams commented in the text.

Cordoba bigrams	Lucca bigrams	Nitra bigrams	Riga bigrams
city integration	**2023 negative**	community garden	neighbourhood association
generates community	actively engage	community workshop	community kitchen
social differences	animal assisted	language courses	environmental ngo
	animal bond	positive view	historical building
	assisted intervention	containers shed	lot informally
	average owner	courses based	negative experience
	city centre	cycle path	procurement process
	depth analysis	discuss opinions	ramp frequently
	dog bowls	diverse people	regular height
	environmental guides	entry questionnaire	reuse packaging
	european commission	excited childrens	time discussing
	favorable opinion	gardening items	ugly ramp
	fountain situated	individual activities	
	guides sensitive	informal communication	
	human animal	las palmeras	
	innovative study	lecturer stano	
	lucca’s walls	natural fence	
	negative solutions	nature themed	
	people stakeholder	**negative fine**	
	pet care	normal environment	

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The LDA-Gibbs model allows us to formulate some other considerations on the overall feedback of our respondents (Figure 6). Indeed, in Topic 1 it seems that respondents were satisfied with the adopted solutions, as words like “positive” and “well” dominate over “negative”. This is not true when we consider Topic 2, for which we have the opposite result. It is then safe to assume that despite many satisfied respondents, many were unsatisfied, and by looking at Table 12 it appears that the highest dissatisfaction was in Lucca and Riga, where the word “negative” has a high rank.

Figure 5 Graph of the bigrams ($n \geq 2$) of the four cities.

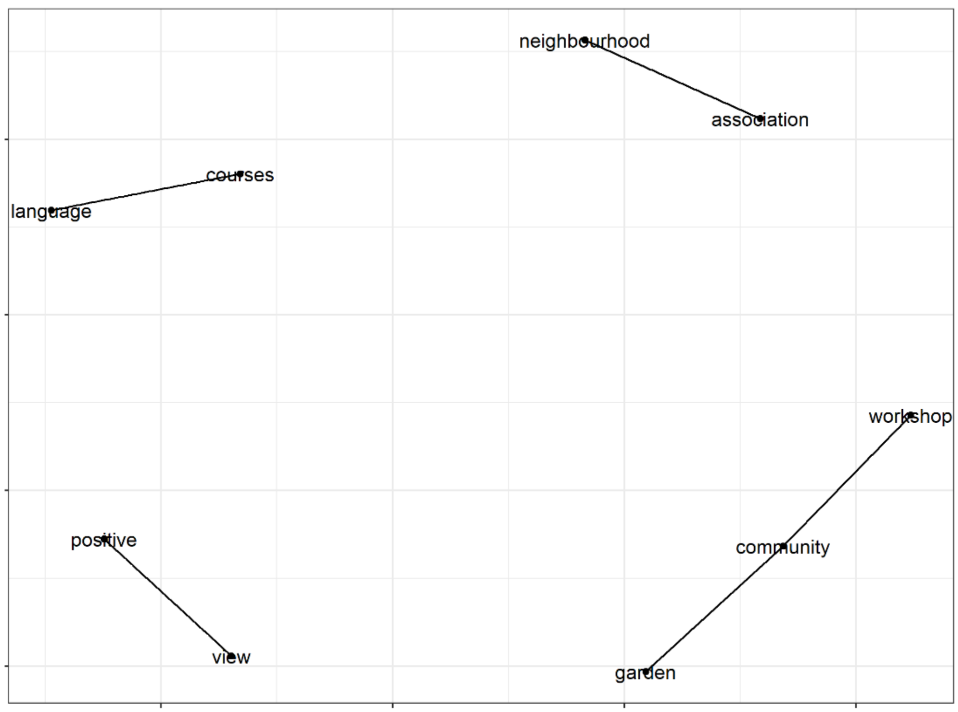

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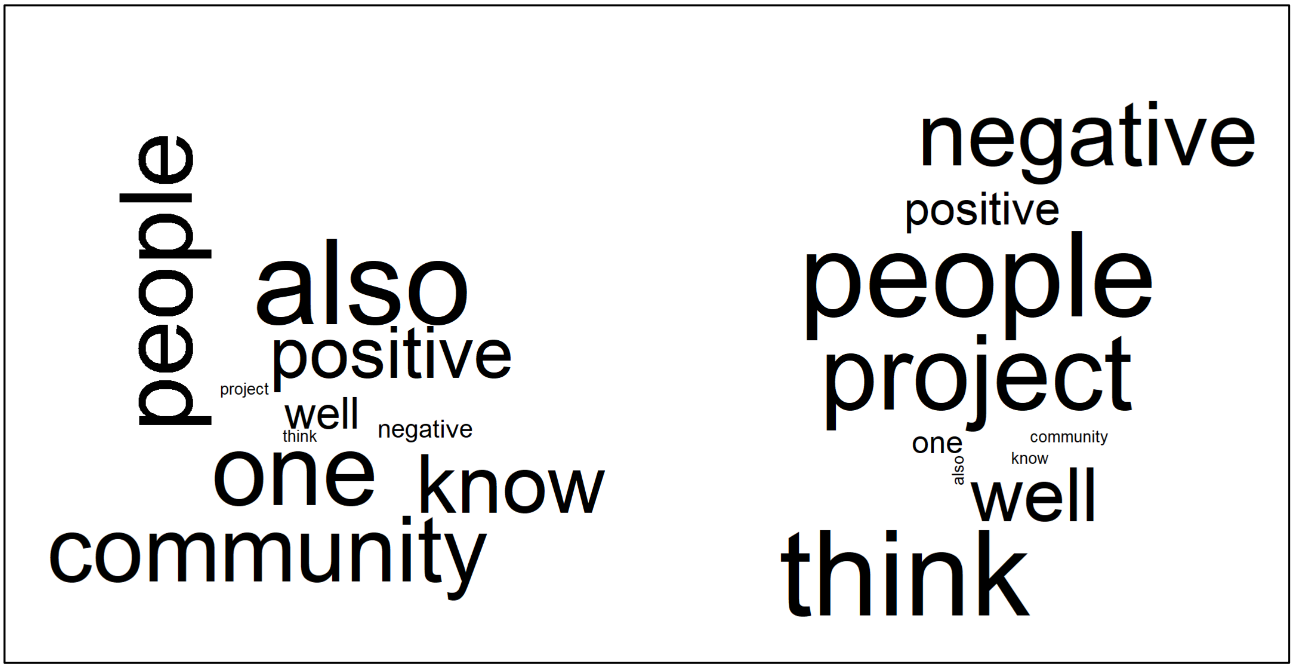
Figure 6 Word clouds of the two topics (topic 1 on the left, topic 2 on the right) obtained with the LDA-Gibbs algorithm. Bigger words indicate more important words.



3.2.3 Overall perception of those who were *indirectly* involved in one or more IN-HABIT actions

The analysis of term frequency on single words is very similar to that in Section 3.2.1. The results are reported in Table 14. The analysis of bigrams provides little insight given the small number of term frequencies (at most 2). The bigrams are reported in Table 13: for Cordoba and Riga it was possible to identify a clear pattern in the text, where the idea of “coexistence” is the core sentiment for Cordoba, while the idea of “market” and “neighborhood” are the core concepts for Riga. In Nitra the word “activity” (and its plural) appears in three bigrams, while “environment” appears in two bigrams with adjectives indicating opposite sentiments (“disadvantaged” and “respectful”), but it is difficult to identify what exactly the respondents were referring to.

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Graph analysis was conducted on all the words given that bigrams appeared at most 2 times. Figure 7 shows interesting linkages between words. Clusters such those with “idea”, “impress”, “people”, and “attract” or “innovative” and “opportunity” reveal a positive perception of the IN-HABIT actions in which the respondents were involved indirectly. There is also a big cluster that highlights the activities in Riga on the bottom left connecting terms such as “tourist”, “territory” and “market”. The analysis of topic via the LDA-Gibbs algorithm (Figure 8) shows that the sentiment towards the IN-HABIT actions was generally positive, as words such as “positive” or “good” appear in both topics in association with “people”, “project”, and activities.

Table 13 Bigrams ranked by tf-idf. In bold bigrams commented in the text.

Cordoba bigrams	Lucca bigrams	Nitra bigrams	Riga bigrams
city closer	idea people	low key	**āgenskalns neighbourhood**
coexistence inside	innovative opportunity	**community activities**	**āgenskalns market**
day dedicated	pleasant environment	complicated situations	front square
ideal time	preexistent path	creative respectful	local residents
personal reasons	previous reply	**disadvantaged environment**	**58 neighbourhoods**
plants catches		dog's leg	association developed
promote coexistence		dražovce district	attracts people
		fewer volunteers	brought joy
		found activities	city district
		hand fewer	correct solution
		home community	**drawing neighbourhoods**
		impress people	entire riga
		key activity	experience brought
		makes sense	international project
		material results	leisure time
		needlessly push	maintained environment
		pressing situations	**market reshaping**
		preventive characteristics	**market’s focus**

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	preventive goal	**market's front**
	respectful environment	**market's neighbourhood**

Table 14 Word ranking per city on the overall perception of those who were INDIRECTLY involved in one or more IN-HABIT actions. "Total" indicates the total number of words collected per city in the responses to this question considering all respondents.

City	Word	Frequency	Total
Riga	market	15	163
Nitra	activities	8	171
Nitra	children	8	34
Lucca	NA	7	163
Riga	āgenskalns	7	163
Riga	neighbourhood	5	51
Cordoba	neighborhood	4	171
Nitra	activity	4	171
Nitra	positive	4	171
Nitra	workshop	4	171
Nitra	NA	4	171
Riga	maintained	4	163
Riga	municipality	4	163
Riga	project	4	163
Cordoba	positive	3	51

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Figure 7 Graph of the bigrams of the four cities

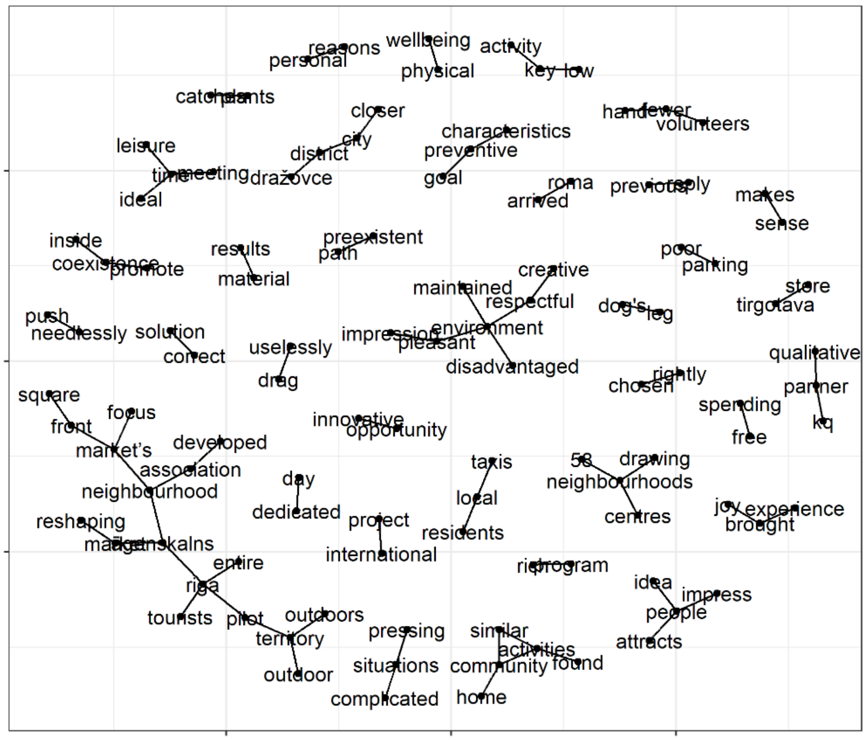

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Figure 8 Word clouds of the two topics (topic 1 on the left, topic 2 on the right) obtained with the LDA-Gibbs algorithm. Bigger words indicate more important words

3.2.4 Feedback from those who were *indirectly* involved in one or more IN-HABIT actions

The bigrams in Table 15 show several concepts that have already been highlighted in the section (3.2.2) dedicated to the feedback from those who actively participated in the IN-HABIT activities, with the core ideas being the “neighborhood”, the “relationship with animals”, “children” and “school”, and “community”. Once again, in Lucca there are bigrams that point to ambiguous and/or negative feelings. A sentiment analysis revealed that words like “effective”, “exaggerating”, “like” or “want” are preceded by the word “not”, meaning that there is negative feedback in the texts, such for example the fact that a solution may have been considered “not effective”. Topic modelling (Figure 9) shows that positive feedback tends to prevail, as in topic 1 the word “good” is prominent, and in topic 2 the word “positive” is slightly bigger than “negative”.

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Table 15 Bigrams ranked by tf-idf.

Cordoba bigrams	Lucca bigrams	Nitra bigrams	Riga bigrams
active participation	animal lines	pecha kucha	community kitchen
include sport	animal assisted	alternative school	planning region
joint collaboration	assisted intervention	capable boy	riga planning
met flowers	don't feel	children cooperated	āgenskalns market
neighbourhood dynamism	i've met	community garden	active citizens
neighbourhood involved	innovative solution	cooperated nicely	actively involved
neighbourhood organisations	meet people	cultural center	barista contest
positive motivate	negative aspects	disrespecting local	buy vegetables
	nursing homes	driver mover	catering enterprises
	organizing animal	ecological activities	change people's
	outdoor space	effective effect	city administration
	people negative	emotional reactions	coffee tasting
	pet owners	encyclopedias studied	community stage
	positive i've	established initiatives	cultural exchanges
	previous reply	existing activities	day announced
		fabian confessed	direct contact
		gifted girl	encouraged cultural
		girl attending	exchanges cohesion
		girl cried	excursion market
		highly positively	experience riga

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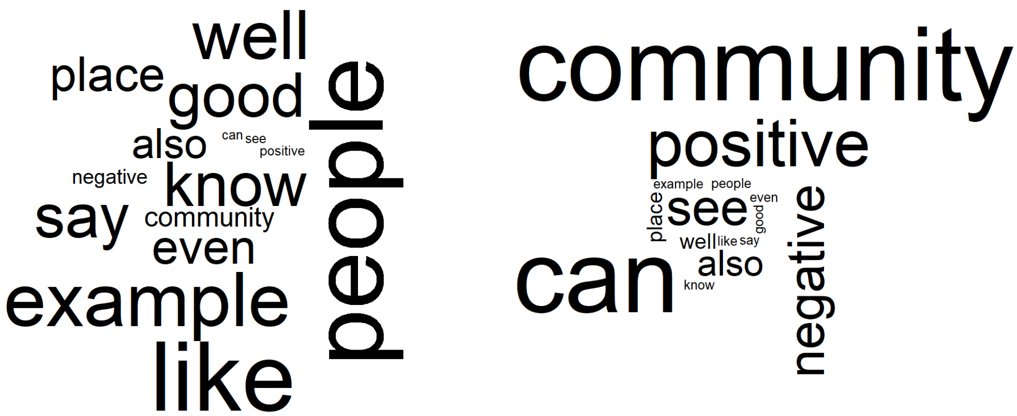
Figure 9 Word clouds of the two topics (topic 1 on the left, topic 2 on the right) obtained with the LDA-Gibbs algorithm. Bigger words indicate more important words.



3.2.5 Overall perception of those who received any *direct/indirect* feedback from someone in the community who participated to one or more implemented solutions

The overall perception of those who received any direct/indirect feedback from someone in the community who participated in one or more implemented solutions is overall positive. If we look at bigrams in Table 16, bigrams such as “social health”, “wonderful project”, of “positive effect” highlight a general satisfaction among respondents. Unfortunately, there were not enough data in this section, hence we could not implement topic modelling, given that the only possible topic was formed by three words: “positive”, “people” and “project”. This corroborates the positive sentiment of those who participated in the project.

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Table 16 Bigrams ranked by tf-idf. In bold bigrams commented in the text.

Cordoba bigrams	Lucca bigrams	Nitra bigrams	Riga bigrams
physical mental	animal friendly	aesthetic environments	successful tenants
social health	dimension leaves	approaches possibilities	agenskalns market
vast majority	directly involved	bring similar	ågenskalns market
	dissemination communication	brought positive	cheap offer
	everyone's lips	cities involved	cheaper produce
	expected inhabit	creatively involved	completely sufficient
	friendly city	ecological solutions	current offer
	human dimension	environments undoubtedly	customer flows
	inhabit lucca	habit project	customer streams
	inhabit project	healthy ecological	desired mix
	involved expanded	idea invite	economic survival
	lucca animal	involve parents	flows constitute
	people involved	makes sense	food trade
	pet friendly	nitra healthy	issue people
	wonderful project	**positive effect**	kebab shop
		primary school	mailing list
		project makes	market lacks
		school workshops	offer cheaper
		similar positive	people directly
		stable formats	publicity people

3.2.6 Feedback from those who received any direct/indirect feedback from someone in the community who participated to one or more implemented solutions

Most of the results in this section of the questionnaire provided positive feedback. As in the previous section, the analysis is partly limited by the small sample size. Table 17 and Figure 17 highlight two important networks, the first of which is on the left around the word "people"

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connecting with “involved”, “react positively” and “beautiful”, and the second one is on the bottom where the word “positive” connects with “extremely”, “feedback”, and “perception”. There is also a link between “negative” and “feedback” which shows that there someone was unsatisfied with the solutions.

Table 17 Bigrams ranked by tf-idf.

Cordoba bigrams	Lucca bigrams	Nitra bigrams	Riga bigrams
improve people's	positive feedback	kids scream	market's accessibility
people's quality	bowls implemented	100 estimate	accessibility solutions
unique event	dedicated services	answer people	accessibility standards
	dog walking	balls hiting	āgenskalns neighbourhood
	dogs owner	brought volunteers	assistance dog
	elderly people	bus stop	beautiful people
	favorable impressions	community positively	biggest location
	home relational	daughter stayed	community organisations
	i’ve received	deploy solutions	contemporary norms
	implemented aai	entrance gate	dedicated parking
	lucca walls	extremely positive	destructive environment
	nursing home	family houses	events dedicated
	occasionally brings	helping roma	ground floor
	owner inside	industrial park	handicapped people
	received positive	lot discussed	healthy products
	vulnerable people	management teachers	impressed happy
		multifunctional playground	inhabitants noticed
		ngo tradition	jazz concert
		people involved	key feedbacks
		people react	lift upstairs

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3.2.7 Overall perception using all the text

Given the relatively limited amount of text collected in each questionnaire, we performed text mining by merging all the text resulting from the "overall perception" question in Section C of the questionnaire. This sub-question is in fact present in the three questions of section C aimed at collecting information about those who were directly (question 1) or indirectly (question 2) involved in the proposed solutions, or those who received feedback from others (question 3). We then combined the texts resulting from these three questions by city under the heading "overall perception".

Having cumulated additional text data, we could construct a better network of bigrams to represent respondents' perceptions of VIS. Figure 10 represents the network structure of all words for "overall perception" using Markov chains (where each word choice depends only on the previous word). In the figure, arrows represent the "direction" of the links, while the intensity of the arrow color indicates how common bigrams are (i.e.: darker arrows indicate more common bigrams). Such results reinforce the interpretation of the previous graphs, but we can get a much better idea of the meaning of bigrams. For example, we can see that the link between "humans" and "animals" creates a "friendly city", and that the left constructive feelings emerge from the cluster of many positive words such as "excellent", "impression", "pleasant", or "brought joy".

The same data can be used to perform a more rigorous topic analysis. First, for computational purposes, we constructed a corpus from the texts by reshaping the four texts (one for each city) into paragraphs using the automatic "corpus_reshape" function of R. In this way, several "documents" were created for each city. Hence, Cordoba.1 indicates the first document generated using all the texts collected from Cordoba respondents, Lucca.7 indicates the seventh document generated using all the texts collected from Lucca respondents, and so on. Then, using the LDA-Gibbs algorithm again, we assigned words to four topics as follows (Table 18).

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Table 18. Most common words in each topic

	Topic 1	Topic 2	Topic 3	Topic 4
[1,]	"people"	"also"	"market"	"project"
[2,]	"interesting"	"good"	"positive"	"positive"
[3,]	"positive"	"even"	"well"	"involved"
[4,]	"lot"	"think"	"also"	"people"
[5,]	"project"	"something"	"people"	"lucca"
[6,]	"opportunity"	"like"	"one"	"like"
[7,]	"great"	"see"	"overall"	"city"
[8,]	"city"	"get"	"can"	"general"
[9,]	"know"	"come"	"city"	"idea"
[10,]	"time"	"impression"	"project"	"happy"
[11,]	"health"	"many"	"time"	"even"
[12,]	"think"	"way"	"different"	"one"
[13,]	"really"	"environment"	"think"	"time"
[14,]	"one"	"maybe"	"know"	"impression"
[15,]	"just"	"can"	"way"	"see"

The above diagram shows the 15 most common words in each topic discovered by the LDA-Gibbs algorithm. The words are sorted according to their posterior probability, that is, their likelihood of being found in that topic. Finally, we studied the relationship between these topics and the documents in each city using a heatmap matrix (Figure 11). A higher association between a topic and a document means that respondents from that city were more likely to talk about that topic. This is also useful for investigating the presence of clusters of ideas and sentiments across cities. For instance, we can see a red block in the upper right corner of the matrix that relates all cities, which means that topic 1 was a common topic among all cities. Looking at the words of topic 1, we can see that they mirror a very positive sentiment, as they include words such as “interesting”, “positive”, “health”, “great”, and “opportunity”. In the matrix we also observe that topic 3 was correlated mainly with Riga respondents, which is reasonable and expected given that the central word in topic 3 is “market” (one of Riga’s main VIS). Topics 2 and 4 also denote positive feelings and are shared by most of the respondents. It is important to highlight that, despite the criticisms, the positive sentiment was the most relevant one, since

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no negative words appear in the first 15 words of each topic. Cluster analysis mainly shows that topic 1 and topic 2 belong to the same cluster, as they share a common positive semantics.

Figure 1 Network structure (bigrams) of all the text gathered at the question "overall perception" using Markov chains.

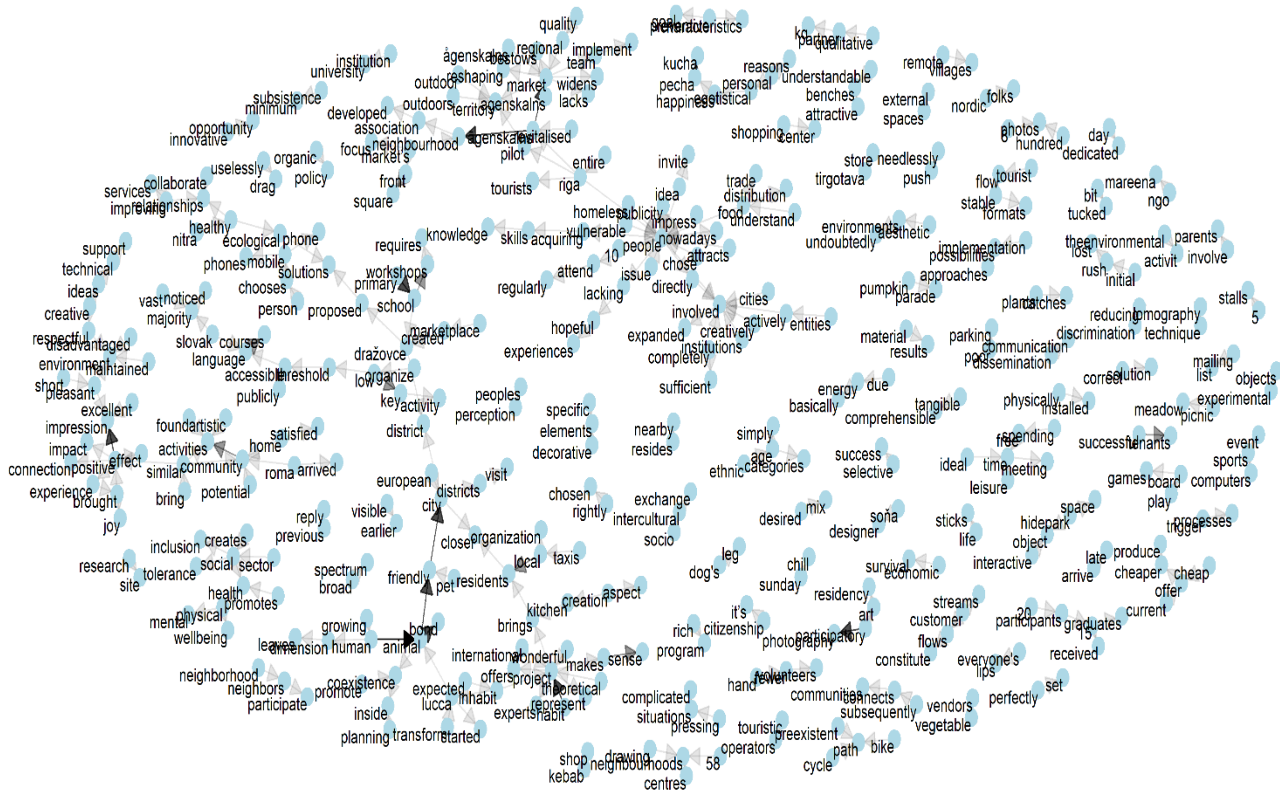

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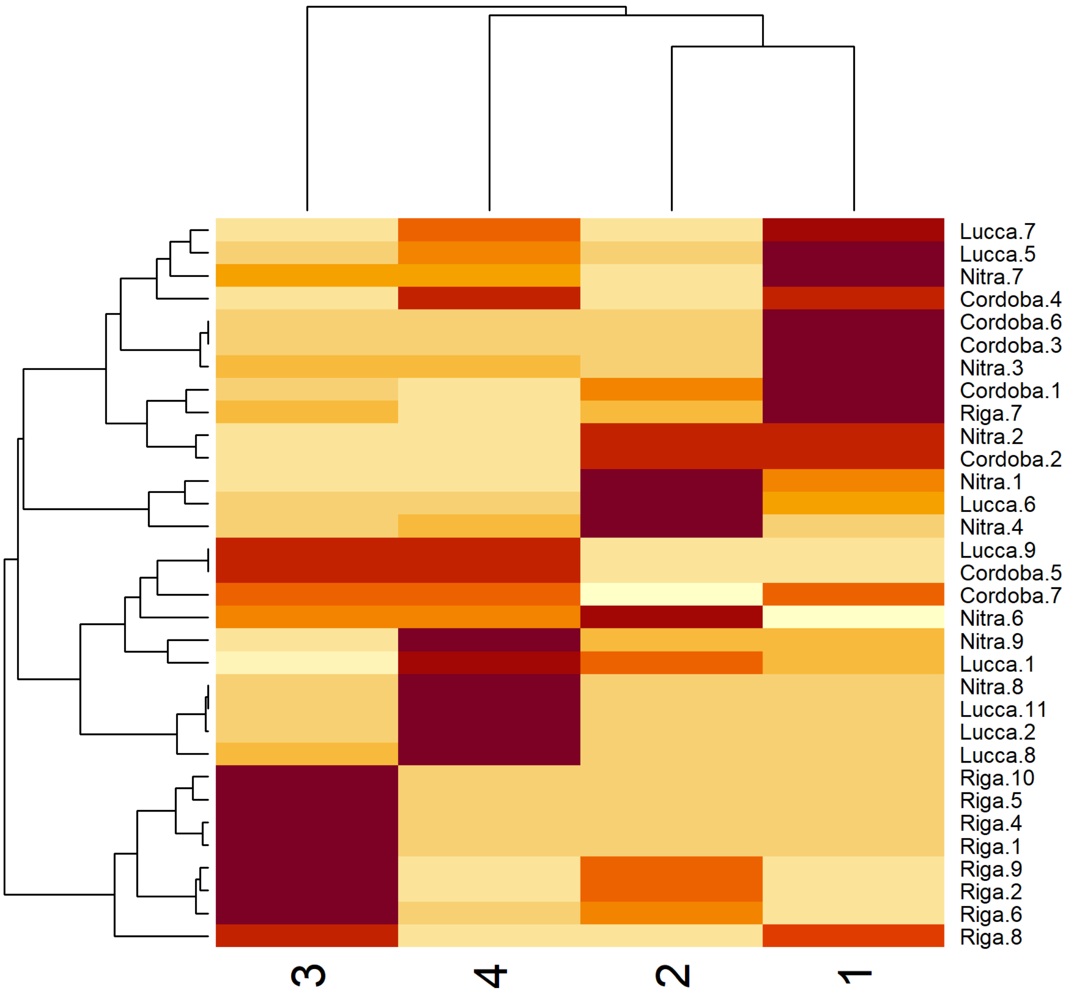
Figure 11 Heatmap matrix of relationships between topics and documents (cities). Colours closer to red indicate stronger relationships.



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3.3 Summary statistics by city

3.3.1 Cordoba

The sample consists of 9 Cordoba residents (5 men; 4 women), including one person with a disability; no respondents identified themselves as minorities in their city. The average age is 28 years old (sd = 12), with a minimum of 28 and a maximum of 78. The 9 respondents participated actively to one or more of the IN-HABIT actions, 5 of them were also involved indirectly, while 6 of them received feedback from people in the community who participated in one or more activities. Table 19 shows the VIS in which the respondents were engaged by gender. It turns out that La Milla Race was the most popular VIS. Table 20 reports the summary statistics of 12 statements that were evaluated by the respondents on a 0-5 Likert scale.

Table 19 Contingency table (VIS by gender) in Cordoba.

VIS	Man	Woman	**Tot.**
Christmas party in Palmeras	2	0	2
Garden in foster home	1	1	2
La Milla Race	1	1	2
May Cross Event, Weekly workshop and the Milla Race	0	1	1
Neighborhood picnic area	0	1	1
Weekly workshops and the Milla Race	1	0	1
Tot.	5	4	9

Given that the median and mode are always 4 or 5 and that no one expressed a value of 0 or 1 shows that the respondents felt that the proposed VIS was very effective in promoting the dimensions described in the 12 items. For 3 respondents, the implemented solution provided opportunities for job search/upgrading. Specifically, for two respondents it provided an opportunity to learn new vocational skills that were useful in finding employment, while for 1 respondent it was useful in finding new vocational training or employment opportunities.

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Table 20 Summary statistics of Section B1 (Likert scale: 0 = strongly disagree, 5 = fully agree).

Question	Min	Mode	Median	Max
1. Increased the extent of the social interaction between people in the city/neighbourhood	3	5	5	5
2. Improved the quality of social interaction between people in the city/neighbourhood	3	5	5	5
3. Contributed to improve willingness of people to engage in similar social activities	2	5	5	5
4. Endowed the local community with the capability to propose more inclusive activities	2	5	4	5
5. Helped reducing the discrimination of any kind (gender based, ethnicity based, age based, etc.)	2	4 and 5	4	5
6. Provided opportunities to foster the organization of similar social activities	2	5	5	5
7. Has been associated with a positive and emotional feeling within the community	3	5	5	5
8. Has been associated with physical wellness	2	5	4	5
9. Represents a solution for the long-lasting positive physical and/or emotional feeling	2	5	5	5
10. Provided the community with more opportunities to participate in healthy activities	2	5	5	5
11. Created a more positive social environment around the city/neighborhood	3	5	5	5
12. Endowed the local community with the capability to propose further healthier activities	2	5	4	5

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3.3.2 Lucca

The sample consisted of 12 Lucca residents (3 men; 9 women), including one person with a disability, and no respondents identifying themselves as minorities in their city. The average age is 56 years old (sd = 9), with a minimum of 47 and a maximum of 77. The 10 respondents participated actively in one or more of the IN-HABIT actions; 5 were also involved indirectly, while 4 have received feedback from people in the community who participated in one or more activities. Table 21 shows the VIS in which the respondents were engaged by gender. It turns out that the IN-HABIT relational areas (old hospital, Campo di Marte) were the most popular VIS. Table 22 reports the summary statistics of 12 statements that were evaluated by the respondents on a 0-5 Likert scale.

Table 21 Contingency table (VIS by gender) in Lucca.

VIS	Man	Woman	**Tot.**
Animal Assisted Intervention in nursing homes	0	1	1
Animal lines and IN-HABIT relational areas	1	3	4
IN-HABIT relational areas (old hospital, Campo di Marte)	2	5	7
Tot.	3	9	12

The median and mode for most of the items are both 4, hence showing that the respondents felt that the proposed VIS was effective in promoting the dimensions described in the 12 items. However, some respondents were very dissatisfied given the presence of zeros as answers. With this respect, we observe that Lucca (as well as Nitra) had the lowest degree of satisfaction. Despite this, the person with disability enjoyed the experience answering 5 to almost all the 12 items. For 5 respondents, the implemented solution provided opportunities for job search/upgrading. Specifically, for 2 respondents it enriched the professional networking relationships, for 2 of them it helped finding new professional training opportunities, and 1 respondent selected both answers.

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Table 22 Summary statistics of Section B1 (Likert scale: 0 = strongly disagree, 5 = fully agree)

Question	Min	Mode	Median	Max
1. Increased the extent of the social interaction between people in the city/neighbourhood	0	5	4	5
2. Improved the quality of social interaction between people in the city/neighbourhood	0	4	4	5
3. Contributed to improve willingness of people to engage in similar social activities	0	4	4	5
4. Endowed the local community with the capability to propose more inclusive activities	2	5	3.5	5
5. Helped reducing the discrimination of any kind (gender based, ethnicity based, age based, etc.)	0	3 and 4	3	5
6. Provided opportunities to foster the organization of similar social activities	0	3	3.5	5
7. Has been associated with a positive and emotional feeling within the community	0	4	4	5
8. Has been associated with physical wellness	3	5	4.5	5
9. Represents a solution for the long-lasting positive physical and/or emotional feeling	2	3	3.5	5
10. Provided the community with more opportunities to participate in healthy activities	0	5	5	5
11. Created a more positive social environment around the city/neighborhood	0	5	4.5	5
12. Endowed the local community with the capability to propose further healthier activities	3	5	4	5

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3.3.3 Nitra

The sample consists of 9 Nitra residents and 3 respondents from other municipalities (8 men; 4 women), including two persons declaring a disability and one belonging to a Roma/Gipsy ethnic minority. The average age is 42 years old (sd = 13), with a minimum of 27 and a maximum of 70. Out of 12 respondents, 10 participated actively in one or more of the IN-HABIT activities; 9 were also involved indirectly; 9 have received feedback from people in the community who participated in one or more activities. Table 23 shows the VIS in which the respondents were engaged by gender. It turns out that the primary school workshops were the most popular VIS. Table 24 reports the summary statistics of the 12 statements that were evaluated by the respondents on a 0-5 Likert scale.

Table 23 Contingency table (VIS by gender) in Nitra.

VIS	Man	Woman	**Tot.**
HidePark participatory art residency	1	0	1
Participative photography	1	0	1
Participatory art residency	1	0	1
Planting of trees along the road to Hidepark, new container for garden tools serving as a workshop in Hidepark	0	1	1
Support for the involvement of foreign communities in Nitra through a Slovak language course	0	1	1
The installation of a new garden shed in the community garde	1	0	1
The primary school workshops	2	1	3
The primary school workshops and the pumpkin parade	1	0	1
The primary school workshops, participatory art residency	0	1	1
NA	1	0	1
Tot.	8	4	12

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The results in Nitra are the most heterogeneous in terms of satisfaction with the proposed dimensions. However, the VIS was particularly appreciated by the respondent who identified as an ethnic minority (modal score on the 12 items equal to 5), and sufficiently also by the two individuals with disabilities (modal score of 3 and 4). For 5 respondents, the implemented solution provided opportunities for job search/upgrading. Specifically, for one respondent it provided the opportunity to learn new professional skills useful for finding a job, and for 4 respondents it helped finding new professional training opportunities.

Table 24 Summary statistics of Section B1 (Likert scale: 0 = strongly disagree, 5 = fully agree)

Question	Min	Mode	Median	Max
1. Increased the extent of the social interaction between people in the city/neighbourhood	0	3 and 4	3	5
2. Improved the quality of social interaction between people in the city/neighbourhood	0	2 and 4	2.5	5
3. Contributed to improve willingness of people to engage in similar social activities	1	2	3	5
4. Endowed the local community with the capability to propose more inclusive activities	0	4 and 5	4	5
5. Helped reducing the discrimination of any kind (gender based, ethnicity based, age based, etc.)	1	4	4	5
6. Provided opportunities to foster the organization of similar social activities	0	5	5	5
7. Has been associated with a positive and emotional feeling within the community	1	5	4.5	5
8. Has been associated with physical wellness	1	4	3.5	5
9. Represents a solution for the long-lasting positive physical and/or emotional feeling	3	5	5	5
10. Provided the community with more opportunities to participate in healthy activities	2	3	3	5
11. Created a more positive social environment around the city/neighborhood	1	5	3.5	5
12. Endowed the local community with the capability to propose further healthier activities	0	2	2	5

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3.3.4 Riga

The sample consisted of 8 Riga residents and 2 persons from other municipalities (2 men; 8 women), with no person with a disability and no ethnic minorities (one respondent did not answer to this question). The average age is 39 years old (sd = 7), with a minimum of 26 and a maximum of 49. Out of the 10 respondents, 4 of them participated actively, all of them were involved indirectly, and 8 of them have received feedback from people in the community who participated in one or more of the IN-HABIT activities. Table 25 shows the VIS in which the respondents were engaged by gender. It turns out that community kitchen and the marketplace area were the most popular VIS. Table 26 reports the summary statistics of the 12 statements that were evaluated by the respondents on a 0-5 Likert scale.

Table 25 Contingency table (VIS by gender) in Riga.

VIS	Man	Woman	**Tot.**
Accessibility, so mainly related to the outdoor area and the community kitchen.	0	1	1
All except e-market	0	1	1
Community kitchen	1	1	2
Improvement of the market area	0	1	1
Minimisation of waste at the market	0	1	1
Renovation of the outdoor area	0	1	1
Transformation of the outdoor marketplace	1	1	2
Transformation of the outdoor marketplace and indoor facilities (lift)	0	1	1
Tot.	2	8	10

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For Riga, despite the low minimum values, the modal and median score are high, revealing a high level of agreement with the 12 items proposed. For 4 respondents, the implemented solution provided opportunities for job search/upgrading. Specifically, for 1 respondent it provided the opportunity to learn new professional skills useful for finding a job and to enrich the professional networking relationships, for 1 respondent it provided the opportunity to learn new professional skills useful for finding a job, while for 2 respondents it helped finding new professional training opportunities and enriched the professional networking relationships.

Table 26 Summary statistics of Section B1 (Likert scale: 0 = strongly disagree, 5 = fully agree)

Question	Min	Mode	Median	Max
1. Increased the extent of the social interaction between people in the city/neighbourhood	1	4 and 5	4	5
2. Improved the quality of social interaction between people in the city/neighbourhood	0	5	4	5
3. Contributed to improve willingness of people to engage in similar social activities	1	3 and 4	3	4
4. Endowed the local community with the capability to propose more inclusive activities	2	3, 4 and 5	4	5
5. Helped reducing the discrimination of any kind (gender based, ethnicity based, age based, etc.)	1	3	3	5
6. Provided opportunities to foster the organization of similar social activities	3	4 and 5	4	5
7. Has been associated with a positive and emotional feeling within the community	4	5	5	5
8. Has been associated with physical wellness	0	3	3.5	5
9. Represents a solution for the long-lasting positive physical and/or emotional feeling	3	5	4.5	5

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10. Provided the community with more opportunities to participate in healthy activities	0	5	4.5	5
11. Created a more positive social environment around the city/neighborhood	3	4	4	5
12. Endowed the local community with the capability to propose further healthier activities	1	4	4	5

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4. Conclusions

Overall, the analysis of the results shows that the respondents agree that the proposed VIS affected the 12 dimensions evaluated throughout the likert scale questions from Section B of the questionnaire. Notably, both the median and mode of their responses are always around 4 and 5 (5 being the highest possible value on the scale), but the presence of 0 as the lowest value in some instances mirrors the disagreement of some respondents. The strongest level of agreement was for the item “represents a solution for a long-lasting positive physical and/or emotional feeling”. Some respondents appear to be dissatisfied, mostly in the cities of Lucca and Nitra. This emerges from the analysis of the Likert scale questions as well from the text analysis. Such findings relate to the social and physical and mental health well-being dimensions and show that the ongoing impact of the IN-HABIT VISs is generally positive, notably as far as the individual physical and mental health is concerned.

Looking at the activities classified in Table 5, it is possible that the biggest issues were found in the VISs on animal-human relationship in Lucca and in the activities concerning schools in Nitra, i.e., the activities with the highest participation. On the other hand, many positive aspects emerged from the rest of the text analysis. Network analysis using graphs revealed interesting connections, such as those between “knowledge,” “skills,” and “understand”, or “tourist”, “territory”, and “market”, or even “physical”, “health”, and “promotes”, showing a positive impact of the initiative on the territory and well-being.
The IN-HABIT initiatives also had a positive impact in terms of community-level economic well-being, as nearly 40% of the respondents declared that the VISs provided opportunities to find a job or to improve current job position. In addition, a number of respondents found the VISs useful to enrich professional networking relationships within the community, learn new vocational skills useful in finding a job, or find new vocational training opportunities.

Interestingly, we learn from the interviewees that many other individuals were involved in the project, such as neighbours, children, business owners, youth, and the elderly in Cordoba,

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business owners, the elderly, NGO professionals, pet owners, social media and social workers in Lucca, NGO professionals, children and civic associations in Nitra, and businesses in Riga. This shows that the scope of the VISs was broad enough to ensure sufficiently heterogeneous participation in terms of age, gender, and even professional background. For these subjects we collected mostly positive feedback on the proposed VISs, although in this case the feedback is only indirect, as information is provided by the respondent. There were some critical responses, as evidenced by the presence of the "negative feedback" bigrams. Yet, topic modelling shows that positive feedback tends to prevail over negative ones. It must be underlined that the small sample size limits the generality of this analysis and that a larger number of responses would be helpful to draw more reliable conclusions. An additional limitation of the sample is that it includes only institutional representatives, while it would be useful to include residents as well.

Taking stock of the findings and on the issues related to the above-mentioned limited sample size, as well as on the impact assessment plan (D7.1), the ex-post IHW impact assessment report will be carried out through a quali-quantitative approach implemented on a comprehensive survey directed at the population involved in the four cities. The survey will be realized in collaboration with the city partners and administered through the IN-HABIT mobile application.

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Appendix A

Figure A.2 Distributions of term frequencies in each city – Overall perception of those who actively participated in one or more IN-HABIT actions

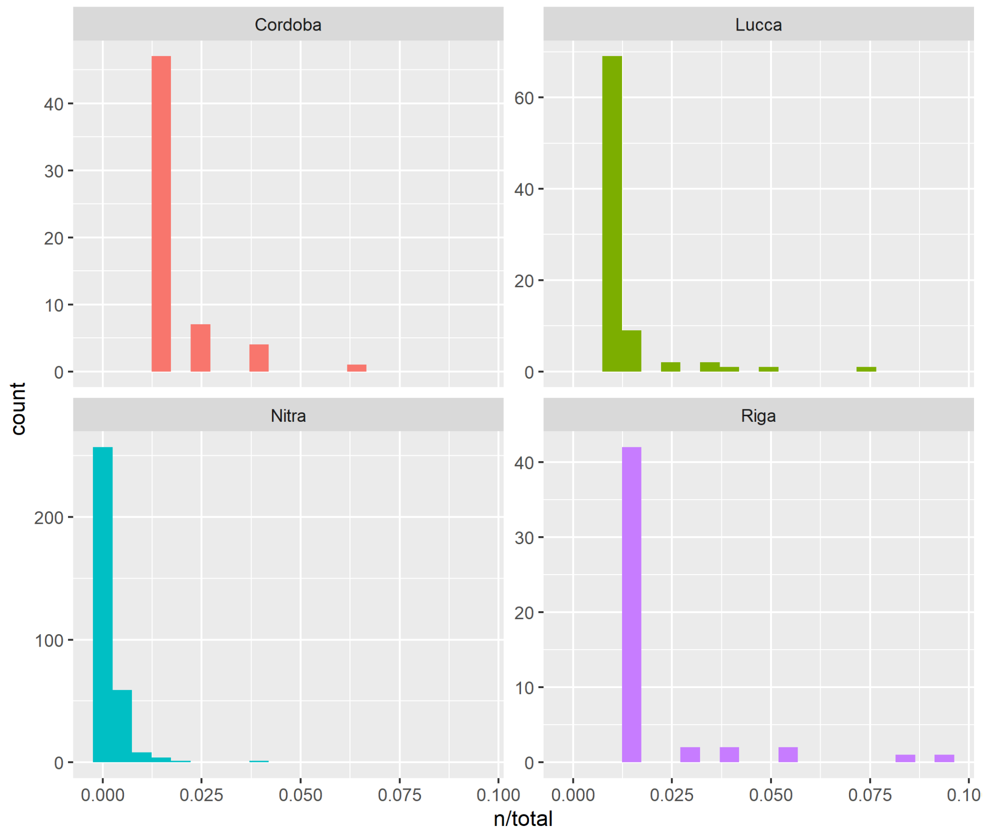

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Figure A.3 Zipf's law for the texts of the four cities (log-log coordinates). Colours defined as in Figure A.1. – Overall perception of those who actively participated in one or more IN-HABIT actions

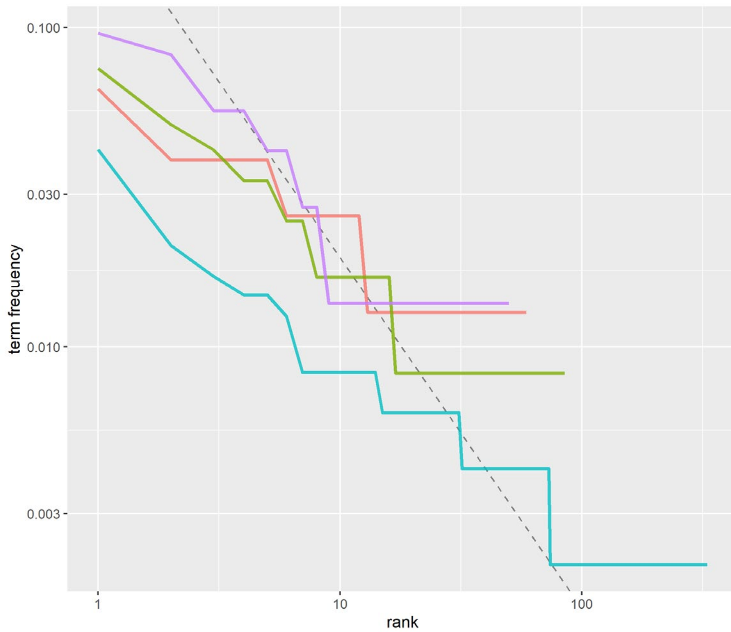

Figure A.1 shows the distributions of term frequencies in each city. These distributions are generally skewed, with a long tail to the right and a peak near zero. This is the case in our sample, that is to say, only a few words are particularly important for each community.

The second empirical fact to be verified is Zipf's law, namely that the frequency of occurrence of a word is inversely proportional to its rank. If this is the case, the graph of word frequency versus rank should show a negative slope. This seems to be the case for our texts (Figure A.2), although there are some deviations, due to the small sample size and the presence of rare words. Having detected no anomalies, we proceeded with the usual analysis.

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Figure A.3 Graph of the bigrams of the four cities – Overall perception of those who actively participated in one or more IN-HABIT actions

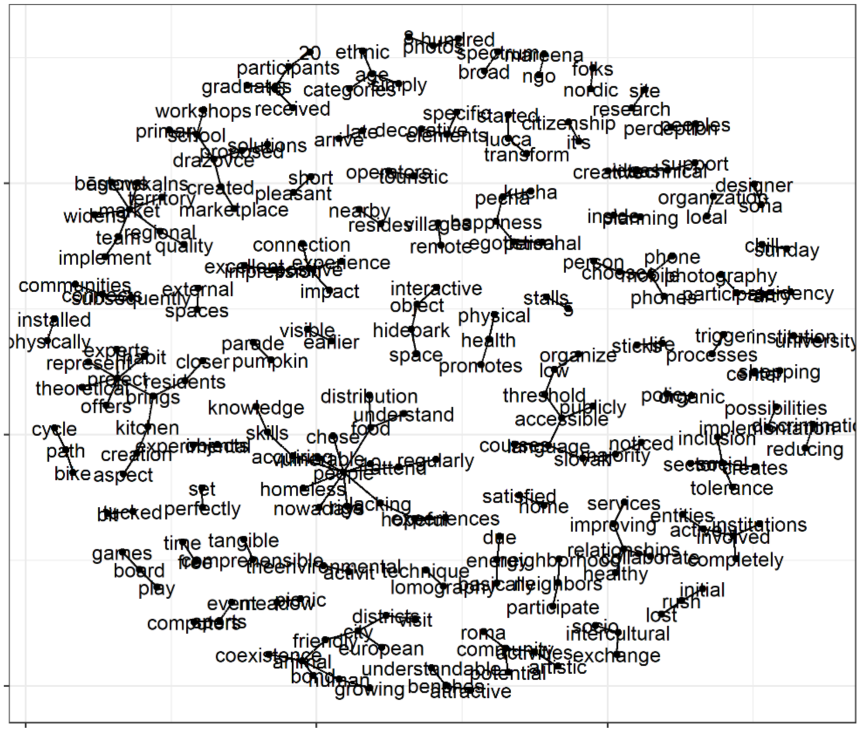

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Figure A.4 Graph of the bigrams of the four cities – Feedback from those who actively participated in one or more IN-HABIT actions

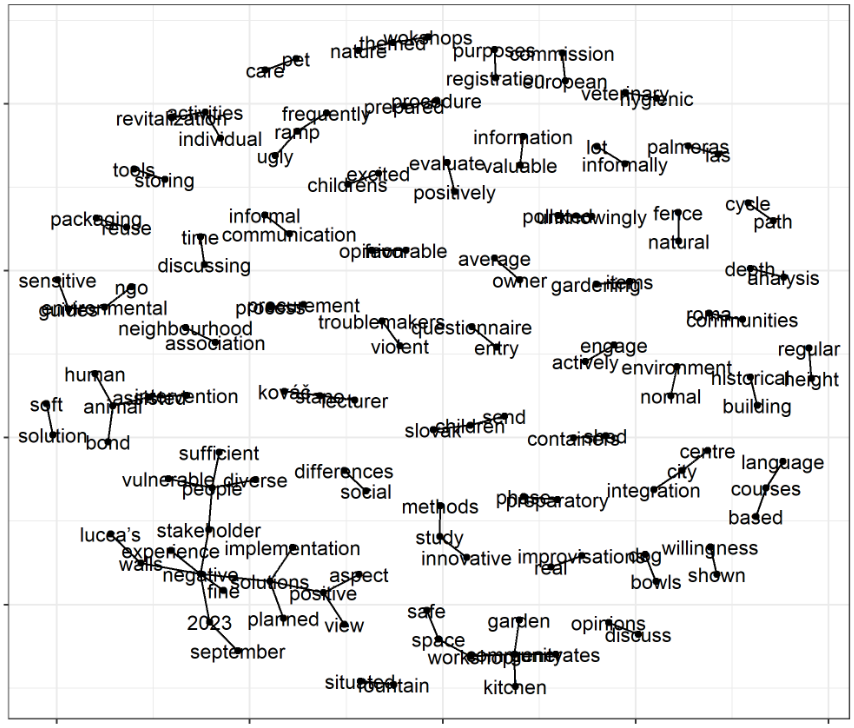

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Figure A.5 Graph of the bigrams of the four cities – Overall perception of those who were indirectly involved in one or more IN-HABIT actions

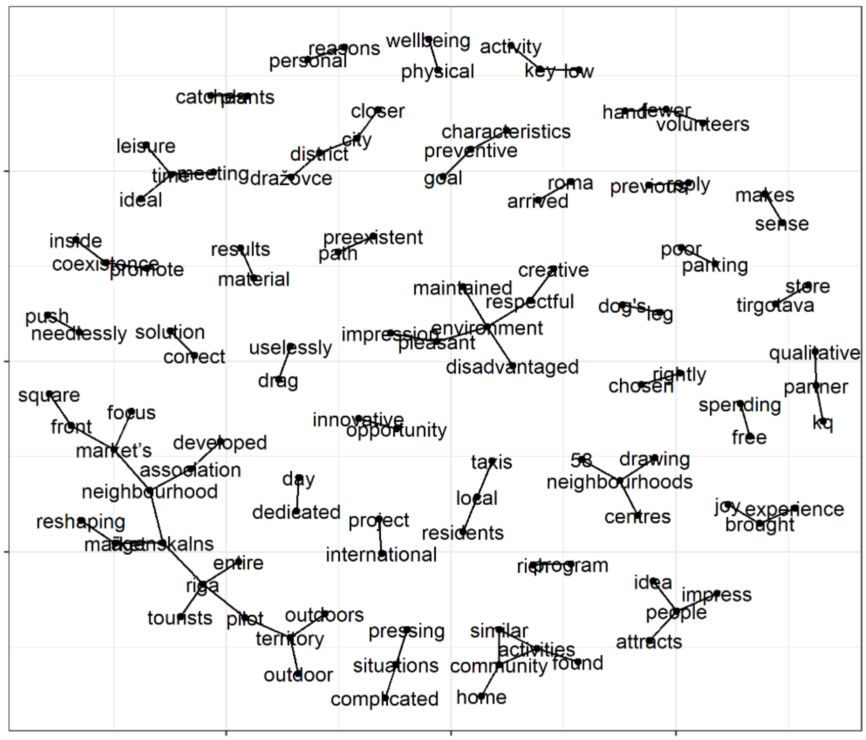

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Figure A.6 Graph of the bigrams of the four cities – Feedback from those who were indirectly involved in one or more IN-HABIT actions

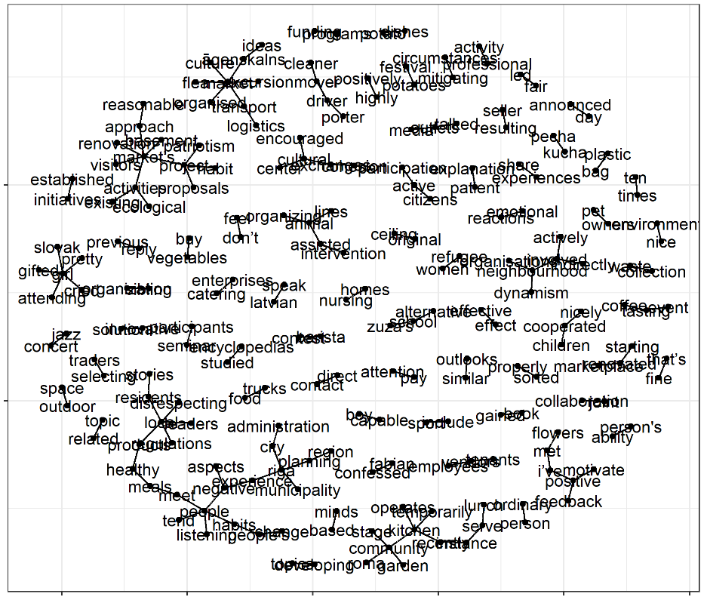

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Figure A.7 Graph of the bigrams of the four cities – Overall perception of those who received any direct/indirect feedback from someone in the community who participated to one or more implemented solutions

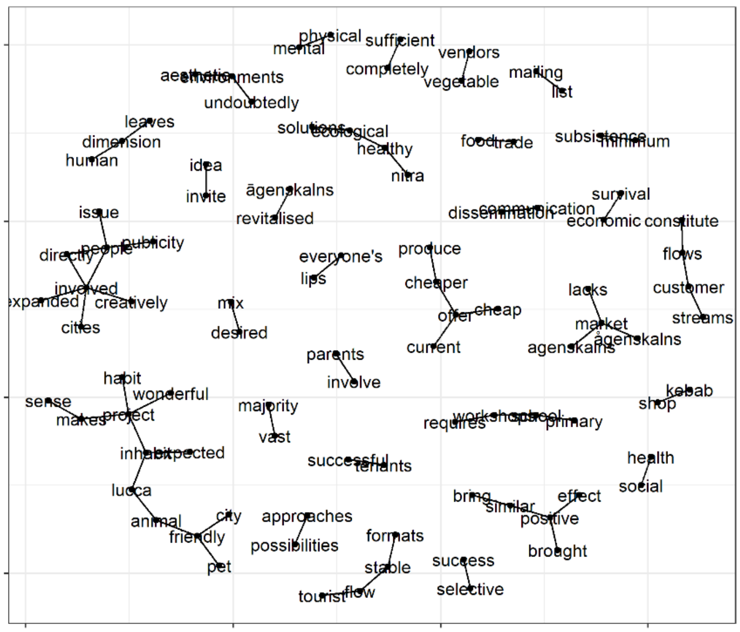

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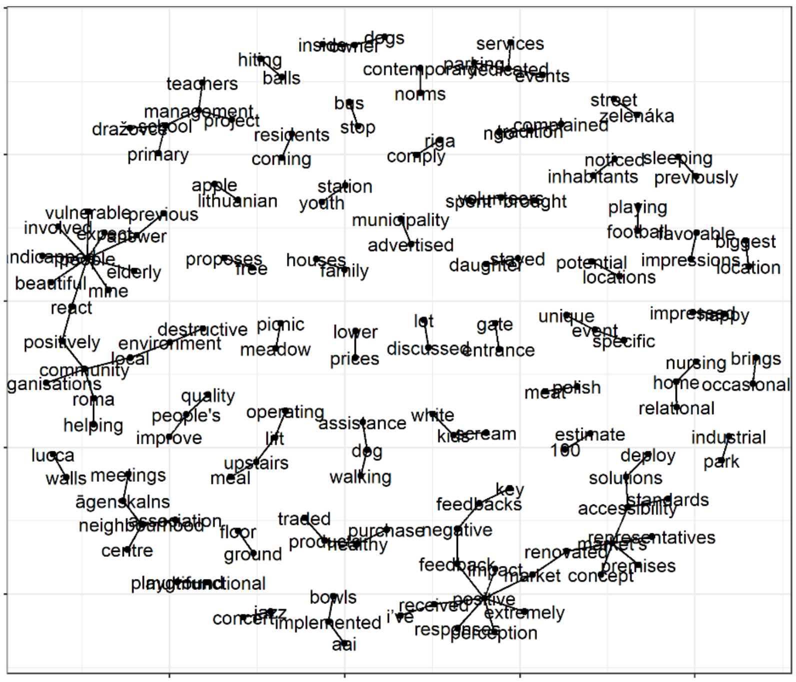
Figure A.8 Graph of the bigrams of the four cities – Feedback from those who received any direct/indirect feedback from someone in the community who participated to one or more implemented solutions



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