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SmarterLabs

Improving Anticipation and Social Inclusion in Living Labs for Smart City Governance

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Summary

The “Smart City Living Lab” is an emerging approach in European cities. It brings together citizens, policymakers, businesses, and researchers to test smart, ICT-based solutions to urban problems in real-life contexts. However, solutions that “work” in the particular reality of a Living Lab may not be adopted at a large scale. Urban infrastructure is interwoven with the daily lives of citizens and therefore difficult to change, and large groups may not even have access to ICT-based solutions. In thid framework, the SmarterLabs project develops a novel approach that anticipate major risks of a smart technology innovation (resistance to change, exclusion of social groups) and performs action research in Living Lab activities in four cities: Bellinzona, Brussels, Graz and Maastricht. By explicitly addressing anticipated barriers and incorporating groups at risk of exclusion in the Living Lab experiment, the chances of successful uptake of the end result are enhanced. For all European cities with Smart City initiatives, the project delivers generic implementation guidelines for Smart City Living Labs on how to address barriers to upscaling that may stem from resistance to large-scale change in socio-technical systems and from people being excluded (in direct or indirect way). By giving special attention to anticipation of possible resistance and social exclusion in the form of Living Labs, the results of Smart City initiatives (now and in the future) are expected to become better scalable and more robust in terms of value creation for a wide range of stakeholders.

Zusammenfassung

Die "Smart City Living Lab" Methodik ist ein aufstrebender Ansatz in europäischen Städten. Es bringt Bürger, Entscheidungsträger, Unternehmen und Wissenschaftler zusammen, um intelligente, IKT-gestützte Lösungen für städtische Probleme in realen Kontexten zu testen. Lösungen, die innerhalb eines Living Labs "funktionieren", werden jedoch möglicherweise nicht auf großer Skala übernommen. Die urbane Infrastruktur ist mit dem täglichen Leben der Bürger eng vernetzt und daher schwer zu ändern. Ferner haben große Bürgergruppen möglicherweise nicht einmal Zugang zu IKT-basierten Lösungen. Innerhalb dieser Rahmenbedingung erforscht das SmarterLabs-Projekt einen neuen Ansatz, um die mit intelligenter Technologieinnovation verbundenen Risiken (Widerstand gegen Veränderungsprozessen, Ausschluss sozialer Gruppen) vorherzusehen und durch projektbegleitender Studien (Action Research) im Rahmen eines „Living Lab“-Konzepts in vier Städten in Angriff zu nehmen: Bellinzona, Brüssel, Graz und Maastricht. Durch die im Living Lab-Experiment explizite Thematisierung der zu erwartenden Barrieren einerseits, und die Einbeziehung von vor sozialer Ausgrenzung bedrohter Gruppen andererseits, erhöhen sich die Chancen erfolgreiche Ergebnisse zu erzielen. Das Projekt liefert an all die europäischen Städte die an Smart-City-Initiativen interessiert sind, allgemeine Leitlinien für die Umsetzung von Smart City Living Labs und befasst sich vor allem mit Upscaling Hindernissen die sich durch den Widerstand gegen große Veränderungsprozesse in Sozio-technischen Systemen ergeben können, wie auch durch die Exklusion bestimmter gesellschaftlicher Gruppen (direkt oder indirekt).

Besondere Aufmerksamkeit wird der frühzeitigen Problemerkennung gewidmet, die durch mögliche Umwandlungen und soziale Ausgrenzung entstehen können, und durch Living Labs getestet. Somit erwartet man das die Ergebnisse von gegenwärtigen und zukünftigen Smart-City-Initiativen, Dank der Schaffung von neuen Werten in Bezug auf verschiedene Anspruchsgruppen, robuster und besser skalierbar werden.

Résumé

Le «Smart City Living Lab» est une approche émergente dans les villes européennes. Il rassemble des citoyens, des décideurs, des entreprises et des chercheurs pour tester des solutions intelligentes, basées sur les TIC, à des problèmes urbains dans des contextes réels. Cependant, les solutions qui «fonctionnent» dans la réalité particulière d'un laboratoire vivant ne peuvent pas être adoptées à grande échelle. Les infrastructures urbaines sont intimement liées à la vie quotidienne des citoyens et sont donc difficiles à modifier. De grands groupes peuvent même ne pas avoir accès à des solutions basées sur les TIC. Dans ce cadre, le projet SmarterLabs développe une nouvelle approche qui anticipe les risques majeurs d'une innovation technologique intelligente (résistance au changement, exclusion des groupes sociaux) et effectue des recherches-actions sur les activités du Living Lab dans quatre villes: Bellinzona, Bruxelles, Graz et Maastricht. En se référant explicitement aux obstacles anticipés et en incorporant des groupes à risque d'exclusion dans l'expérience Living Lab, les chances d'aboutir à la réussite du résultat final sont améliorées. Pour toutes les villes européennes ayant lancé des initiatives Smart City, le projet fournit des lignes directrices de mise en œuvre génériques pour Smart City Living Labs sur la manière de surmonter les obstacles aux changement de dimension pouvant découler de la résistance aux changements à grande échelle des systèmes sociotechniques et des personnes exclues (directement ou indirectement). En accordant une attention particulière à l'anticipation d'éventuelles résistances et exclusions sociales sous la forme de Living Lab, les résultats des initiatives Smart City (actuelles et futures) devraient devenir plus évolutifs et plus robustes en termes de création de valeur pour une large gamme des parties prenantes.

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1 Introduction

This 2018 Annual Report presents activities performed between December, 1 2017 and September, 30 2018 within the ENSCC ERA-NET SmarterLabs project. The document is aimed at providing an overview of project progress during such a period, both building on the activities presented in previous SmarterLabs Annual Reports, as well as in the Deliverables developed according to project schedule.

2 Context

The SmarterLabs project aims at developing a Living Lab approach to deal with two major risks to successful implementation of smart city innovations, particularly in the field of transport: unforeseen barriers to large-scale change of socio-technical systems and exclusion of social groups not matching the required “smart citizen’” profile.

Retrospective analyses and action research in Living Lab experiments will be performed in Bellinzona (CH), Brussels (BE), Graz (AT), and Maastricht (NL). In Bellinzona, a Living Lab was activated to co-design with interested citizizens a smartphone app promoting sustainable individual mobility patterns. Activities in the Living Lab were explicitly designed with the aim of favouring upscaling of the innovation in the Lab. Besides achieving this goal, the whole project setting also allowed to address much more ambitious goals, directly affecting policy-making and urban governance processes in Bellinzona.

In the other SmarterLabs cities similar Living Lab processes were organized. Cross-analyses of the strategies implemented in each city to favour upscaling and social inclusion allow to develop guidelines for “smarter” living labs, targeting practitioners and any stakeholder group or institutional body aiming to introduce smart innovation at the urban level, and favouring its diffusion and large-scale adoption.

3 Progress in project activities

Activities have been performed according to the SmarterLabs work programme developed in the ENSCC full proposal: we concluded WP4 activities and kept working on WP5. Besides, project management (WP1) and communication activities (WP6) have been regularly held. Two general project meetings, each of whom included a dissemination workshop with local institutions and practitioners, were planned for 2018:

- Istanbul (TK), May, 29 – June, 1 2018;
- Santander (SP), November, 7 – 9 2018.

The following sections provide a summary of the activities we performed throughout the year 2018.

3.1 Action research in the *Bellidea* living lab

As already indicated in previous SmarterLabs Annual Reports, action research activities (WP4) were developed under responsibility of the University of Maastricht. In this WP, however, project partners had more room to move independently, in order to follow and support the specific needs of the living lab activities developed by each City partner. Unifying elements lye in fact in the type of problems that will be taken into account (barriers to inclusion, difficulties in up-scaling and other specific barriers related to each case study, as emerged from literature review and retrospective analysis), while specific case studies face quite different urban and mobility transformation processes.

The methodology to perform action research in the Bellinzona living lab was created in late 2016, with the active contribution of all Swiss partners, including non-academic ones (City of Bellinzona and Provelo Ticino). Focus of the living lab was the co-design of a smartphone app targeting individual behaviour change in the field of mobility, with a reduction in car use (Phase 1). The living lab and the resulting app have been named "*Bellidea*", with a wordplay referring to the name of the city, Bellinzona, and the Italian words "bell'idea", which mean "good idea". Analysis of literature on living lab experiments highlighted in fact the importance of co-design and collective learning, as success factors to reduce barriers to later large-scale adoption at the municipal level, after conclusion of the living lab.

Also, we explicitly introduced an additional phase in living lab activities, aimed at widening discussion from the app to the specific Bellinzona context (Phase 2): once they have developed the *Bellidea* app, participants to the living lab were stimulated to reflect on their mobility habits, on possible alternatives to car use available to them, on opportunities to be strengthened and critical factors to be removed, from a system perspective. In such a context, we engaged them in a workshop aimed at co-creating the "Charter of principles for sustainable mobility in the Bellinzona area". This allowed the *Bellidea* living lab to develop bottom-up, participatory elements for future mobility scenarios, opening-up to policy-making and governance approaches for the Bellinzona area.

The final activity performed, at the very end of the *Bellidea* living lab process, was aimed at assessing its effectiveness, by involving all the citizens and institutions we interacted with (Phase 3). A final survey targeting all the living lab participants was planned, as well as a series of semi-structured interviews, targeting city managers and civil servants in Bellinzona and the main stakeholders related to mobility in the region. Such a process was aimed at understanding how they perceived the whole Belildea process and especially at investigating possibilities to replicate the same approach for future decision-making processes in Bellinzona, also in other fields than mobility.

3.2 Overcoming constraints to social inclusion and upscaling: turning *Bellidea* into a «smarter» living lab

To effectively address social inclusion and upscaling, coherently with the goals of the SmarterLabs project, for instance we performed a retrospective analysis aimed at identifiying specific constraints affecting inclusion and upscaling, in the specific context of the *Bellidea* living lab. Then, for each constraint, possible anticipating strategies were identified, with the idea of subsequently field testing them in the living lab process. Key constraint identified for the area of Bellinzona are presented in the next Sections.

3.2.1 Citizens' lack of financial, intellectual and time resources to participate in the Lab

The *Bellidea* living lab was largely at risk of just attracting people who had already reduced their car use, thus resulting in a very polarized sample of participants. Particularly, there was the risk to mainly involve only cyclists, since the local association lobbying in favour of regular bicycle use (ProVelo) was among the lab initiators, and participation to the lab was open to any interested citizen, on a voluntary basis. However, how could a group of urban cyclists be able to co-design an effective smartphone app targeting reduction in car use among mainstream car drivers? It was clear that the lab should involve a variety of participants, sufficiently differing in their mobility patterns and socio-economic characteristics, so as to reproduce diversity within the local society.

Social groups at risk of exclusion were in particular identified in two main categories:

- "mainstream car drivers", or, more in general, population segments with no particular pro-environmental attitude and behavior, and lacking interest for transport and mobility problems;

- traditionally socio-economic marginalized groups, such as elderly and young people and migrants;

Failing to include them would have for instance precluded a large scale diffusion the app, but also reduced representativeness, and thus overall social and political consensus on any scenarios resulting from Phase 2, also hampering later diffusion of similar governance practices.

To anticipate such a constraint, a hybrid recruitment campaign was designed, including both bottom-up and top-down activities. First of all, a stakeholder analysis was performed, in order to identify the key target groups to be engaged. As a result, commuters, general car drivers, bicycle riders and public transport users were identified and the relevant associations representing their interests were involved, with the aim of mobilizing them in the outreach of Lab participants. Then, a process claim and main motivational message for the communication campaign were identified and a dedicated webpage on the City's website was created. Distribution of flyers was planned within already existing public events, such as the traditional Saturday market of Bellinzona, and local newspapers and magazines were expected to widely amplify the *Bellidea* communication material, soon after a scheduled press conference. Posts in the newsletters and articles in the bulletins of the above associations were then developed, to amplify and support the press release delivered by the City of Bellinzona at the launch of the public campaign for lab recruitment. The emphasis was put on co-creation activities, and on the key idea behind the app, that was rewarding citizens with tangible prizes, if they opt for (more) sustainable mobility patterns. Explicitly addressing prizes (extrinsic motivational factors) was supposed to raise the interest by mainstream commuters and car drivers up to the level of already intrinsically motivated bicycle riders and public transport users.

To reinforce and integrate such bottom-up, spontaneous self-applications, a top-down selection of diverse and overall representative citizens (groups and individuals) was also made: civil servants and policy-makers of the City of Bellinzona were requested to personally engage in contacting representatives of the target groups listed in Table 1, exploiting their network of personal contacts. Specific activities were planned to engage elderly people, students, and migrants: flyers introducing *Bellidea* lab activities were brought to places where computer literacy courses for elderly people were offered, and personal contacts with high school teachers and a local association supporting the integration of migrant people (SOS Ticino), that had already collaborated with the city of Bellinzona for a bicycle renting activity, were taken. Additionally, the contact person of SOS Ticino was offered practical, tactful support for any migrants, who, though interested in *Bellidea* activities, were reluctant to join the lab due to a lack of fluency in the Italian language.

Target group	**Contact association/institution**
General citizens	Gym associations
	Carnival groups and associations
Commuters	Canton Ticino Administration - Human resources
	Hospital - Human resources
Car drivers	Touring Club Switzerland TCS
	Automobile Club Switzerland ACS
Bicycle riders	Provelo
Bicycle riders and public transport users	Associazione Traffico e Ambiente ATA
Migrants	Department for Social Services of Bellinzona
	Soccorso Operaio Svizzero SOS
Students	High School and Commercial Institute in Bellinzona
Elderly people	Uni3 (Courses for third age computer literacy)

Table 1 Key target groups involved and related institutions and associations contacted during the *Bellidea* recruitment campaign.

3.2.2 Limited learning

The *Bellidea* living lab was meant as a pilot project, run on a voluntary, politically non-binding base. On the one hand, this had favoured lab acceptance by the City managers, who were unfamiliar with participatory approaches, and in the past had even tended to oppose them. However, on the other hand, the fact that the process was voluntary, together with the fact that SUPSI had taken on the responsibility to coordinate and manage it, due to their past experience in the field of participatory processes, tended to make responsibilities and commitment by the City to contribute to the participatory knowledge-sharing process less pressing. This was expected to make the process of capitalizing on the "lessons-learnt" from the lab and integrating them into the City's policies more difficult.

To anticipate the risk of limited learning, a learning strategy was explicitly developed when designing the lab process itself, with the aim of monitoring knowledge creation. Such a strategy included analysis of project impacts according to a multi-criteria framework, assessing the level of engagement and satisfaction by lab participants, and reporting and communication of results, both internally to all actors involved, as well as externally, through local media, and basically consisted in the activities programmed for Phase 3. Similar activities were also planned for the period following the launch of the *Bellidea* app to the whole population: regular statistics regarding app use and its effect on local mobility (who, when, how, how much, ecc.) were envisioned. Particular care was dedicated to avoiding "unbiased and neutral" assessment by external experts, driving a one-way learning process, by defining "their problem", providing "their knowledge and technology", and preparing "their solutions". Therefore, such statistics would at first be summarized within traditional report documents, though they were planned to be publicly made available, within an online *Bellidea* dashboard, showing anonymized key indicators, data and maps, and therefore also fostering a public debate on the future of local mobility and land development.

3.2.3 Wait-and-see attitude

According to their initial perception, the City of Bellinzona initially tended to address the living lab process as a sequence of closed and separate steps: first, the app has to be developed; (if and) when it will be available, a plan will be made to diffuse it to the whole population; finally, depending on the success and level of diffusion it will have, an assessment will be made whether additional citizens need to be engaged. And only at the very end of that process, decisions would have taken, if replicating a similar approach also in other decision-making processes. Namely, no specific upscaling strategy would have been devised by the City, in a pretty passive "Wait-and-see" attitude. Particularly, app use to the population was initially expected to follow a rather traditional communication plan, involving a press conference and the distribution of information leaflets, and no specific efforts would have thereafter been planned to actively advertise the initiative and promote app use. The very choice of engaging citizens in app co-design within the *Bellidea* living lab, as suggested by our team in SUPSI, however triggered the citizens' own intrinsic motivation and commitment, thus innately generating communication and dissemination possibilities versus the outside. Therefore, the "multiplier effect" triggered during lab experience thanks to committed participants, who got actively engaged in promoting app use among their circle of family and friends, was explicitly exploited as a strategy to overcome the rather passive attitude by the City.

Also, specific functionalities were explicitly included in app-design ("collective challenges"), with the aim of periodically actively attracting new citizens to join app use: at least twice a year, it was planned that the City of Bellinzona launched collective challenges through the *Bellidea* app, inviting all citizens to join collaborative challenges asking to perform sustainable mobility choices for a limited period of time (e.g. "Next week-end let's all strive to use the car for less than 20% of our overall travelling time"). If such challenges are achieved, collective prizes are offered to the citizens. Also the product of the lab itself

(the app), was therefore endowed with an inbuilt mechanism to favour its diffusion and counteract the dominant “Wait-and-see” approach.

Finally, a specific plan for communication activities soon after the launch of the app to the whole population and also in the following months, was developed, to maintain app users interest and increase their number over time.

3.2.4 High institutional fragmentation

In Bellinzona, administrative organization at the City level was the main obstacle preventing diffusion of the living lab approach to other fields than mobility and institutionalization of new governance practices. The strategy to overcome “silo compartments” barrier was to actively engage councillors and civil servants, instead of waiting for them to spontaneously express interest in process or results. Thus, it was planned to invite them to attend *Bellidea* lab meetings, in order to personally experience how they work and the effort needed, and guess their potential in addressing complex or conflictual topics. Also, a final meeting targeting civil servants of other departments than the *Bellidea* promoter, and the related political decision-makers, was planned at the very end of the process. It was aimed at presenting and discussing the approach, the results obtained and the final evaluation of the performed activities (results of Phase 3). Such a meeting, reinforced by expected positive results of Phase 3 evaluation, was supposed to reduce fears and prior oppositions by the city managers, and to favour larger uptake of participatory approaches in future decision-making processes.

3.2.5 Low institutional receptiveness

The City of Bellinzona was formally owning the *Bellidea* living lab process; however, due to their lack of familiarity with participatory approaches, they were not fully aware of the potential of such processes in supporting policy development. Therefore, they tended to lack leadership and predominantly rely on advice and superintendence by our team of researchers at SUPSI, who, as already mentioned, were given responsibility for managing and running the whole living lab process. In line with their initial interest for exploring effectiveness of a persuasive mobile app, in fact, at first City managers tended to perceive the lab as a technology innovation testing ground: a single, small-scale, closed and controlled process, aimed at developing and evaluating the app prior to its roll-out at city-level. In particular, City decision-makers tended to cling to authoritative governance styles, rather than opening up to more consultative, cooperative or even facilitative approaches, mainly due to the fear of losing formal power and responsibility on the decision. Their initial main concern was to avoid possible financial and personal drawbacks and, inadvertently or not, the tendency was to keep the living lab in the policy periphery.

Such a situation is however not uncommon. In particular, leadership can only be learnt through experience, and providing first-hand opportunities of experiencing public participation processes would be a first start. Therefore, our SUPSI team tried to promote a new political culture by ensuring the presence and active participation of representatives of the City of Bellinzona (both civil servants and political decision-makers) in lab meetings. This was expected to help getting local authorities and decision-makers gradually acquainted with the concept that living labs and participatory processes in general may represent valuable learning-by-doing tools, and constructive and enriching means for reflection on practices or policy.

4 Results

The *Bellidea* living lab was launched on January 2017, with a campaign aimed at recruiting participants. As a results, overall 46 citizens answered our public call to join the *Bellidea* living lab, and seven monthly

meetings were organized until February 2018, with a break during Summer months. A short description of the activities we performed during each meeting is presented in the *Bellidea* website – News section (http://www.*Bellidea*.ch/news/, in Italian). All the materials produced to support and stimulate discussion in the meetings and the related outcome are available on the same website in the "documents" section (http://www.*Bellidea*.ch/documenti/, in Italian). Since the website is mainly used as a reference point for the living lab participants, all the material is made available only in the Italian language.

4.1 Social inclusion in the *Bellidea* living lab

After the initial enthusiasm, a decrease in participation was noticed over time, with a core group of 16 citizens continuing to actively attend all the monthly meetings ("regular lab participants"). To assess if the group of participants to the *Bellidea* lab was sufficiently diverse, at subscription we asked them to fill in a questionnaire, querying about their perceived mobility patterns and gathering basic socio-economic data. The collected data is reported in Figure 1, which presents lab participants based on their self-declarations about the means of transport they mostly use (Figure 1.a) and the means of transport they own (Figure 1.b). Here, in the context of public transport, owning a travel pass was considered equal to owning the means of transport. The charts show both the characteristics of all participants at the start of lab activities (n=46) and the characteristics of those who regularly participated to lab meetings (n=16). In both cases, there is a clear prevalence of people using (and owning) a mix of available means of transport, while the "converted" (those who don't use or own a car) have lower weight, especially if only regular lab participants are considered. Notwithstanding "car dependent" people (those who only use and own a car) played a very limited role within the group of lab participants, the composition of such samples was nevertheless judged as satisfactory, as the presence of people used to all means of transport, capable of appreciating the opportunities and the limitations of each mode, prevailed.

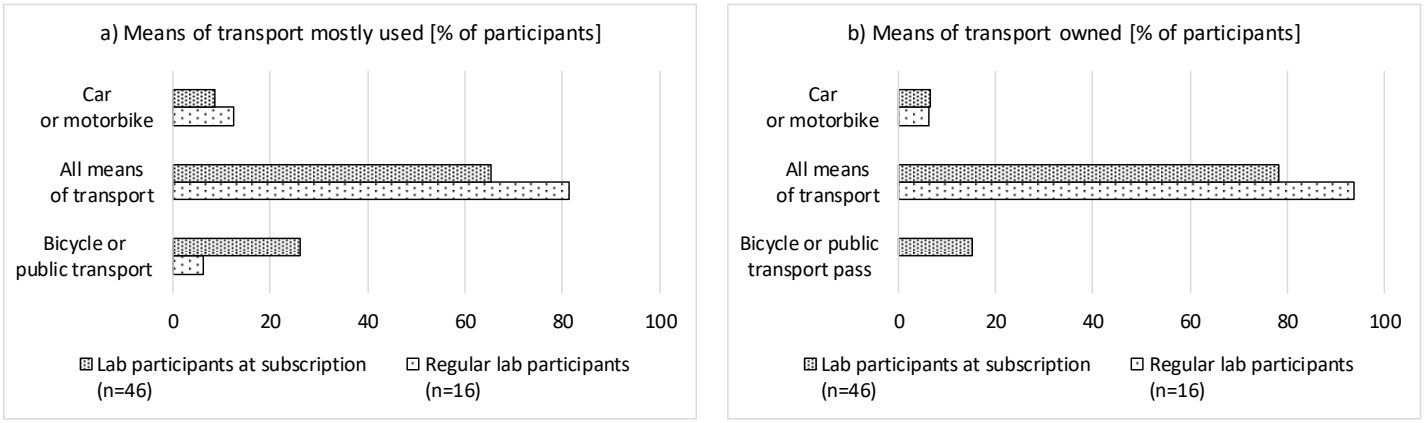

Figure 1 Characteristics of the participants to the *Bellidea* living lab, with respect to their mobility patterns and their self-declarations: all lab participants at subscription (n=46) and regular lab participants (n=16).

4.2 The *Bellidea* app

The co-creation process that was activated during the living lab has produced an app that triggers collective change in mobility patterns by favouring at the same time a virtuous circle in support of the local economy (Figure 2). Exploiting another activity tracking app named *Moves*, *Bellidea* performs automatic detection of the transport mode, provides users with eco-feedback on their individual mobility patterns, stimulates them with mobility-related challenges and invites them to collect points, which

depend on how they move and which transport mode they use – the higher the weekly percentage of travelling time by public transport, bicycle or walking, the higher the amount of points collected. Points allow for a comparison between the users, by means of a weekly leaderboard, and can be redeemed for prizes such as discounts on energy bills and vouchers for local stores and/or activities (cinema, theatre, museum, swimming pool, etc.) and public transport tickets. To start with, points are offered by the City of Bellinzona and a few public partners, such as the local public transport operator and utility company. For the future, the City is thinking of widening the network of partners, also including local private companies. An idea they are exploring is to launch a public call, open to any interested local commercial activity, to join the "*Bellidea* network". Members of such a network would be required to contribute to prizes for the *Bellidea* users, for example with vouchers or discounts, while in exchange getting the opportunity to retain already existing customers and attract new ones. Ultimately, such a process could activate a virtuous circle for the local economy, with *Bellidea* points ending to become a sort of local currency accepted in local shops and services, as in a similar social innovation experience in the Netherlands, with the Ring-Ring mobile app and community (https://ring-ring.nu/).

Next to individual rewards, lab participants decided to introduce community prizes as well. To this purpose, *Bellidea* also offers community challenges, to be periodically launched throughout the year, such as «This month, let's use the bicycle for at least 20% of our overall travelling time». If app users achieve such a challenge, the community as a whole gets a prize, such as for example discounts on public transport season tickets, public transport excursions for school classes or cargo-bike transport services for elderly people. Such a mechanics is expected to further motivate people to keep the level of activity high, since it builds on both their feeling of belonging to the local community and their desire for attractive prizes.

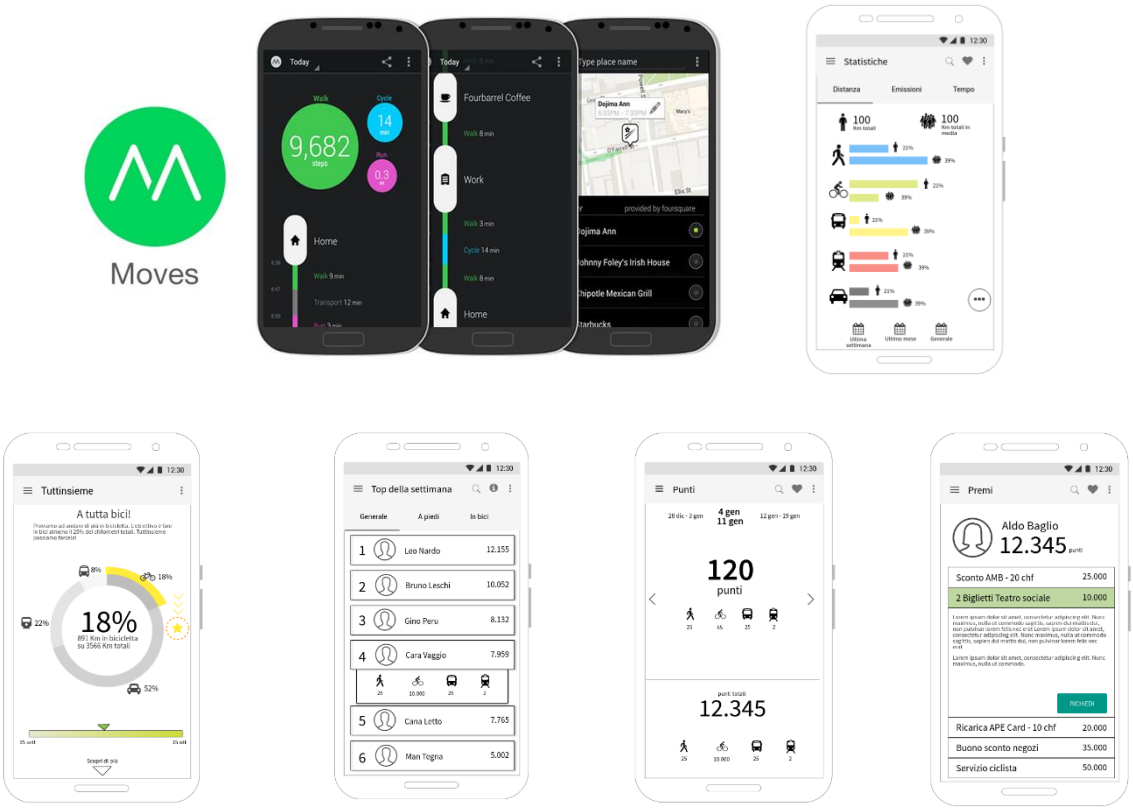

Figure 2 A selection of screenshots of the *Bellidea* app (in Italian). Basic activity tracking is performed by the commercial Moves app.

4.3 Diffusion of the *Bellidea* app to the population

The *Bellidea* app was launched on April, 25 2018 to the whole population of the Bellinzona area, by means of a joint press conference by the City of Bellinzona, SUPSI and Provelo Ticino. From that day on, interested citizens living, studying or working in Bellinzona could download and start using it whenever they liked it.

Thanks to the communication efforts and the specific activities aimed at favouring large diffusion of the app among the wider population, *Bellidea* became pretty popular. Overall, between April, 25 and July, 31, 721 accounts were registered in the *Bellidea* app, and 207 users collected at least two full weeks of data. While communication activities to support wide diffusion of the *Bellidea* app were ongoing, in July 2018 we received the unexpected news that the *Moves* app, on whom *Bellidea* was relying to perform all the basic mobility tracking activities, would have been closed by the end of the month. Such a decision to discontinue *Moves* was communicated with very limited advance, so that no reliable alternative was found. Therefore, at the end of July 2018 we had to temporarily stop all *Bellidea* activities, freezing them until an alternative to *Moves* is found. This was promptly and openly communicated to both living lab participants and the *Bellidea* users, and the *Bellidea* app was replaced by a “light” version, allowing to redeem previously collected points, but no longer attributing points. At the time of writing (October 2018) we are still exploring possible alternatives to replace *Moves*, by taking into account already existing commercial and research apps. The goal of all actors involved in *Bellidea* is in fact to restart as soon as possible, towards the full achievement of the envisioned upscaling benefits.

4.4 From the *Bellidea* app to mobility scenarios and new governance practices

According to the plan of activities in the *Bellidea* living lab, Phase 2 was devoted to upscaling discussion from the app to future mobility scenarios for the area of Bellinzona. To this workshop, the last meeting of the lab was organized as a discussion workshop, aimed at first performing a shared SWOT analysis of current mobility in Bellinzona (strengths, weaknesses, opportunities and threats), and then at identifying the most suitable measures to favour transition to a more sustainable mobility, with the very final aim of drafting a “Charter of Principles for sustainable mobility in Bellinzona”, to be then shared with the relevant stakeholders and brought to discussion at the city level.The workshop was held in February 2018, and was attended by all regular participants to lab activities. Outcomes of the meeting where then elaborated by SUPSI and turned into a two-pager policy brief, aimed at stirring discussion with the wider network of stakeholders, citizen and policy-makers, in a workshop in Autumn 2018.

Further, a follow-up project was developed, with the aim of analzying the crowdsourced data collected by the *Bellidea* app and making them fully available by an interactive webportal for city planning (maps, tables, indicators, ecc.). Besides favouring public access to the *Bellidea* data (conveniently anonymized), the project also envisioned to further promote public discussion, by means of additional workshops and meetings to co-analyse insights provided by materials on the *Bellidea* webportal and to further contribute to co-designing future scenarios for both mobility and urban settlements in the Bellinzona area. Basically, the idea was to keep the *Bellidea* living lab open, and to favour evolution of the focus of activities over time, as long as they were getting more mature. The webportal project had been nearly accepted for funding by a Swiss Federal Office, when the notice of *Moves* being discontinued imposed to freeze it as well: without a tracking app, data would not have been available and the webportal would have made no sense.

In such a framework, the City of Bellinzona opted for postponing the workshop on future mobility scenarios as well, and also the envisioned evaluation activities to later diffuse the “smarter” living lab approach in other city departments and decision-making processes were temporarily stopped by the external decision to discontinue the *Moves* app. At the time of writing, surveys and interviews to assess

lab outcomes from the participants' point of view have not been performed yet, to avoid getting biased evaluations, due to the interruption of the *Bellidea* process soon after its launch – even though it was ultimately caused by external events.

5 Discussion of results

5.1 Overcoming constraints precluding *Bellidea* app effectiveness

Even though we can just refer to the short-term activity of the *Bellidea* app, data collected during these three months offers us elements to assess both progress towards upscaling app use to the whole population and effectiveness in overcoming limitations of previous app-based interventions, as identified within preliminary activities oft he SmarterLabs project (WP2), namely "early abandon" and "preaching to the converted".

Figure 3 shows the evolution of the weekly number of *Bellidea* app users, from the launch of the app to the end of July, 2018. To avoid possible biases in the collected data, we have excluded data collected during the last three weeks of July, when the temporary suspension of the *Bellidea* app, due to *Moves* discontinuation, was notified to participants. Thus, only data collected from April, 23 2018 to July, 9 2018 has been considered. During this period, on average we accounted for 180 (SD ± 28) active users per week, each of whom regularly interacted with *Bellidea* for a bit less than 5 weeks. Overall, such figures suggest that upscaling regarding the number of app users started to take place in a tenfold order of magnitude: from the 16 citizens who regularly attended lab meetings, the average number of *Bellidea* users grew around 10 times. Since we acknowledged that achieving a critical mass of app users requires time to create a network of users and produce a word-of-mouth effect (Czepiel, 1974), these figures were viewed as encouraging, but not as fully satisfactory. In fact, figures also showed a decreasing trend over time in the number of active users reported. To counteract this phenomenon and correspondingly increase the number of users, further communication activities were put into practice. For instance, on early June *Bellidea* was presented and discussed on a radio programme, which had the immediate effect of increasing the number of active users as is detectable in Fig. 4. Stronger communication and engaging activities were planned for early September 2018, after the summer break, with the launch of the first *Bellidea* collective challenge during the European mobility week. However, with the temporary suspension of the *Bellidea* app, scheduled activities aimed at increasing the number of app users and sustaining their use over time have been postponed as well. Effectiveness of collective challenges as a tool to favour user retention and engagement will therefore be assessed within future research activities.

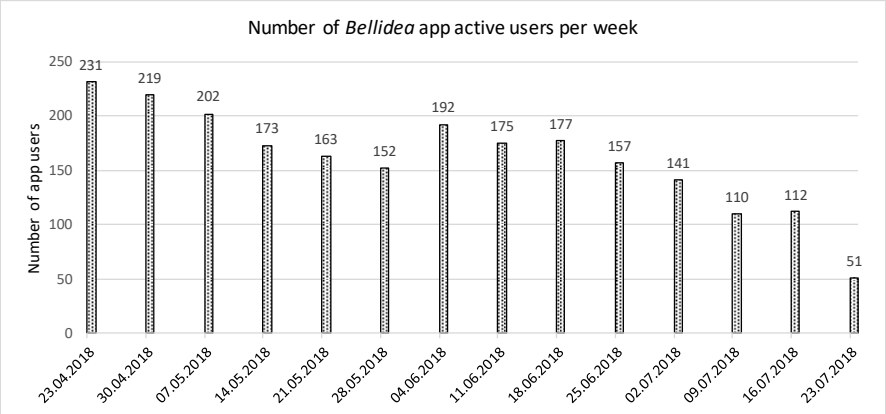

Figure 3 Evolution of the number of active users of the *Bellidea* app, between its launch and its temporary discontinuation at the end of July 2018.

To check whether “converted” users were dominant among *Bellidea* app users, we analyze their mobility patterns, based on data collected via the app. On average for the first two weeks of use, *Bellidea* only tracked the performed trips, without providing any feedback, points or inviting to join challenges (training period). Individual data collected during such two weeks can therefore be regarded as “mobility pattern baseline”, while data collected during the following weeks is “*Bellidea* influenced”. By comparing baselines of *Bellidea* users with data of the 2015 Swiss Mobility and Transport Census (SMTC, FSO-ARE, 2015), which can be taken as representative of the average “mainstream car driver” in the Swiss region of Canton Ticino, an indication about representativeness of *Bellidea* users is therefore obtained. Consistently with the key indicator used to attribute points in *Bellidea*, which is travel time by each transport mode, we consider the average daily total travel time and the average daily travel time by car, with respect to the following two sets of users:

- “newcomer” app users (n = 207), namely those who collected a minimum amount of data sufficient to identify their baseline mobility patterns (two full weeks of data), no matter how long they further used the app;
- “loyal” app users (n = 106), namely those who were actually engaged by app mechanics and showed a sustained app use over time, by interacting with the app for at least eight full weeks (two weeks for baseline data and six weeks for their “*Bellidea* influenced data”).

Comparing average daily travel time of the set of 207 newcomers with 2015 SMTC data (Figure 4), statistically significant differences appear: *Bellidea* users travel for shorter periods, both in total and by car. Therefore, based on such travel time data, on average the set of *Bellidea* users who collected at least two weeks of data can be regarded as “converted” citizens, reflecting more sustainable mobility patterns than average 2015 SMTC “mainstream car drivers”. However, if we consider the sub-set of 106 loyal app users, who kept interacting with *Bellidea* for a longer period of time (Figure 4), no statistically significant differences between their average travel time and 2015 SMTC values are found. It seems therefore that users with higher *Bellidea* retention rates tend to be more “mainstream car drivers” than “converted” individuals**.** In other words, loyal app users seem to actually coincide with the *Bellidea* target group, that is, those citizens that most need to change their mobility patterns. Citizens with less need for improvement, instead, seem to have interacted with the app for a while, but then to have stopped using it, since they do not need it.

Though related to a short term observation of *Bellidea* app use and based on aggregated, average data of all *Bellidea* users, these figures are encouraging, suggesting that the strategic design choices aimed at overcoming the “preaching to the converted” and “high abandon rates” limitations produced positive outcomes, with respect to previous experiences.

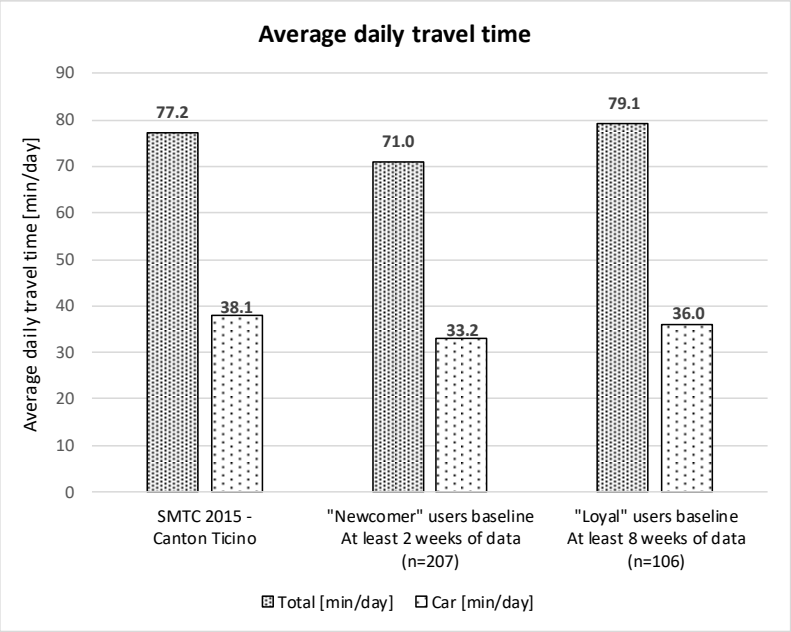

Figure 4 Comparison between baseline mobility indicators of *Bellidea* users (both “newcomers”, n = 207, and “loyal app users”, n = 106) and the Swiss mobility and transport census.

5.2 Evalution of the *Bellidea* process

Probably, a more pro-active attitude from the City authorities would have been needed to address and solve the Moves-related technological barrier. Instead, it turned into a reason for temporaily stopping the participatory process activated. This reflects the pre-condition, with which the *Bellidea* lab started – a challenging context of rather closed doors towards public participation. However, it is hoped the lab would serve as a success story to draw local authorities nearer to participatory decision-making processes and trigger interest for future city planning. Though lacking a structured evaluation process, in fact evaluation elements regarding such an expectation where informally gathered by SUPSI, by interaction with lab participants and civil servants, during project meetings.

Regular lab participants showed wide appreciation of the process and approach, in general, as well as of the specific attempt to address mobility problems from a different perspective, with respect to the past. They particularly appreciated being invited to become key players of the future mobility policy of the city, which is why they regularly attended project meetings and kept interacting with the process for about one year, without falling into temptation to abandon halfway. As a confirmation for their appreciation of the process, many of them also attended the press conference for the launch of the *Bellidea* app to all the citizens, which implied taking a morning of leave from work, and accepted being interviewed by radio and TV journalists, to become they themselves public testimonials of the project.

Regarding civil servants, not only they were satisfied for having reached their goal of launching an innovative tool to address mobility-related problems. They also told SUPSI the whole *Bellidea* process inspired them to rethink their working methods. As responsible for mobility and transport issue in the city, they strived to analyze mobility and transport issues with the eyes of the citizens, by first observing them and then trying to reproduce their decisions. However, thanks to *Bellidea* they realized directly interacting and creating a dialogue with them is much more effective and convenient, instead of trying to put themselves in their shoes. Therefore, even though the full upscaling possibilities as they were envisioned have not been achieved (yet), and no institutionalization of new governance practice has taken place, there are encouraging indications of a progress towards this direction.

6 Evaluation 2018 and outlook for 2019

Activities performed during the first part of year 2018 were mainly aimed at concluding development of the *Bellidea* app and launching it to the population, wile at the same time widening discussion in the living lab, to address mobility topics at the regional scale. All such activities were performed as planned, and the *Bellidea* app was launched to the population in late Spring. It was already having some success in terms of diffusion of the number of users and, when the process was starting to bear fruits, the emergence of a technological obstacle that could not be avoided in process design and management (related to a dependency on the external Moves mobility tracking app), affected the whole process, by temporarily freezing the upscaling opportunities that were just going to take place.

At the time of writing (October 2018) we are still exploring possible alternatives to replace *Moves*, by taking into account already existing commercial and research apps. The goal of all actors involved in *Bellidea* is in fact to restart as soon as possible, towards the full achievement of the envisioned upscaling benefits.

The material collected so far within action research in the living lab, however, supported us in developing analyses regarding constraints affecting upscaling of «smart innovation» in living labs, and effectiveness of strategies especially designed to address them. Within WP5, Strategies tested in the *Bellidea* living lab and their outcome where cross compared to similar strategies tested in the other «SmarterLabs» living labs, in order to perform a cross comparison of their effectiveness, varying specific topics, as well as social, economical, political and cultural conditions. Differences among case studies and competences of the SmarterLabs project partners allowed to get a wider, deeper and more diverse insight on smart urban transformations in the mobility sector.

As a result, a very advanced draft of the “SmarterLabs” guidelines for practitioners was already developed, which is the main output of the SmarterLabs project, due in Spring 2019. Contents of such guidelines were progressively tested and discussed with other city policy-makers, practitioners and stakeholders, within dissemination workshop across Europe ((https://smarterlabs.uni-graz.at/de/neuigkeiten/). . During the first one, held on late 2017 in Helsinki (FI), a list of constraint and possible theoretical anticipation strategies was discussed. During the second one, held in Istanbul (TK) in Spring 2018, further insight was offered to workshop participants, since a full “how to” guideline document, made of a series of information sheets reporting practical suggestions from the SmarterLabs experiences was discussed. During the last workshop, planned for late Autumn 2018 in Santander (SP), the nearly final version of such “how to” guidelines will be discussed, accompanied by further material focusing on “why” smart living labs might support cities and local actors towards effective implementation of their smart city programmes. This will allow to get a final feedback directly from the target users of the SmarterLabs outcome, supporting finalization of effective and useful guidelines.

Final project activities for 2019 will focus on perfecting the material available so far, and improving its communication effectiveness. To this purpose, a professional animation video will be developed to support the “Why” guidelines and act as a teaser of the final SmarterLabs products. Also, the “How to” guidelines will be enriched by cartoons, on purpose developed by professional cartoonists. The final project material will be presented in an international conference to be held in Masstricht (NL) in Spring 2019.

Finally, as shown in Section 7, in 2018 we were highly engaged in dissemination activities, both regarding the specific *Bellidea* living lab we designed and managed in Bellinzona, as well as regarding the general SmarterLabs outcomes. In 2019 we will continue this effort, also after the formal conclusion of the project activities, targeting the publication of *Bellidea* and SmarterLabs outcomes in scientific journals.

6.1 Specific consequences of Moves discontinuation on SFOE funded activities in the SmarterLabs project

The decision of discontinuation of the Moves app was received when nearly all action research activities envioned for the *Bellidea* living lab in WP4 had been performed. With respect to the plan of Bellidea activities developed in SmarterLabs WP2, reported in Figure 5, it happened at the end of Phase 2, when final evaluation activities (Task 2.3) were already ongoing.

In fact, the Bellidea living lab had been set, a diverse group of living lab participants were recruited, and app co-design activities were performed. Starting from experiencing the already existing *GoEco!* app and exploring other persuasive apps in the field of mobility, participants supported us in the co-design of the functionalities of the *Bellidea* app. Later, the app was developed by professional experts, under direct funding by the City of Bellinzona, and the prototype was tested by living lab participants, as long as new functionalities were available. Thanks to the suggestions for improvement emerged in those activities, the app was therefore ready for being launched to the whole population (April 2018).

Therefore, Phase 1 activities were fully completed before Moves discontinuation.

Phase 2 activities started with the last meeting of the living lab participants, in February 2018, when discussions on barriers and opportunities towards sustainable mobility in Bellinzona were organized. Outcome of such discussions was summarized in a two-pager policy brief, ready for the final discussion with other stakeholders and institutions, envisioned in task 2.2. This activity has not been performed yet, since the City of Bellinzona preferred to temporarily suspend all the activities related to the *Bellidea* living lab, until the *Bellidea* app becomes fully working again.

As shown by material presented in Sections 4 and5 of the present report, this did not preclude, however, performing of the analyses of the effectiveness of the activities in the *Bellidea* living lab (task 2.3), which were fundamental to elaborate a cross-case analysis of the effectiveness of the adopted strategies in the four living lab processes involved in the SmarterLabs project, and subsequently develop the SmarterLabs policy briefs and guidelines for practiioners.

Therefore, though critical for the success of the diffusion of the *Bellidea* app in the hands of the city of Bellinzona, and for favouring later practical upscaling in terms of creation of new governance practices for urban decision-making processes in Bellinzona, the discontinuation of Moves did not produce critical outcomes for activites envisioned in the SmarterLabs project, and the milestones envisioned in the project contract can be achieved as envisioned.

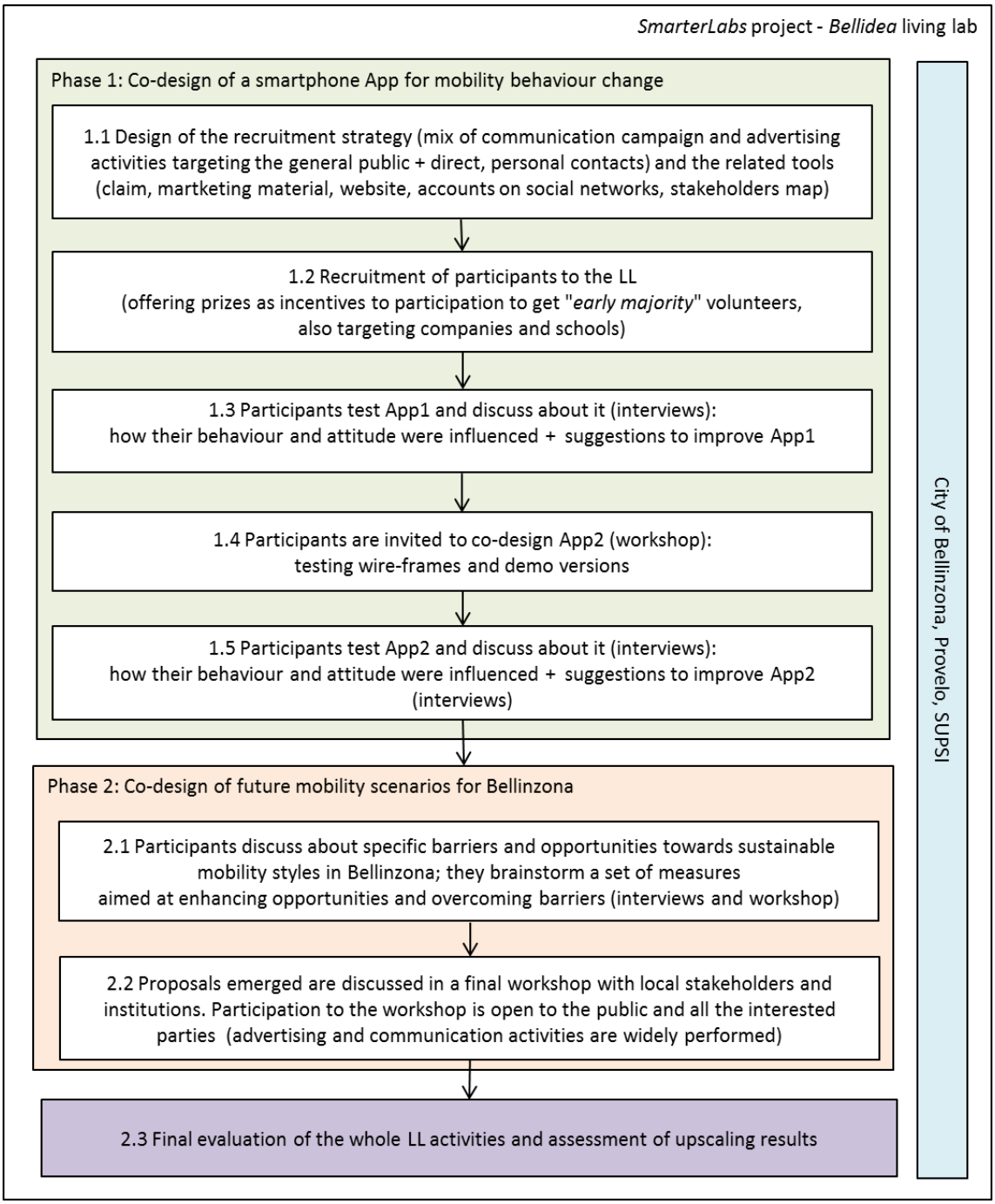

Figure 5 The plan of living lab activities designed for the Bellidea living lab in SmarterLabs WP4.

7 Publications

In chronological order:

Vermes, N., Mangili, F., Cellina, F., Veiga Simão, J. *Accurate transport mode detection in Smartphone-based mobility tracking for sustainable mobility*, In Proceedings of the FTAL 2018 Conference on Industrial Applied Data Science, Lugano, Switzerland, 18-19 October 2018.

Cellina, F., Veiga Simão, J., Mangili, F., Vermes, N., Granato, P. *Outcomes of a smart city living lab prompting low-carbon mobility patterns by a mobile app*. Poster presented at the SCCER Mobility 2018 conference, Zurich, Switzerland, September, 11 2018.

Cellina. F., Veiga Simão, J., Granato, P., *Co-designing a persuasive app promoting a less car-dependant community: introducing the Bellidea living lab*. In Book of abstracts Behave 2018 - The 5th European Conference on Behaviour and Energy Efficiency, Zurich, September 2018.

Cellina, F., Castri, R., Diethart, M., Höflehner, T., Da Schio, N., Dijk, M., Constraints on upscaling and social inclusion in smart city living lab experiments and ways to anticipate them: lessons from four “smarter” labs. In Open Living Lab Days 2018 Research and Innovation Conference Proceedings 2018, European Network of Living Labs, ISBN (e-book): 9789082102789, DOI: 10.5281/zenodo.1434741.

Cellina. F., Castri, R., Veiga Simão, J., *Lessons from a mobility smart city living lab triggering new governance practices at the urban level*. In Proceedings of “Breaking the Rules! Energy Transitions as Social Innovations International Conference”, Berlin, June 2018.

Cellina. F., Simão, J., Mangili, F., Vermes, N., Granato, P. *Outcomes of a smart city living lab prompting low-carbon mobility patterns by a mobile app*. In: Proceedings of the 18th Swiss Transport Research Conference STRC 2018, Ascona, May 16-18, 2018.