



An empirical investigation of social innovation initiatives for sustainable urban development



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ABSTRACT

Recent literature on social innovation highlights its conceptual ambiguity and emphasizes how technology has contributed to the renovation of this 200 year old practice, calling for more sector-specific research. Addressing this call, this paper examines how social innovation fits in the urban sustainability discourse and in what way it empowers urban citizens and their communities towards serving their interests. The findings with respect to 29 cases of social innovation initiatives for environmental sustainability across 9 domains suggest that a large spectrum of sustainability challenges and topics are addressed by existing initiatives, which in turn can refer to different urban spatialities. For each initiative we examine the social innovation process, focusing on the types of involved organizations, the underlying innovation mechanisms as well as the use of technology. In terms of citizen empowerment, we examine the empowerment mode, the main beneficiaries of the innovation, as well as the specific outcome of the initiative. Following this analysis, we arrive to the identification and description of four primary citizen profiles in social innovation for sustainable urban development. We close by calling for further research into the perception, behavior and needs that are associated with the identified citizen profiles and their communities.

1. Introduction

In recent years, social innovation has been increasingly practiced by individuals and their communities, as well as the civil, public and private sector. Although it has practically existed for two hundred years now,¹ the pressing social, economic and environmental challenges that cities have recently come to face, together with proliferating advancements in Information and Communications Technology (ICT) have brought social innovation to the forefront of urban development practice and policy. Social innovations are literally everywhere. They happen across and in-between sectors (public, private, civil), they span an extremely large variety of areas (economy, environment, social inclusion, integrated development and others), and they transform urban life in unexpected ways.

Social innovations are widely understood as new ideas that aim at meeting social goals (Manzini, 2014; Mulgan, 2006a, 2006b). They are so widespread and game-changing nowadays, that it is impossible to ignore them. The ‘smartest’ and most innovative governments and policy making authorities capitalize on this old but renovated concept

by incorporating it in public policy agendas and providing funding, training and networking opportunities for social innovators and their communities. Social innovation has a central role in the European Union (EU)’s Europe2020 strategy towards smart, sustainable and inclusive growth,² which includes the flagship initiative ‘Innovation Union’, whereby innovation is regarded not as merely industrial, but rather as a means to actualize society’s capacity to organize, act and respond on the persisting challenges of growth, and capitalize on the knowledge generation and transfer opportunities provided by new technology. The European Commission (EC) has in operation a host of different policy instruments to foster social innovation, ranging from networking platforms to financing tools for social innovation initiatives (European Commission – Directorate-General for Internal Market, 2016). Next to the institutional interest on social innovation, leading researchers on sustainability have underlined its importance in contemporary societies due to the new and extraordinary possibilities it opens (Bawens, 2007; Manzini, 2014; Murray, 2009; Tapscott and Williams, 2007).

Nevertheless, the all-encompassing idea of social innovation has

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¹ For a historical perspective of social innovation, see Godin (2012). Social Innovation: Utopias of Innovation from c.1830 to the Present. *Project on the Intellectual History of Innovation, Working Paper No. 11*.

² European Commission (2016), *Europe 2020 in a nutshell*. Available: http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/index_en.htm (Access 10/03/2017).

created conceptual ambiguity as to what it means and how it is practiced. Recent literature calls for more sector-specific research, in order to reach more detailed understanding of its content and particular characteristics (Grimm, Fox, Baines, & Albertson, 2013; Bureau of European Policy Advisers, 2011). Addressing this research gap, in this paper we focus on social innovation for sustainable urban development. Our main purpose is to examine how social innovation fits in the urban sustainability discourse and in what way it empowers urban citizens and their communities towards serving their interests.

In the following section (Section 2), we explore the recent literature on social innovation. We offer an introduction to the social innovation notion, highlighting its conceptual ambiguity, its specificities and emphasizing how technology has contributed to a reconfiguration of this 200 year old practice. We proceed to describe the role of social innovation for local (urban) sustainable development, exploring the relationship among social innovation, sustainability and the urban environment. In the next section (Section 3), we describe the methodological roadmap followed in order to execute our research, which comes down to systematically comparing a series of existing social innovation initiatives related to urban sustainability across domains that emerged through a critical processing of the social innovation literature. The following section (Section 4) presents our social innovation for sustainability case studies, as well as the results of the comparative analysis among them. This section is supplemented by Annex A, which offers the detailed findings of our research as per each case. The final section, (Section 5) is the one of the conclusions, where we critically discuss our research findings, and also present further directions for future research.

2. Literature review

2.1. Introduction to contemporary social innovation and its basic characteristics

Social innovations emerge through new ways of thinking and acting in the face of pressing challenges, rather than academic discourse (The Young Foundation, 2012). Social innovation is practiced through many different methodological angles (Jenson and Harrison, 2013) and its mechanisms, in the sense of interactions and events leading to the realization of social innovation, depend on the specific time and context (Phills, Deiglmeier, & Miller, 2008). Furthermore, it means different things across disciplines, countries and cultures (Rüede and Lurtz, 2012; The Young Foundation, 2012; Borzaga and Bodini, 2012; Grimm et al., 2013; Bureau of European Policy Advisers, 2014, 2011). All of these facts make it difficult to understand and analyze social innovation systematically within a clearly defined framework.

As a result of the above, a large number of definitions for social innovation exist, but none of them is commonly accepted (Millard and Carpenter, 2014; Jenson and Harrison, 2013; Borzaga and Bodini, 2012). During the past decade we have seen an unprecedented rise of the interest for social innovation, manifested through an exponential increase of related publications (Weerakoon, McMurray, Rametse, & Douglas, 2016; van der Have and Rubalcaba, 2016; Schachter, Mónica, & Wallace, 2015), which, however, has exacerbated the ‘conceptual ambiguity’ with regards to what it means and how it can be practiced. It is characteristic that Schachter et al. (2015) found 251 different definitions of social innovation. Rüede and Lurtz (2012), through a thorough review of 318 papers, books and book chapters, concluded with seven different concepts of social innovation, each one based on a different framework of understanding.³ The study of Pelka

³ Their work concluded that social innovation can be understood as 1. “...to do something good in/for society”, 2. “...to change social practices and/or structure”, 3. “...to contribute to urban and community development”, 4. “...to reorganize work processes”, 5. “...to imbue technological innovations with cultural meaning and relevance”, 6. “...to make changes in the area of social work”, 7. “...to innovate by means of digital

and Terstriep (2016) about how social innovation is understood and mapped across 17 recent research projects on social innovation under the EU’s 7th Framework Programme (FP7) revealed that there is very large variability in terms of how social innovation is defined (if defined at all), how the roles of the involved actors are understood, what kind of data is collected and how it is analyzed, and on a second level which criterion they are mapped upon (spatial, sectorial, and other qualitative/quantitative). The conceptual ambiguity around social innovation is not necessarily to be regarded as negative, however, as it allows room for different interpretations and creative thinking and acting with respect to social innovation (The Young Foundation, 2012).

For comprehensive reviews of existing approaches and definitions for social innovation, we suggest the work of The Young Foundation (2012), Rüede and Lurtz (2012), van der Have and Rubalcaba (2016), Weerakoon et al. (2016) and Schachter et al. (2015). It is out of the scope of this paper to provide a definition for social innovation, but we consider crucial to provide some critical observations about it. A definition widely adopted by a large number of academic and policy documents is the one provided by the research project TEPsie⁴ funded under EU’s FP7, as it was compiled after a very thorough and systematic review of how social innovation is understood and practiced across different frameworks. According to this research, ‘social innovations are new solutions (products, services, models, markets, processes etc.) that simultaneously meet a social need (more effectively than existing solutions) and lead to new or improved capabilities and relationships and better use of assets and resources. In other words, social innovations are both good for society and enhance society’s capacity to act’ (The Young Foundation, 2012). The basic issue with this definition is that it could potentially include any kind of innovation, as it can be argued that all innovations transform social relations, and therefore all of them are inherently social. Based on Ogburn’s theoretical differentiation between technical and social innovations (Ogburn, 1964), we support the nonmaterial nature of social innovations, which implies that social innovations are intangible: ‘their potential material outcomes are solely a supplementary result and they focus not on needs but on asset building’ (Neumeier, 2012). Under this perspective, social innovations are manifested in changes of attitudes, behaviours or perceptions associated with intentional and coordinated actions, aiming at social change that emerges with the establishment of new social practices (Cajaiba-Santana, 2014; Hellström, 2004; Howaldt and Schwarz, 2010). Arguably, social innovation is quite a contested term and different competing definitions are vying for first place.

A definitive characteristic of social innovation is that it can come from and involve any sector, and actually in novel roles and schemes. The civil sector (non-profit organizations, non-governmental organizations, community groups, individuals), the public sector (government) and the private sector (businesses and entrepreneurs) are not only included to different degrees, but sometimes ‘hybrid’ and ‘intermediary’ organizations emerge from the previous, which in fact can play a major role in the social innovation process (Anania and Passani, 2014; The Young Foundation, 2012). Based on who the initial driver of an initiative is, social innovations are classified into broad categories; for example, there are top-down and bottom-up or grassroots innovations (Manzini, 2014; Seyfang and Smith, 2007). Similarly, Haxeltine et al. (2013) classify social innovations as systemic, broader-level and grassroots ones. However, it frequently happens that a social innovation is initiated in one sector and transferred to another one with unexpected success (OECD Committee for Scientific and Technological Policy, 2011). Each actor brings new ideas, perspectives, capacities and capabilities in the interplay; the result is a cross-pollination of

(footnote continued)
connectivity”

⁴ <http://www.tepsie.eu/> - TEPsie – The theoretical, empirical and policy foundations for building social innovation in Europe.

initiatives, which lies in the very heart of social innovation (OECD Committee for Scientific and Technological Policy, 2011). Through the social innovation process, actors are encouraged to adapt and re-configure their function to become conducive towards achieving the envisioned scope (Phills et al., 2008).

Although social innovation is clearly distinct from economic and technological innovation, they often co-exist by building upon each other (The Young Foundation, 2012). For example, one of the first, game changing paradigms that opened the way for social innovation practices in the 1970s is microfinancing (Mulgan, 2006a, 2006b; Murray, Caulier-Grice, & Mulgan, 2010). Microfinancing was developed as a means to provide small amounts of credit (economic innovation) to entrepreneurs and small businesses who were too poor to access bank loans (social innovation). Citizen reporting platforms, such as FixMyStreet,⁵ and ImproveMyCity⁶ aiming to engage citizens in tackling local problems (social innovation) are now commonly used across large, medium and small cities globally and would not have been realized without the existence of mobile devices and mobile applications (technological innovation).

Speaking of technology, it is worth considering the transformative effect of digital technologies on social innovation a bit further. It is difficult to imagine any social innovation nowadays without some element of technology involved. Technological and social innovation processes are in a constant interplay (Grimm et al., 2013) and it is considered necessary to investigate how technologies are used and in which ways they can be more effective. For example, is technology ‘enabling’ or ‘supporting’ for social innovation (Carpenter, 2014)? Who is the ‘producer’ and who is the ‘user/consumer’ of the innovation (Grimm et al., 2013)? A definition for Digital Social Innovation (DSI) is provided by Bria et al. (2015), whereby DSI is thought of as ‘a type of social and collaborative innovation in which innovators, users and communities collaborate using digital technologies to co-create knowledge and solutions for a wide range of social needs and at a scale and speed that was unimaginable before the rise of the Internet’. It is clear that the emphasis is in the increased effectiveness of solutions and the outreach and speed that ICT enables. Among the benefits of DSI are: i. the more interactive, transparent and fruitful interaction among social innovation actors, ii. the generation of richer ideas and solutions, iii. the generation of solutions that respond better to user needs, who in turn become ‘agents’ of the solutions, iv. the appearance of completely new tools (ex. big data analytics and visualizations) and business and collaboration models (ex. crowdfunding), and finally v. the rapid, low cost, easy development of social innovation networks and dissemination of ideas (Carpenter, 2014; Anania and Passani, 2014; Bria et al., 2015; Shea, 2015; Millard, 2012; Millard, Nielsen, & Thaarup, 2013).

The EC uses a special term for platforms of the category, the so-called Collective Awareness Platforms for Sustainability and Social Innovation (CAPS), (European Commission DG CONNECT, 2016). The foremost characteristic of CAPS is that they open the opportunity for individuals to come together in collaboration (hence they are ‘collective’), and they deepen individuals’ understanding of social processes taking place within and outside themselves (hence they create ‘awareness’). Naturally, CAPS could not be realized without the existence of online platforms, which source and accelerate collective awareness. Web platforms, in this stream of thought, are conceived as socio-technical solutions that harness the power of a variety of ICT tools, such as websites, social media, wikis, etc. (Arniani et al., 2014). Among the main objectives of CAPS is on the one hand sustainability, meaning the mitigation of the environmental footprint of human activity and, on the other hand, social innovation, in the sense of leveraging socio-technical solutions that engage users in socially beneficial activities within a vision for a more sustainable and fair world (Arniani

et al., 2014; Sestini, 2012).

2.2. Social innovation for local (urban) sustainable development

Today, it is widely accepted that until recently prevailing western standards of living cannot be supported anymore, as well as that transition towards sustainability requires radical changes in the way we live. In this perspective, Manzini (2007) claims that social innovations are needed in order to move from current unsustainable models of living to new, sustainable ones. Social innovation for environmentally sustainable urban development is actually a topic that falls within two (closely connected) clusters of literature: the first one is predominantly concerned with the role of social innovation in local development, building on the role of citizens and their communities in neighborhoods, cities and regions, and the second one is concerned with socio-technical transitions, focusing on the process and involved actors in social innovation in addressing social challenges (van der Have and Rubalcaba, 2016). With the purpose of making the most of our research, in this paper we will examine them in combination.

In recent years, social innovation and sustainability have been increasingly addressing common concerns. This comes as a result both of the increasing recognition of sustainability as a key driver of contemporary urban development, but also its establishment in the socio-political discourse (Howaldt and Schwarz, 2010). Today cities face many global and local sustainability challenges which threaten to dissolve the urban social and economic fabric (OECD Committee for Scientific and Technological Policy, 2011; URBACT, 2015): global migration, climate change, resource depletion, social polarization are only some of them. These challenges threaten urban resilience in environmental, social and economic terms. The cost of dealing with these large-scale problems – for example climate change- is daunting for city administrations (Murray et al., 2010). In addition, the ongoing austerity has forced national and local governments to cut down on public spending. There is inadequate funding for citizen services and, as a result, a large part of citizen and community needs are left unmet. In parallel, the transition toward the use of renewable energy sources has slowed down. Although many governments had been well on their way towards achieving the 20/20/20 EU sustainability targets,⁷ they encountered economic difficulties that forced them to downsize their policy programmes and delimit the allocation of subsidies for energy transition (SI-DRIVE, 2016a; Boonstra et al., 2015).

In this given situation, the local (urban) dimension, in the sense of local challenges and needs is quite as significant as the global one, if not more. Urban development is absolutely relevant to sustainability; cities are the major resource consumers and simultaneously the major polluters of the planet. They are hubs of economic activity and knowledge exchange; they exercise citizen-centric governance; they can experiment with innovative ideas by putting them into practice; they have manageable sizes and more or less known problems; they are the place where ‘smartness’ is born and where ‘smartness’ is left to wither (Angelidou, 2014; Angelidou, 2016a). Cities are the place where urban futures (i.e. visions about the future of cities) and the knowledge and innovation economy come together (Angelidou, 2015; Angelidou, Gountaras, & Tarani, 2012; Angelidou, 2016b; Angelidou, Gountaras, & Tarani, 2011). According to Manzini (2007), the local dimension is expressed as the combination of ‘specific features of places and their communities with the new phenomena generated and supported worldwide by globalization and by cultural, socioeconomic interconnection’. In this context, social innovation plays a determining role in the development of new relationships within urban territories (OECD Committee for Scientific and Technological Policy, 2011) and has a special role in advancing local urban governance towards social

⁵ www.fixmystreet.com.

⁶ www.improve-my-city.com.

⁷ 20% cut in greenhouse gas emissions (from 1990 levels), 20% of EU energy from renewables, 20% improvement in energy efficiency until the year 2020

inclusion (Gerometta, Haussermann, & Longo, 2005). In addition, social innovation is inherently ‘local’, as solutions deployed at one place may not be a good or relevant fit for other places (Grimm et al., 2013).

Hence, the links between social innovation and sustainable urban development are very pronounced (Pisano, Lange, & Berger, 2015). In the city environment, social innovation seeks to forge solutions to ‘wicked’, ‘intractable’ and generally hard to solve problems for which the public or private sector have so far been unable to provide solutions:

- it actively promotes the ‘sharing’ of resources, making the first step towards sustainability
- it concentrates on satisfying social and economic needs that have not been met through traditional solutions
- it provides local answers to local problems, building a knowledge and learning base which can be of value to other cities, too.

The foremost focus areas of social innovation within the sustainability discourse include i. governance structures, politics, regulation, institutions, ii. economy and labor, iii. consumer behavior and iv. use regimes and systems (Howaldt and Schwarz, 2010). As long as environmental sustainability is concerned, social innovation initiatives respond variably to a large variety of challenges, including energy efficiency, resource efficiency, recycling, waste collection, air and water pollution, loss of biodiversity (SI-DRIVE, 2016b). In the framework of the research project SI-DRIVE⁸ funded under EU’s FP7, the major practice fields of social innovation initiatives are further analyzed, based on two broad categories: the demand and the supply side of energy (Table 1). Technology plays a major enabling and supporting role for those social innovations, either by providing solutions as alternatives to old, unsustainable technologies and routines per se, or by simply providing the socio-technical platform whereby social innovation takes place, allowing large scale cooperation and the appearance of new business models (SI-DRIVE, 2016a; Boonstra et al., 2015; SI-DRIVE, 2016b; Budde et al., 2015).

Finally, Carpenter (2014) provides an overview of the correspondence between the outcomes of social innovation and the needs addressed. Among them are included (relevant to urban sustainability) a better quality of life with access to services and facilities; empowerment, education and cultural development; transparency, trust and better relationships among citizens and actors. Cost reduction and efficient problem solving are also important benefits of social innovation for urban sustainability (URBACT, 2015).

3. Research design

3.1. Research question

As there is conceptual ambiguity around social innovation, and social innovation is a practice-led area, scientific publications and policy documents call for more empirical research in how social innovation unfolds in practice (Grimm et al., 2013; Bureau of European Policy Advisers, 2011). Furthermore, the sector-specific nature of social innovations (OECD Committee for Scientific and Technological Policy, 2011; Phills et al., 2008) necessitates their study within specific frameworks depending on their scope, application areas and other features.

This paper addresses this call by framing social innovation into the sustainable urban development discourse. The research questions raised in this paper are: ‘What kind of social innovation practices can be found in the sustainable urban development domain? What challenges do they address, what are their main features and what roles do they entail for people,

citizens and their communities?’

The first step in addressing the above questions is to create a detailed research roadmap, by combining already existing literature and experience with our own critical perspective as to what social innovation for urban sustainability could mean.

3.2. Research roadmap

The methodological roadmap of our research is built across two distinct phases (Fig. 1). The first phase explores the “what to research” with respect to social innovation initiatives for sustainable urban development. The second phase is focused on the ‘how to perform the research’ in order to arrive to useful conclusions, and it comes down to the selection of a series of cases to be studied and determining how to analyze them. Further information is provided in Section 3.3 about phase 1, and in Section 3.4 about phase 2.

3.3. Phase 1: the ‘what’ – research domains

Our main focus is to explore the characteristics of social innovation for sustainable urban development, and predominantly across the three basic and distinct dimensions of social innovation, as they are put forward by a large body of literature: i. Content, ii. Process and iii. Empowerment (Sinclair and Baglioni, 2014; OECD Committee for Scientific and Technological Policy, 2011; Phills et al., 2008; The Young Foundation, 2012; Moolaert, Martinelli, González, & Swyngedouw, 2007; Gerometta et al., 2005; Borzaga and Bodini, 2012; Grimm et al., 2013). ‘Content’ refers to the satisfaction of challenges and needs, which have not been met by existing structures and institutions. ‘Process’ refers to the change of relationships among citizens and between citizens and government and the change in the way that services are produced and offered to individuals and specific population/community groups. ‘Empowerment’ comes as a result of the social innovation process and refers to the extension of the operational capacity of citizens and organizations to act, respond and be heard, in turn strengthening their role and position in the state of play.

In terms of ‘Content’, we explore the circumstances under which social innovation for sustainable urban development takes place. We first focus on the ‘Principal Subject’ of each initiative, be it about citizen environmental sensing, the sharing, reusing and recycling economy, communities and organization networks that share and promote sustainability-related ideas, and social enterprises offering environmentally friendly products and services or engaging in environmentally sustainable behavior and production processes. ‘Sustainability Challenges’ addressed refer to the actual problem that each social innovation seeks to solve. For the scope of this paper, our research is focused on social innovation cases that address environmental challenges, including energy efficiency, resource efficiency, recycling, waste collection, air and water pollution and loss of biodiversity (Budde et al., 2015). We also explore the ‘Characteristics of the Urban Setting’, referring to the spatial setting, scale and relationships that frame each initiative, building on previous categories provided by Millard and Carpenter (2014) and van der Have and Rubalcaba (2016).⁹

Advancing to the ‘Process’ domain, we focus our attention on the Organization Type, the Innovation Mechanism of the initiative and its ICT component. ‘Organization Type’ refers to the organizations that are involved in realizing and advancing the social innovation initiative (Bria et al., 2015; Hostick-Boakye, 2014); ‘Innovation mechanism’ refers to what the actual social innovation process stands for (The Young Foundation, 2012); and ‘ICT component’ describes the emerging

⁸ <https://www.si-drive.eu/>- SI-Drive: Social Innovation – Driving Force of Social Change.

⁹ Due to space restrictions, in this paper we do not provide the original categories appointed in each study. We rather build on them to develop our own critical view about the information to be researched under each domain as presented in Fig. 1.

Table 1

Social Innovation practice fields from an energy demand and supply side (adapted from Boonstra et al., 2015; Budde et al., 2015; SI-DRIVE, 2016a, 2016b).

Energy Demand (Budde et al., 2015; SI-DRIVE, 2016b).	Energy Supply (SI-DRIVE, 2016a; Boonstra et al., 2015)
Repairing, re-use, extending life time of products	Energy collectives
Sustainable consumption and sharing economy	Local (domestic) production of energy
New forms of sustainable living	Working with smart meters
Urban gardening	Energy services
Protection and restoration of ecosystems	Providing examples and inspiration
Eco-labelling	District and neighborhood energy systems
Alternative sustainable food production and distribution	Energy efficient mobility
Reducing waste of raw materials & recycling	
Energy advice and consulting, focusing on enabling low-income groups to save energy/costs	
Socio-technical innovation addressing societal challenges, new forms of research and development	
“Historical social innovations” – Sustainable water management approaches	

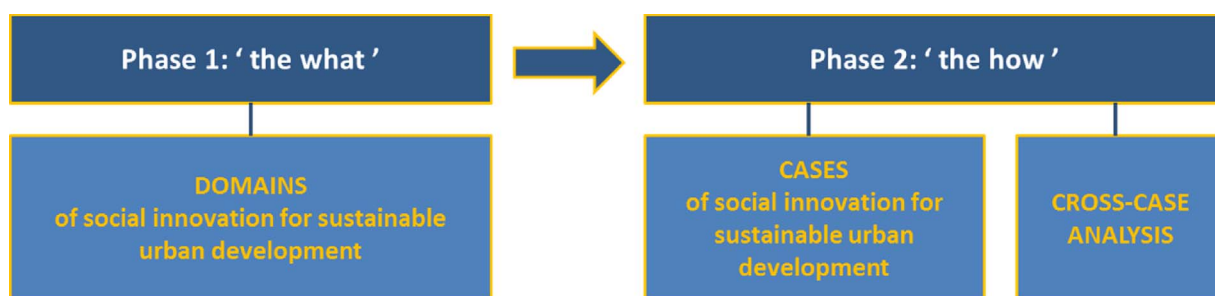


Fig. 1. Research Roadmap for the purpose of investigating of social innovation for sustainable urban development (authors' elaboration).

technology exploited by the initiative (Bria et al., 2015), the degree to which the used technology is innovative, i.e. standard/off the shelf or bespoke/tailored to the needs of the initiative (Carpenter, 2014), as well as whether ICT merely supports an innovation which could have taken place anyway, or whether it actually enables it and hence the innovation could not have been realized without this technology and, finally, whether technology radically transforms the social innovation process by disrupting the status quo of the involved roles, relationships, and transactions (Carpenter, 2014).

In the ‘Empowerment’ domain, we deal with the beneficiaries of the innovation and how they are empowered (in terms of increasing their capacity to organize, act, and achieve results). We focus on the main ‘Beneficiaries’ of the social innovation initiative, who represent the stakeholders who enjoy increased autonomy, power and influence capacity by means of this innovation – citizens who form communities of interest or practice, grass roots organizations, social enterprises, foundations and charities, business and the private sector in general, academia and research and other knowledge institutions, and finally government and the public sector (Bria et al., 2015; Hostick-Boakye, 2014). We outline how the beneficiaries are actually empowered – by sharing information and recourses, by identifying problems and underlying issues, by actually solving those problems collectively, and finally, by taking collective decisions which influence government and community policy making (Millard et al., 2013; Davies and Simon, 2014). In the ‘Empowerment’ dimension we also incorporate the existence of a specific ‘outcome’ (Phills et al., 2008) or ‘impact’ (Conger, 2009), in the sense of advancing knowledge about how to address an unmet need or solve an unsolved problem, which is also prominent in many studies. Hence we examine the specific ‘Outcome’ of the social innovation initiative, be it a new product or service, a process, new knowledge or idea, a social movement, a piece of legislation, a new technology, a new institution, a collaboration platform, a different organizational form or a new business model (Cajaiba-Santana, 2014; Phills et al., 2008; The Young Foundation, 2012).

The above work is summarized in the following Fig. 2, which presents our main research domains about social innovation for sustainable

urban development.

3.4. Phase 2: the ‘how’ – empirical investigation of cases and analysis

For our research, we scrutinized over 200 research papers, research project deliverables, policy documents, online platforms with the purpose to identify cases of social innovation initiatives related to environmental sustainability. The most extensive collections of social innovation initiatives are provided by Bria et al. (2015) and the platform www.digitalsocial.eu (European Commission, 2016), Misuraca et al. (2016), J & rgensen et al. (2016), Terstriep et al. (2015) and Millard and Carpenter (2014) (a total of approximately 1000 cases across various domains only in the previous recourses). Finally, we used Google’s Internet search engine in order to supplement the above cases, based on the following keywords: ‘social innovation’; ‘environment’; ‘energy’; ‘sustainable development’; ‘sustainable cities’; ‘urban sustainability’.

From the outset, we set the following criteria for including any social innovation initiative in our collection of cases:

- the existence of a spatial development component
- the existence of an ICT (socio-technical) component, and
- the existence of sufficient information by means of primary (initiative website and/or social media) and secondary resources (scientific literature, policy documents and other publications).

Using the above information sources, and respecting the set criteria, we managed to detect 29 cases of social innovation initiatives for sustainable urban development, which in turn were regarded as matching the purpose of this research. These cases are analytically presented in Section 4. With respect to each detected case of social innovation initiative for sustainable urban development, we collected data in terms of the three distinct domains of social innovation: i. Content, ii. Process and iii. Empowerment (as explained in Section 3.3). The foremost volume of our data was collected by means of primary research, and predominantly by exploring the websites of each initiative. Secondary information sources included the above literature sources.

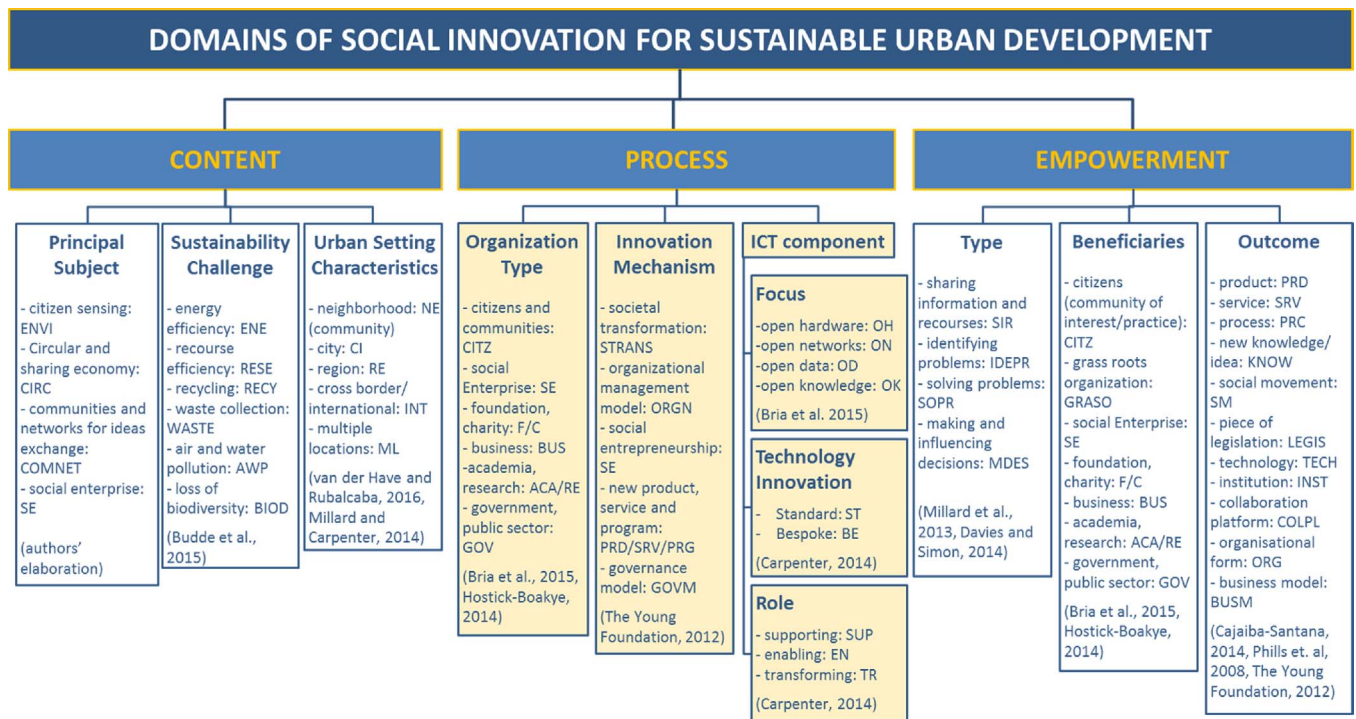


Fig. 2. Research domains for social innovation for sustainable urban development (authors’ elaboration). Next to each entry there is also the corresponding abbreviation available – these abbreviations were created to make the analysis more compact and presentable (authors’ elaboration).

To analyze the collected data, we performed a cross-case comparative analysis (Miles, Huberman, & Saldaña, 2013; Yin, 2003; Eisenhardt, 1989), which is a form of qualitative analysis that allows to first analyze each case individually and afterwards synthetically, allowing for the detection of patterns, clusters and disparities across the cases. The collected data are available in a cross-case matrix form in Annex A, Table 2.

4. Findings

4.1. Cases

The following list of 29 items presents the identified cases of social innovation for sustainable urban development in alphabetical order. We also provide basic information about the objective of the initiative, its website, and how it was detected:

4.2. Citizen profiles in social innovation for sustainable urban development

The analysis of the collected data with respect to each of the previous cases of social innovation for sustainable urban development took place across the three distinct domains of social innovation, namely Content, Process and Empowerment (Annex A, Table 2). Within the main subject of each initiative, we identified the primary role that citizens acquire, what needs are satisfied by means of this role, and how citizens are empowered. We examined the content of the initiatives, focusing on their qualitative characteristics and specific features; we examined the relevant spatial reference, as well as the existence of general benefits. We also placed specific attention to the role of technology and ICTs in the innovations. Based on the previous analysis, we arrived to four primary citizen roles: the ‘citizen-sensor’, the ‘sharing citizen’, the ‘collaborative citizen’ and the ‘entrepreneurial citizen’ (Fig. 3). Analytical information about each citizen profile is provided in the following sections.

4.2.1. The citizen-sensor

The first major subject of social innovation initiatives for

sustainable urban development is related to citizen environmental sensing. This term refers to networks of citizens, sometimes interconnected, who actively observe, report, collect, analyze and disseminate any kind of information related to environmental issues. These initiatives are also referred as ‘crowdsourcing’ or ‘participatory sensing’, since they focus on capitalising on the power of the crowd and rely on citizen participation to achieve their goals (Boulos et al., 2011). In this model, the role of the citizen is the role of one who ‘senses’ his/her environment through the collection and sharing of environmental data.

The continually reduced costs and the availability of a multitude of different sensors (Hancke and Hancke Jr, 2012; Jiang et al., 2016) enable citizens to actively participate in measuring elements of the environment by themselves. Citizens are motivated to engage in this model in order to collect and share their data and/or information,¹⁰ and, at the same time, be part of a global community tackling sustainability issues. Therefore, the basic outcome of these initiatives is sharing information from different sensors in order to better understand the environmental challenges. This is achieved through the development of new products (Air Quality Egg, Citizen Sensor, Smart Citizen, YouSense), such as hardware and software, as well as through theoretical and empirical investigation related to ‘citizen sensing’ (Citizen Sense, EveryAware, HackAir). Although the main beneficiaries seem to be citizens in all cases, there are also significant benefits for the public and private sector.

According to our findings, there are several initiatives focused on monitoring air pollution (CO and NO₂, temperature, humidity, sound levels etc.) by combining mobile sensors with web technologies and human computing (Michelucci, 2013). There are also two projects focused on the loss of biodiversity (OpenTreeMap and ForestWatchers) through the collective reporting of the state of trees and forests respectively. In terms of spatial settings, almost all of the projects have an

¹⁰ While these terms are definitely related, data and information do not mean the same thing. Data refers to unprocessed numbers, pictures or statements while information is the result of analysing or processing the data. Depending on the type of each application, citizens contribute by sharing either data or information related to environmental issues.

Table 2
Cases of social innovation initiatives for sustainable urban development used in this research (authors' elaboration).

#	Name	Short Description	URL	Source
1	Air Quality Egg	An open source hardware platform device for crowdsourced citizen monitoring of airborne pollutants	http://airqualityegg.com/	Internet search
2	Ambiente Solidale	Along with other organizations, it bypassed the official waste collection system of the city and took it into their own hands to distribute recycling bins to homes and businesses throughout the region	http://www.ambientesolidale.it	European Commission – DG Environment (2014)
3	Bybi	A social enterprise aiming at creating a sustainable urban honey industry that can provide opportunities for long-term unemployed and bring people in contact with nature	http://bybi.dk	European Commission – DG Environment (2014)
4	Citizen Sense	A project that investigates the relationship between technologies and practices of environmental sensing and citizen engagement	http://www.citizensense.net/	Internet search
5	Citizen Sensor	A do-it-yourself (DIY), open source hardware and software to encourage personal and community environmental monitoring	http://citizensensor.cc/	Internet search
6	CitySense	An application that enables environmental monitoring through open data for all citizens	http://www.citysense.es/	Apps4citizens website (2016)
7	Dodo	An organization addressing environmental issues societally	http://dodo.org/	Internet search
8	eReuse project	A student-run social enterprise with the goal of creating a fully contained, local e-waste management system	http://www.ereuseproject.org/	European Commission (2016)
9	E-Reuse	Open source technology for reusing digital devices ensuring final recycling	https://www.ereuse.org/en/	CHEST Research Project (2014)
10	EveryAware	EU-funded project for the creation a new technological platform combining sensing technologies, networking applications and data-processing tools	http://www.everyaware.eu/	Internet search
11	FoodCloud	Offers a way for businesses to donate surplus food to charities within their communities	http://food.cloud/	Internet search
12	ForestWatchers.net	Permits monitoring selected patches of forest across the globe, almost in real-time, using a notebook, a tablet or a smart phone connected to the Internet	http://forestwatchers.net/	Internet search
13	Freecycle Network	A free Internet-based service where more than 5000 area-based groups of people connect to give away and ask for things that would otherwise be thrown away	https://www.freecycle.org/	Martin and Upham (2015)
14	Freegle	A free Internet-based service where people can give away and ask for things that would otherwise be thrown away	https://www.ilovefreegle.org/	Martin and Upham (2015)
15	GreenApes	A game-design platform for the promotion of sustainable behavior for citizens	https://www.greenapes.com/it	CHEST Research Project (2014)
16	HackAir	EU-funded project for the engagement of users in generating and publishing information relevant to outdoor air pollution	http://www.hackair.eu/	Internet search
17	INFORSE	International network for sustainable energy – network of 60 countries to promote sustainable energy and social development	http://www.inforse.org/	J & rgensen et al. (2016).
18	La Petite France	Provides more sustainable transport delivery system, by delivering goods using electric bicycle that tows a large storage cabin	www.lapetitereine.com	European Commission – DG Environment (2014)
19	Love your waste	A collaboration aiming to minimize food waste and convert biowaste to new resources	http://www.loveyourwaste.com/	Internet search
20	Making Sense	EU-funded project that seeks to engage communities around digital 'maker' culture, open design and environmental sensing	http://making-sense.eu/	European Commission (2016)
21	Media Watch for Climate Change	A comprehensive and continuously updated knowledge repository on climate change and related environmental issues	http://www.ecoresearch.net/climate/	Internet search
22	Open Tree Map	Enables individuals, organizations, and governments to collaboratively contribute to an interactive and dynamic map of a community's tree population	https://www.opentree.org/	ICOS (2016)
23	Public Lab	A community laboratory where people can learn how to investigate environmental concerns using DIY techniques	https://publiclab.org/	Internet search
24	Safecast	An open source device that captures and shares measurement on radiation levels	http://blog.safecast.org/	European Commission (2016)
25	Smart Citizen Kit	An open source environmental monitoring hardware board, web service and mobile app	https://smartcitizen.me/	European Commission (2016)
26	Sutton Community Farm	A community farm set by a cooperative structure that allows the farm to become community-owned and to launch a not-for-profit community share offer	http://suttoncommunityfarm.org.uk	European Commission – DG Environment (2014)
27	Transition Network	A network of cities that include grassroots community projects to increase self-sufficiency and sustainability	https://transitionnetwork.org/	Pisano et al. (2015)
28	Waste FabLab	A social infrastructure where people manage, repair, prepare for reuse and transform local waste	https://www.changemakers.com/discussions/entries/waste-fab-lab	Guerrini (2014)
29	YouSense	A kit for citizens to monitor and sharing of air pollution data	http://www.yousense.eu/	Internet search

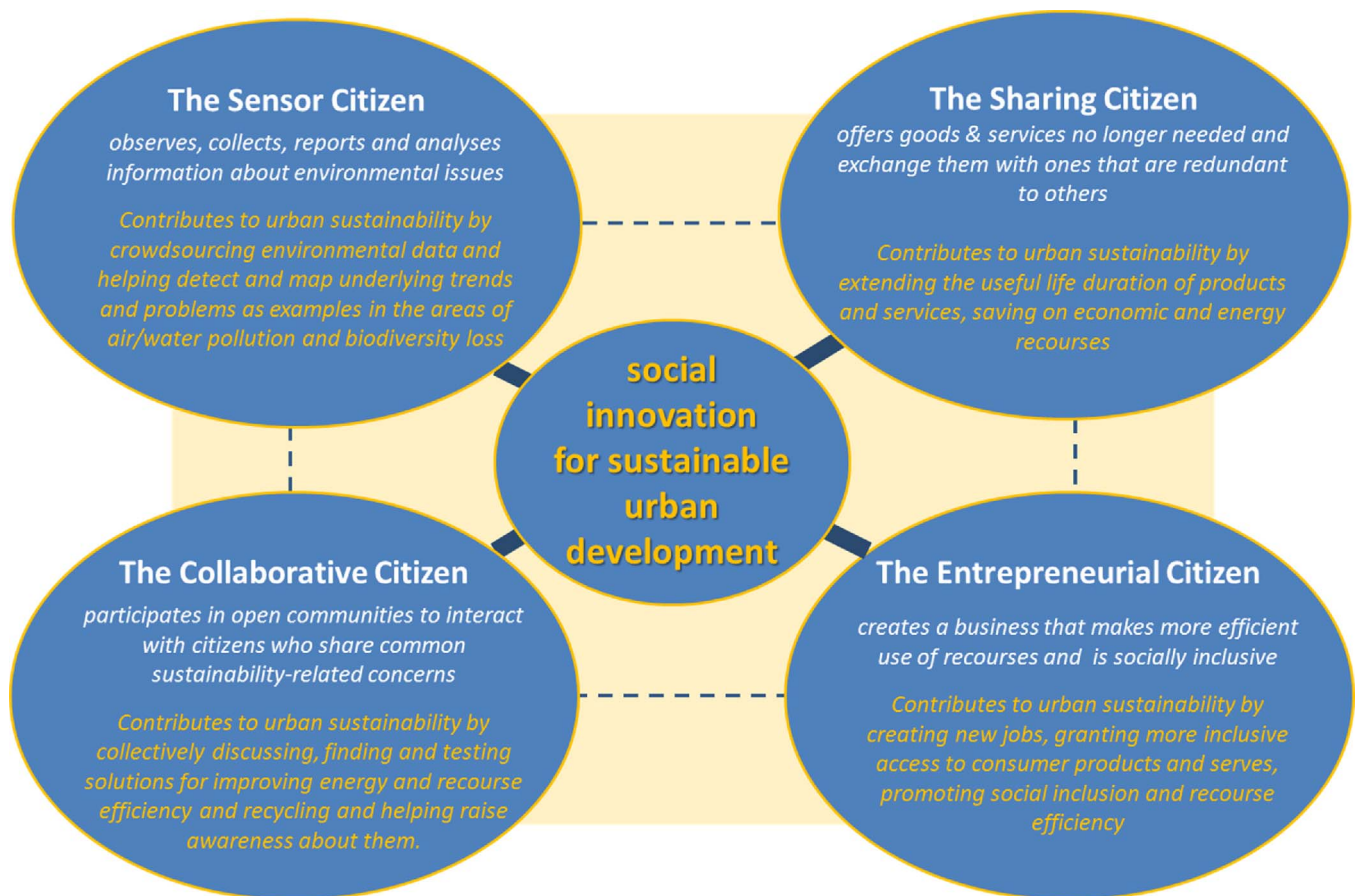


Fig. 3. Four citizen profiles around social innovation for sustainable urban development and how they contribute to urban sustainability (authors' elaboration).

international dimension as they either require cross-border cooperation or are implemented in multiple locations. The reason for that lies on the inherent characteristics of these initiatives, as most of them are research programmes that investigate open technologies and distributed tools operating remotely. AirQualityEgg and CitySense are not included in this category; the first one is a grassroots initiative that has transformed into a company after crowdfunding and the second one is led by a public-private collaboration and is implemented in a city level.

ICT has a transforming role in all of these initiatives, as most of them support either the development of new technologies or the experimentation and investigation over existing ones. Tailor-made sensors and devices for specific use and purposes, on the one hand, and research on expanding functionality and improving interoperability, on the other side, are key challenges for these initiatives. Finally, openness is considered a core element of ICT for this group of initiatives, as open standards for hardware, software and data play a fundamental role in achieving broad collaboration between users and interoperability between systems.

4.2.2. The sharing citizen

The second major subject of social innovation initiatives for sustainable urban development revolves around the Circular Economy (Ellen MacArthur Foundation, 2013), the Sharing Economy (Dervojeda et al., 2013) and sustainable consumption, in the sense of citizens and businesses offering and consuming goods and services based on a peer-to-peer business model. The value proposition of the sharing/circular economy paradigm lies with the matching between peers who own a

certain recourse with peers who in some way are in need of this recourse. The existence of supply and demand is hence key to the success of the initiative, with one or both of them being the driving force between transactions. In this model, the role of citizens is the role of the ones who share and exchange their resources to better satisfy their needs.

In more detail, citizens (and other grassroots users) are drawn into this collaboration model by the desire to acquire access to recourses for which they would otherwise have to pay a higher price, or to recourses that they only want to use temporarily. They are also driven by the desire to donate or sell items they no longer use or need for a low fee, while also reducing their environmental footprint and contributing to a social purpose. The basic outcome is the sharing service itself, which may involve innovative lines of business and collaboration models. As a by-product of the sharing service, we may also see social movements and new organizational forms rising. Actually, from our findings we discern that most initiatives start from charities, grassroots, research and academic organizations, of which eventually many are transformed into social enterprises. The main beneficiaries are always citizens.

Shared goods and services may include practically anything in redundant, most common being electric and electronic parts and equipment (eReuse project, E-Reuse), clothes (Ambiente Solidale) and surplus food (FoodCloud, Love your waste). Goods may either be forwarded to customers in their original state or first reworked/repaired (eReuse project, E-Reuse, Waste-Fab-Lab). Depending on the product, basic quality, safety and hygiene requirements may apply (especially with respect to food). Most initiatives are local, taking place

within cities; the necessary transportation of goods which takes place within these types of initiatives poses spatial restrictions with respect to the distance travelled, which is also associated with the expected life duration of the product; for example, it may be difficult and ineffective for cooked food to be transported over long distances in terms of cost. The most important benefits rising from this group of initiatives include saving resources, reducing the environmental impact of production, consumption and other human activities, and creating new physical or virtual, blue and white collar jobs.

Technology has a crucial and enabling role in this collaboration model, since online platforms allow the matchmaking process to take place much less effortlessly compared to traditional practice. ICT wise, open networks lie in the heart of the initiative, playing a crucial role in actualizing the innovation; the larger the network, the larger the amount of incoming and outgoing resources, and hence the more successful the matchmaking process will be. For practical reasons, most initiatives use bespoke technologies unless the purpose of the initiative itself lies with repairing or redeveloping new electric/electronic products.

4.2.3. The collaborative citizen

Another large group of social innovation initiatives related to environmental sustainability are represented through open communities and organization networks. These networks primarily consist of individual citizens, communities and non-governmental organizations that share a passion for sustainability and have common goals about it. In a sense, they could be regarded as open communities of interest and/or practice (Wenger, 1998). Compared to the previous subject, the goals here are more ‘open’, ‘global’ and driven by the desire to increase common good, although the local dimension and personal interests still do exist.

More specifically, the motives of citizens for participating in these communities are more oriented towards advancing discussion, raising awareness and creating and promoting solutions about sustainability challenges. Other motives include personal interest, achievement and recognition. To this end, citizens contribute their knowledge, ideas, and skills and openly collaborate to formulate open networks and communities. The foremost outcome is new, crowdsourced knowledge and assets, which in turn can be transferred to other geographical areas and sectors.

Sustainability goals and activities within this stream of initiatives range from very broad to very specific. For example, people, communities and organizations may convene under the overarching goals of promoting environmental sustainability in general (see, for ex. Dodo, INFORSE and Transition Network), or they may be focused on specific sustainability topics such as climate change, climate policy and climate science (Media Watch for Climate Change), urban resilience and disaster mitigation (Public Lab), sustainable behavior and lifestyles (GreenApes). An important observation is that the overarching style of these initiatives is about promoting local solutions to global environmental issues – in turn, innovative ideas and best practices may be transferred to new areas and adapted to solve different problems.

That said, this transfer of practices and ideas, which at the first level respond to local sustainability challenges, can take place either way. Hence the role of technology in this type of initiatives is usually supporting and in some cases it is transforming, as it allows local networks to expand their outreach globally and encourage citizen participation. Finally, openness is again one of the core elements of these initiatives as all of them are structured upon open collaborative networks of citizens.

4.2.4. The entrepreneurial citizen

The last subject of social innovation initiatives includes models of social entrepreneurship that promote inclusive and sustainable economic growth. As social entrepreneurship, we accept the definition provided by the [The Young Foundation \(2012\)](#), as well as the definition of the Skoll Centre for Social Entrepreneurship, as ‘the practice of

combining innovation, resourcefulness and opportunity to address critical social and environmental challenges’ (Skoll Centre for Social Entrepreneurship, 2017). Social enterprises are based on novel mechanisms and organizational models that attempt to tackle global issues such as alleviating hunger, improving education and combating climate change.

For this research, the selected initiatives are social enterprises that have been instigated by individuals or groups of citizens and they are more clearly related to the climate change challenge, through the promotion of a more efficient use of resources. What basically motivates people to engage in this model is the idea that businesses can play a crucial role in addressing societal challenges, creating new jobs and granting more inclusive access to consumer products and services. It is a common belief today that the success of a business should not be measured only in terms of financial performance, but also through its ability to create social value. The basic outcome of these initiatives is a novel organizational and/or business model linked to an existing product or service, while the main by-product to consider is the rise of the social movement around the social and solidarity economy.

The structures and forms behind these enterprises vary significantly, from a cottage industry of honey products (Bybi) and an urban delivery service with electric bikes (La Petite Reina) to a collaborative city farm (Sutton Community Farm). However, what is common among them is that new organizational models emerge and constitute innovative solutions for typical urban problems. All cases are local, as they involve activities and services that operate within cities. As observed in Section 4.2.3 about communities and networks, these initiatives also promote local solutions addressing global environmental issues.

Finally, the role of ICT in these cases is important but not as crucial as in the previous categories. Electronic websites and online platforms are basically used for marketing and networking purposes, increasing the impact of these initiatives globally. Nevertheless, the ultimate scope of these initiatives stays strongly at the local level.

5. Conclusions

In this paper we presented a short review of the social innovation literature, focusing on the relationship between social innovation and sustainable urban development. We explored how off-the-shelf and bespoke technology has allowed the growth of people networks, and expanded the outreach of social innovation initiatives in the field of sustainability. By researching 29 cases across nine domains that emerged through the social innovation literature, and by analysing them comparatively, we detected four types of citizen profiles in the sustainability discourse: the ‘citizen-sensor’, the ‘sharing citizen’, the ‘collaborative citizen’ and the ‘entrepreneurial citizen’.

The foremost observation to make from the above analysis is related to the roles citizens acquire in the social innovation for sustainability discourse. Building upon the existing body of literature that explores the social aspect of innovation in terms of process and empowerment, we maintain that different citizen roles imply different capabilities and interrelations and, therefore, different dynamics for the social innovation ecosystem. In addition, these citizen roles are highly dependent on the type of ICTs and the way these tools are used. The blurred boundaries between users/consumers and producers and the emergence of ‘prosumers’¹¹; as an expression of this blur, have been significantly encouraged by the extended use of ICT (Manzini, 2007; Millard et al., 2013; Wallin, Horelli, & Saad-Sulonen, 2010). However, this relation between citizen roles and ICTs needs to be further investigated. The current research stands for a first attempt to investigate this relation between citizen and ICTs, identifying citizen profiles in the area of social innovation regarding environmental sustainability.

Based on our analysis, citizens acquire different roles, but

¹¹ The term was initially conceived by Alvin Toffler, an American writer and

nevertheless these roles are not always unique and clearly noticeable. A sharing citizen, can be easily transformed into an entrepreneurial one, by deciding to advance his/her undertakings into a social business. Citizen sensors, engaged in collecting and reporting data from the environment to solve a sustainability problem, are frequently at the same time part of an open community of citizens who share a passion for solving this very same problem. Hence, in social innovation for sustainable development, citizens can have dual or multiple roles at the same time or change roles depending on the situation.

That said, the complexity of the citizen roles and profiles has analogous implications about the related social innovation subject areas themselves, only at this level the situation becomes even harder to comprehend, as meso and macro level factors intervene more decisively in the social innovation process. For example, we sometimes observe that social innovation initiatives focused on the circular and/or sharing economy may lead to the creation of innovative business models and social enterprises, which in turn may be backed by or result to the creation of communities and networks of people who share common goals and concerns.

Annex A

See [Table A1](#).

Where does then research about social innovation for urban sustainability need to focus? By observing the independent and combined characteristics of each citizen profile, as well as the interactions between the citizens themselves and their communities, one could possibly discern more in-depth information about this multi-stakeholder and multi-level phenomenon. More longitudinal and comparative research is then needed into the roles of citizens in the context of social innovation for sustainability through real-life cases and empirical research. In a society where ‘everybody designs’ (Manzini, 2015), we have to identify our emerging, interwoven roles in order to take concrete steps towards sustainability.

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Table A1 Research findings for 29 cases across nine domains for social innovation for sustainable urban development (authors' elaboration). The abbreviations are analytically presented in Fig. 2 (authors' elaboration).

#	Name	Content		Process			Empowerment					
		Subject	Urban Setting Characteristics	Sustainability Challenge	Organization Type	ICT Component		Type	Beneficiaries	Outcome		
						Focus	Technol Innov.				Role	
1	Air Quality Egg	ENVI	ML	AWP	GRASO	PRD/SRV/PRG	OH, ON	BE	TR	SIR, IDEPR	CITZ, BUS	PRD, TECH
2	Ambiente Solidale	CIRC	CI	RECY, WASTE	GRASO	STRANS, GOVM	ON	ST	SUP	SOPR, MDES	CITZ	SRV, SM, ORG
3	Bybi	SE	CI	RESE, BIOD	SE	SE, PRD/SRV/PRG	ON, OK	ST	SUP	SOPR, MDES	CITZ	PRD, ORG, SM
4	Citizen Sense	ENVI	INT	AWP	ACA/RE	STRANS	OK	ST	EN	SIR, IDEPR	CITZ	KNOW
5	Citizen Sensor	ENVI	ML	AWP	ACA/RE	PRD/SRV/PRG	OH, ON, OD	BE	TR	SIR, IDEPR	CITZ, ACA/RE	PRD, TECH
6	CitySense	ENVI	CI	AWP	BUS, GOV	PRD/SRV/PRG	ON, OD	BE	EN	SIR, IDEPR	CITZ, ACA/RE, GOV	SRV, KNOW
7	Dodo	COMNET	CI	ALL	GRASO	STRANS	ON, OK	ST	SUP	SIR, IDEPR	CITZ	KNOW, SM
8	eReuse project	CIRC	CI	RECY	ACA/RE, SE	STRANS, SE, PRD/SRV/PRG	ON	ST	EN	SIR, SOPR, MDES	CITZ	SRV, KNOW
9	E-Reuse	CIRC	INT	RECY	F/C	STRANS, PRD/SRV/PRG	ON, OK	BE	EN	SIR, SOPR	CITZ	PROC, CLPL
10	EveryAware	ENVI	INT	AWP	ACA/RE	STRANS	OK	ST	EN	SIR, IDEPR	CITZ, ACA/RE, GOV	KNOW
11	FoodCloud	CIRC	CI	WASTE	SE	ORGN, PR/SRV/PRG	ON	ST	EN	SIR, SOPR	CITZ, F/C, BUS	PROC, SM
12	ForestWatchers	ENVI	INT	BIOD	F/C	PRD/SRV/PRG	ON, OK	ST	EN	SIR, IDEPR	CITZ	KNOW
13	Freecycle Network	COMNET	INT	RECY	F/C	ORGN	ON	ST	SUP	SIR	GRASO, F/C	COLPL
14	Frengle	CIRC	INT	RECY	F/C	ORGN, PRD/SRV/PRG	ON	ST	SUP	SIR	CITZ, GRASO, F/C	SRV, COLPL
15	GreenApes	COMNET	CI, ML	ENE, RESE, RECY	BUS	PRD/SRV/PRG	ON	ST	EN	SIR, IDEPR	CITZ, BUS	KNOW, SM
16	HackAir	ENVI	INT	AWP	ACA/RE	PRD/SRV/PRG	OH, ON	BE	TR	SIR, IDEPR	CITZ	PRD, TECH, KNOW
17	INFORSE	COMNET	INT	ENE	F/C	ORGN	ON	ST	SUP	SIR, IDEPR	GRASO, F/C	KNOW, COLPL
18	La Petite Reina	SE	CI	RESE, AWP	SE	SE, PRD/SRV/PRG	ON	BE	EN	SOPR	CITZ	SRV
19	Love your waste	CIRC	CI	ENE, WASTE	BUS	PRD/SRV/PRG	ON	ST	EN	SOPR	CITZ, ACA/RE	SRV
20	Making Sense	ENVI	INT	AWP	ACA/RE	STRANS	OK, OH	ST	EN	SIR, IDEPR	CITZ, ACA/RE, BUS	KNOW
21	Media Watch for Climate Change	COMNET	INT	ENE, RESE, AWP	GOV	PRD/SRV/PRG	ON	BE	TR	SIR, MDES	CITZ, ACA/RE, GOV	KNOW
22	OpenTreeMap	ENVI	INT	BIOD	BUS	PRD/SRV/PRG	OK	ST	EN	SIR, IDEPR	CITZ, ACA/RE, GOV	KNOW
23	Public Lab	COMNET	CI	ALL	GRASO	STRANS	ON, OK	ST	EN	SIR, SOPR, MDES	CITZ, ACA/RE, GOV	KNOW, COLPL
24	Safecast	ENVI	ML	AWP	F/C	PRD/SRV/PRG	OD, ON	BE	EN	SIR, IDEPR	CITZ, ACA/RE, GOV, BUS	PRD, KNOW, COLPL
25	Smart Citizen Kit	ENVI	ML	AWP	ACA/RE	PRD/SRV/PRG	OD, ON, OH	BE	TR	SIR, IDEPR	CITZ, ACA/RE, GOV, BUS	PRD, KNOW, COLPL
26	Sutton Community Farm	SE	CI	RESE	SE, F/C	SE, PRD/SRV/PRG	ON, OK	ST	SUP	SIR, SOPR, MDES	CITZ, GRASO	PRD, ORG, SM
27	Transition Network	COMNET	INT	ALL	F/C	ORGN	ON, OK	ST	SUP	SIR, SOPR, MDES	GRASO, F/C, GOV	KNOW, COLPL
28	Waste-Fab-Lab	CIRC	CI	RECY	F/C	PRD/SRV/PRG	ON, OK	BE	EN	SIR, SOPR	CITZ, ACA/RE	SRV, SM, ORG
29	YouSense	ENVI	INT	AWP	ACA/RE	PRD/SRV/PRG	OK, OH	BE	TR	SIR, IDEPR	CITZ, ACA/RE, GOV, BUS	PRD, KNOW

References

- Anania, L., & Passani, A. (2014). A Hitchiker 's guide to digital social innovation. *20th ITS biennial conference: the net and the internet – emerging markets and policies*.
- Angelidou, M., Gountaras, N., & Tarani, P. (2011). Digital services in knowledge cities: the case of digital thermi. In T. Yigitcanlar, & A. C. Fachinelli (Eds.), *The 4th knowledge cities world summit*.
- Angelidou, M., Gountaras, N., & Tarani, P. (2012). Engaging digital services for the creation of urban knowledge ecosystems: the case of thermi: Greece. *International Journal of Knowledge-Based Development*, 3, 331–350.
- Angelidou, M. (2014). Smart city policies: a spatial approach. *Cities*, 41, S3–S11.
- Angelidou, M. (2015). Smart Cities: a conjuncture of four forces. *Cities*, 47, 95–106.
- Angelidou, M. (2016a). Exploiting digital social innovation in advancing smart cities. *Inneo 2016*.
- Angelidou, M. (2016b). Four european smart city strategies. *International Journal of Social Science Studies*, 4, 18–30.
- Arniani, M., Badii, A., De Liddo, A., Georgi, S., Passani, A., Piccolo, L. S. G., et al. (2014). *Collective awareness platform for sustainability and social innovation: an introduction*.
- Bawens, M. (2007). *Peer to peer and human evolution*. London: Foundation for P2P Alternatives. [Available at:] p2pfoundation.net.
- Boonstra, B., Ooms, M., Huygen, A., Rhombert, W., Budde, B., Boelman, V., et al. (2015). *Social innovation in energy supply – state of the art summary, SI-DRIVE (Social innovation: driving force of social change), EU FP7 research project*.
- Borzaga, C., & Bodini, R. (2012). What to make of social innovation?: Towards a framework for policy development. *Social Policy and Society*, 13, 411–421.
- Boulos, M. N. K., Resch, B., Crowley, D. N., Breslin, J. G., Sohn, G., Burtner, R., et al. (2011). Crowdsourcing, citizen sensing and sensor web technologies for public and environmental health surveillance and crisis management: trends, OGC standards and application examples. *International Journal of Health Geographics*, 10, 1.
- Bria, F., Almirall, E., Baeck, P., Halpin, H., Kingsbury, J., Kresin, F., et al. (2015). *Growing a digital social innovation ecosystem for Europe*. London: Nesta.
- Budde, B., Chonkova, B., Hickey, R., Dimova, A., Damianova, Z., Schroeder, A., et al. (2015). *Social innovation in environment and climate change – State of the art summary, SI-DRIVE (Social Innovation: Driving Force of Social Change), EU FP7 research project. Empowering people, driving change. Social innovation in the european union*. Bureau of European Policy Advisers.
- Social innovation: a decade of changes*. Luxembourg: Bureau of European Policy Advisers.
- Cajaiba-Santana, G. (2014). Social innovation: Moving the field forward. A conceptual framework. *Technological Forecasting and Social Change*, 82, 42–51.
- Carpenter, M. J. (2014). *Digital technology in social innovation: A synopsis. A deliverable of the project: The theoretical, empirical and policy foundations for building social innovation in Europe (TEPSIE), European Commission –7th Framework Programme*. Brussels: European Commission, DG Research. <http://www.tepsie.eu>.
- Conger, S. (2009). Social inventions. *The Innovation Journal: The Public Sector Innovation Journal*, 14.
- Davies, A., & Simon, J. (2014). Engaging citizens in social innovation: a short guide to the research for policy makers and practitioners. *Deliverable of the project: The theoretical, empirical and policy foundations for building social innovation in europe (TEPSIE), european commission –7th framework programme, brussels: European commission, DG research*.
- Dervojeda, K., Verzijl, D., Nagtegaal, F., Lengton, M., Rouwmaat, E., Monfardini, E., et al. (2013). *The sharing economy: Accessibility based business models for peer-to-peer markets*. Business Innovation Observatory: European Commission.
- Eisenhardt, K. M. (1989). Building theories from case study research. *The Academy of Management Review*, 14, 532–550.
- Ellen MacArthur Foundation (2013). *Towards the circular economy: economic and business rationale for an accelerated transition*.
- European Commission – Directorate-General for Internal Market, I., & Entrepreneurship and SMEs (2016). *Social innovation*. Available: http://ec.europa.eu/growth/industry/innovation/policy/social_en.
- European Commission DG CONNECT (2016). *Collective awareness platforms for sustainability and social innovation*. Available: <http://ec.europa.eu/digital-agenda/en/collective-awareness-platforms-sustainability-and-social-innovation>.
- European Commission (2016). *Digital social innovation platform*. DS14EU, European Union, Horizon 2020 Programme. Available: www.digitalsocial.eu.
- Gerometta, J., Haussermann, H., & Longo, G. (2005). Social innovation and civil society in urban governance: Strategies for an inclusive city. *Urban Studies*, 42, 2007–2021.
- Godin, B. (2012). *Social innovation: Utopias of innovation from c. 1830 to the present. Project on the intellectual history of innovation, working paper No. 11*.
- Grimm, R., Fox, C., Baines, S., & Albertson, K. (2013). Social innovation, an answer to contemporary societal challenges? Locating the concept in theory and practice. *Innovation: The European Journal of Social Science Research*, 26, 436–455.
- Hancke, G. P., & Hancke, G. P., Jr. (2012). The role of advanced sensing in smart cities. *Sensors*, 13, 393–425.
- Haxeltine, A., Avelino, F., Wittmayer, J., Kemp, R., Weaver, P., Backhaus, J., & O'Riordan, T. (2013). Transformative social innovation: A sustainability transitions perspective on social innovation. *Paper presented at NESTA Conference Social Frontiers: The Next Edge of Social Science Research, 14–15 November 2013, London, UK*.
- Hostick-Boakye, S. (2014). *Turning up the dial: Digital social innovation in northern Ireland*. The Young Foundation on behalf of the Building Change Trust.
- Howaldt, J., & Schwarz, M. (2010). Social innovation: Concepts, research fields and international trends. In H. Klaus, & F. Hees (Eds.), *Studies for innovation in a modern working environment –International monitoring*.
- Jørgensen, M. S., Avelino, F., Dorland, J., Rach, S., & Wittmayer, J. (2016). *Deliverable 4.4, synthesis across social innovation case studies, TRANSIT (Transformative social innovation theory project), EU FP7 research project*.
- Jenson, J., & Harrison, D. (2013). *Social innovation research in the European Union. Approaches, findings and future directions (Policy Review)*. Brussels: Publication Office of the European Union: European Commission.
- Jiang, Q., Kresin, F., Bregt, A. K., Kooistra, L., Pareschi, E., van Putten, E., et al. (2016). Citizen sensing for improved urban environmental monitoring. *Journal of Sensors*.
- Manzini, E. (2007). *Design research for sustainable social innovation. Design research now*. Birkhäuser.
- Manzini, E. (2014). Making things happen: Social innovation and design. *Design Issues*, 30(1), 57–66.
- Manzini, E. (2015). *Design, when everybody designs* (1st ed.). Cambridge (Mass.): The MIT press.
- Martin, C. J., & Upham, P. (2015). Grassroots social innovation and the mobilisation of values in collaborative consumption: A conceptual model. *Journal of Cleaner Production*, 134, 204–213.
- Michelucci, P. (2013). *Handbook of human computation* (1st ed.). New York, NY: Springer.
- Miles, M., Huberman, M., & Saldaña, J. (2013). *Qualitative data analysis: A methods sourcebook*. Incorporated: SAGE Publications.
- Millard, J., & Carpenter, G. (2014). *Case study analysis report of online collaboration and networking tools for social innovation. A deliverable of the project: The theoretical, empirical and policy foundations for building social innovation in Europe (TEPSIE), European Commission –7th Framework Programme*. Brussels: European Commission, DG Research. <http://www.tepsie.eu>.
- Millard, J., Nielsen, N. C., & Thaarup, R. K. (2013). *Report on the role of communities and networks in social innovation, and the role that online networking tools are playing. Deliverable of the project: The theoretical, empirical and policy foundations for building social innovation in Europe (TEPSIE), European Commission –7th Framework Programme*. Brussels: European Commission, DG Research.
- Millard, J. (2012). *Report on the development of online networking tools. Deliverable of the project: The theoretical, empirical and policy foundations for building social innovation in Europe (TEPSIE), European Commission –7th Framework Programme*. Brussels: European Commission, DG Research.
- Misuraca, G., Kucsera, C., Lippardini, F., Voigt, C., & Radescu, R. (2016). *D1.2-Annex – IESI knowledge map 2015 – booklet. V.1.0 31 st october 2015*. Institute for Prospective Technological Studies, Joint Research Centre.
- Moulaert, F., Martinelli, F., González, S., & Swyngedouw, E. (2007). Introduction: Social innovation and governance in european cities: Urban development between path dependency and radical innovation. *European Urban and Regional Studies*, 14, 195–209.
- Mulgan, G. (2006a). *Social Innovation: What it is, why it matters and how it can be accelerated*. Available: [http://www.sbs.ox.ac.uk/sites/default/files/Skoll_Centre/Docs/Social Innovation ? What it is%2C why it matters%26 how it can be accelerated.pdf](http://www.sbs.ox.ac.uk/sites/default/files/Skoll_Centre/Docs/Social%20Innovation%20What%20it%20matters%26%20how%20it%20can%20be%20accelerated.pdf).
- Mulgan, G. (2006b). *The process of social innovation. Innovations: Technology, Governance, Globalization*, 1(2), 145–162. <http://dx.doi.org/10.1162/itgg.2006.1.2.145>.
- Murray, R., Caulier-Grice, J., & Mulgan, G. (2010). *The open book of social innovation*. The Young Foundation and NESTA.
- Murray, R. (2009). *Danger and opportunity: Crisis and the social economy*. London: NESTA Provocation 09.
- Neumeier, S. (2012). Why do social innovations in rural development matter and should they be considered more seriously in rural development research? – Proposal for a stronger focus on social innovations in rural development research. *Sociologia Ruralis*, 52(1), 48–69.
- OECD Committee for Scientific and Technological Policy (2011). *Fostering social innovation to address social challenges*.
- Ogburn, W. (1964). *On culture and social change*. Chicago, IL: University of Chicago Press.
- Pelka, B., & Terstriep, J. (2016). Mapping social innovation maps: the state of research practice across europe. *European Public, Social Innovation Review*, 1, 3–16.
- Phills, J. A., Deiglmeier, K., & Miller, D. T. (2008). Rediscovering social innovation. *Stanford Social Innovation Review*, 6, 34–43.
- Pisano, U., Lange, L., & Berger, G. (2015). *Social Innovation in Europe: An overview of the concept of social innovation in the context of European initiatives and practices*. Vienna, Austria: European Sustainable Development Network.
- Rüede, D., & Lurtz, K. (2012). *Mapping the various meanings of social innovation: Towards a differentiated understanding of an emerging concept. EBS business school research paper*.
- SI-DRIVE Social Innovation in Energy Supply (2016a). *European policy brief, SI-DRIVE (Social innovation: Driving force of social change), EU FP7 research project*.
- SI-DRIVE Social Innovations and the Environment (2016b). *European policy brief, SI-DRIVE (Social innovation: Driving force of social change), EU FP7 research project*.
- Schachter, E., Mónica, E., & Wallace, M. L. (2015). *Shaken, but not stirred: Six decades defining social innovation. Ingenio working paper series*.
- Sestini, F. (2012). *Collective awareness platforms: Engines for sustainability and ethic*. IEEE Technology and Society Magazine.
- Seyfang, G., & Smith, A. (2007). Grassroots innovations for sustainable development: Towards a new research and policy agenda. *Environmental Politics*, 16(4), 584–603.
- Shea, P. (2015). Appropriate technology design and digital social innovation. *CulTech2015: Cultural diversity and technology design workshop. communities and technologies conference*.
- Sinclair, S., & Baglioni, S. (2014). Social innovation and social policy – Promises and risks. *Social Policy and Society*, 13, 469–476.
- Skoll Centre for Social Entrepreneurship (2017). *What is social entrepreneurship?* Available: <http://www.sbs.ox.ac.uk/faculty-research/skoll/what-social-entrepreneurship>.
- Tapscott, D., & Williams, A. D. (2007). *Wikinomics: How mass collaborations changes everything*. New York: Portfolio.
- Terstriep, J., Kleverbeck, M., Deserti, A., & Rizzo, F. (2015). *Comparative report on social*

- innovation across europe. deliverable D3.2 of the project «Boosting the impact of SI in europe through economic underpinnings» (SIMPACT), european commission 7th framework programme* Brussels: European Commission, DG Research and Innovation.
- The Young Foundation (2012). *Defining Social Innovation. A deliverable of the project: The theoretical, empirical and policy foundations for building social innovation in Europe (TEPSIE), European Commission –7th Framework. Programme*, Brussels: European Commission, DG Research.
- URBACT (2015). *Social innovation in cities*. Available: <http://urbact.eu/social-innovation>.
- Wallin, S., Horelli, L., & Saad-Sulonen, J. (2010). Introduction – ICTs changing the research and practice of participatory urban planning. In S. Wallin, L. Horelli, & J. Saad-Sulonen (Eds.), *Digital tools in participatory planning*. Espoo: Centre for Urban and Regional Studies Publications, Aalto University, School of Science and Technology.
- Weerakoon, C., McMurray, A., Rametse, N., & Douglas, H. (2016). Social innovation: A preliminary bibliometric analysis. *Social innovation and entrepreneurship research conference*.
- Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge: Cambridge University Press.
- Yin, R. (2003). *Case study research: Design and methods*. London: SAGE Publications.
- van der Have, R. P., & Rubalcaba, L. (2016). Social innovation research: An emerging area of innovation studies? *Research Policy*, 45, 1923–1935.