

Beyond Complaining: Towards Sustained Citizen-Led Initiatives for a Smarter City Through Hybrid Digital Commons

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Can an open-source tool provide a model for sustainable participatory Information Systems in the city? What major benefits would it bring? What barriers would it face? This PhD project addresses these questions, by examining the role and sustainability of citizen-driven initiatives for the smart city. Tightly linking to the OpenStreetMap (OSM) data ecosystem, we propose to explore how it can form and maintain advantageous synergies with local communities. We plan to explore current practices and relevant use cases, assess upsides and hurdles, and identify room where collaborations among citizens and services can grow. Targeting an increased satisfaction of citizen needs, we seek mechanisms, patterns, practices and tools leading to an increased voluntary citizen participation in quantity and throughout time.

1 Context and Motivation

Concerns regarding environmental degradation and limited citizen action are longstanding. Citizen initiatives have addressed issues such as urban planning and energy consumption reduction [12]. Recent digital technologies have facilitated the monitoring of environmental and social conditions and have supported broader citizen participation. However, these technologies can also reproduce existing inequalities. Limited access to digital tools and insufficient technical knowledge may exclude part of the population from participation, a phenomenon commonly described as the digital divide [17].

Citizen participation is often described through ladder-based frameworks, where higher levels correspond to increased citizen power and decision-making capacity [4]. In practice, participation is frequently restricted to surveys and opinion gathering, while opportunities for direct action remain limited. In parallel, the Free Open-Source Software (FOSS) movement has enabled citizens to develop and appropriate their own digital infrastructures. Open data and open software practices promote transparency and support more autonomous forms of civic action, despite remaining affected by digital divide issues.

Participatory approaches have increasingly been integrated into Smart City and Citizen Science initiatives to address environmental and urban challenges [7]. These initiatives rely heavily on digital platforms and data collection systems [1]. Their effectiveness therefore depends on the quality of the supporting tools. Accessible and usable systems are necessary to support participation from diverse populations. Such tools must account for the practical constraints faced by users, including mobile usage, intermittent connectivity, and varying levels of technical expertise. Without these considerations, participation remains limited and unequal. Citizen Science initiatives have nevertheless supported grassroots projects and community-oriented approaches to social and ecological issues [19, 21].

The OSM platform shares several characteristics with these participatory initiatives. As an open-source platform, it enables the collaborative production and dissemination of Volunteered Geographic Information (VGI) [17]. OSM data is widely used in urban planning and citizen-oriented projects [2, 27]. Its collaborative governance and open standards also qualify it as a digital common [13]. However, this governance model introduces technical and social participation barriers, including cooperation difficulties and digital divide issues [24]. Contributing to OSM therefore remains non-trivial for many users.

Despite these challenges, OSM exhibits a participation model that has enabled its long-term sustainability. The platform relies on a large number of users performing small and occasional contributions [29]. Sustaining such a model requires continuously attracting **new contributors, particularly local users** capable of documenting their own

environment. Accessible tools can support this objective by lowering participation barriers and enabling punctual contributions from a broader population. Over time, repeated low-effort participation may also facilitate the emergence of more experienced and expert contributors. Supporting both occasional and advanced users is therefore necessary for the long-term sustainability of the platform. This can be achieved by lowering the barriers for potential contributors.

Citizen-driven initiatives and the OSM ecosystem may therefore benefit from strong complementarities. Citizen initiatives require accessible and context-aware tools to support effective participation. At the same time, OSM requires sustained local engagement to ensure the continuous production and maintenance of geographic data. Better integration between both domains could strengthen civic action towards locally perceived issues while reinforcing the sustainability of the OSM community. Such synergies may also improve the contextualisation of citizen needs and support the design of solutions better adapted to local environments.

2 Literature Review

While several factors have held back citizen action, some others provide opportunities to increase it. Participatory exclusion issues, conflicting motivations and dissatisfaction towards democratic structures can be tackled through simpler contribution processes, different data governance mechanisms and processes targeting increased citizen empowerment.

Constraining (Digital) Technology for the City. Digital solutions towards sustainability often tend to reinforce the same power structures that impede reaching environmental sustainability goals. While able to empower marginalised groups, they often use citizens as mere data sources [28]. Additionally, and opposed to physical spaces, digital settings tend not to provide room for discussion, learning and civic identity development by default, factors linked to strong participatory habits [5]. Smart city initiatives may similarly reinforce existing inequalities linked to the digital divide [15, 23]. We plan to provide better, accessible tools for citizens to interact and organise local initiatives.

Complex, Lengthy, Non-Inclusive Contribution and Coordination Processes. Participatory projects often require significant time investments, which can discourage long-term engagement [6]. In OSM, complex editing workflows, fear of making mistakes, and difficulties integrating into the community further constrain participation [25]. The collaborative nature of the platform also creates coordination challenges between contributors with different motivations, expectations, and views [11, 16, 9]. Tensions may also emerge when commercial actors contribute without sufficient understanding of local contexts [11, 26].

OSM has remained sustainable through the contributions of many users performing small and occasional edits [29]. However, as a digital platform, it remains exposed to participatory inequalities linked to the digital divide. Approaches supporting participation beyond strictly digital interactions remain largely unexplored.

Limited Citizen Participation and Community-Driven Initiatives. Data cooperatives have emerged to allow users to keep control over their data [22]. Distrust on the efficacy of current systems on covering participation demand [8] have led to the development of democratic innovations. Still, doubts arise when existing mechanisms “invite” citizens to participate rather than “invent” their solutions [8]. Participation is often reduced to informing, consultation and placation [20], lower steps of the participation ladder, conferring limited citizen empowerment.

Considering citizen-driven initiatives, the long-term impact of grassroots projects remains limited [14]: engagement may be purely symbolic by design, and perspectives of local users are often excluded as tools often fail to reflect communal values, practices and contexts [10]. To this day, there is a lack of longitudinal multi-site studies [14] as well as empirical accounts on how collective action can relate to grassroots movements [3] that we plan to address.

3 Research Questions

This proposal aims at addressing the following Research Questions (RQs):

RQ1: Balancing Offline and Online Methods. How to design and balance offline and online contributing options for an increase in citizen participation?

RQ2: Simplifying Contribution Processes. How to lower participation barriers to make contribution accessible and simple for punctual project contributors?

RQ3: Improving Citizen-Driven City Science Projects. How can the OSM data ecosystem best be leveraged to help citizen-led city projects to thrive, *e.g.*, at which project steps?

The proposed RQs target the exploration of initiatives aimed at increasing citizen participation and action in sustained citizen-led projects for the city.

4 Approach and Methods

This proposal will be using approaches and methods widely used in **Human-Computer Interaction**. It investigates how collaborative digital commons can support more inclusive and sustainable forms of civic participation. The central idea is that of OSM being sustained by many users contributing small amounts of work [29]. The project investigates how participation can be made easier and more meaningful by connecting digital mapping tools with real-world activities such as neighbourhood projects, urban planning, or local environmental initiatives. This includes both digital tools and low-tech ways of contributing, with the goal of lowering barriers linked to digital skills, access, and time.

We propose the following procedure:

1. Assessing needs. This phase aims to identify barriers affecting citizen participation and contribution patterns. Surveys and interviews will be used to identify technical, social, and organisational difficulties. Particular attention will be given to lightweight and low-effort participation mechanisms capable of supporting meaningful interactions while reducing participation costs (RQ2). Different data governance approaches can also be explored to identify structures suited to local contexts and participant needs. Low participation at this stage may indicate limitations in the selected methods and motivate further refinement. This phase will be conducted during the **first year of the PhD**.

2. Prototyping and co-designing. This phase focuses on the iterative design and evaluation of tools addressing the issues identified previously. Supporting both digital and offline interactions may broaden participation opportunities and reduce exclusion linked to digital access constraints (RQ1). Different governance strategies may also be articulated to address heterogeneous user requirements. Observing participants interacting with prototypes can provide insights beyond self-reported feedback. Limited engagement during this stage may reveal design inadequacies or insufficient alignment with participant interests, motivating iterative redesign processes. This phase will take place during the **second and early third year of the PhD**.

3. Self-management and sustainability. This phase investigates the conditions enabling the long-term sustainability and self-management of the proposed solutions. It focuses on collaborative processes between citizen initiatives, city projects, and the OSM ecosystem (RQ3). Particular attention will be given to reducing dependence on top-down management structures while strengthening citizen autonomy and local participation. Low engagement at this stage may indicate governance limitations, inadequate tools, or difficulties in community coordination, requiring iterative reassessment. This phase will primarily take place during the **final year of the PhD**.

The research follows an empirical and participatory approach that combines lab studies, field observations, interviews, and analysis of contribution patterns. These methods will support a better understanding of participation practices and participation barriers. The resulting insights will inform the co-design and evaluation of more accessible and sustainable participatory systems. The project also aims to establish a continuous feedback process where co-design activities support further need assessment and progressively strengthen self-management capacities.

4.1 Evaluation of Contributions

The design in close collaboration with communities provides an intrinsic evaluation method of our contributions. Iterative assessment and design performed alongside contributors enables short feedback cycles and high turnaround times for designing tools fitting the needs of their users. More specifically, the project has the following sub-goals:

- 1. SG1 - Survey and Exploratory Studies.** These studies will provide a clearer understanding on the needs and painpoints of different types of contributors to OSM. This can be achieved with surveys for breadth and targeted interviews for a more in-depth understanding.

2. **SG2 - Design of Collaborative Tools.** In this phase, we plan to co-design tools and interfaces to promote collaboration between OSM and citizen initiatives. We will be using user centered design along the way to design tools that would fit both the OSM and possible grassroots initiatives.
3. **SG3 - Evaluation.** After the design of new artefacts, we plan a thorough evaluation in lab settings to iterate and smaller scale in-the-wild studies (i.e. local citizen science initiatives using maps). **Note: as this overall process is iterative, SG2 and SG3 will be repeated.**
4. **SG4 - Scalability.** Finally, we plan to focus on the scalability of the proposed tools, how they work in hybrid contexts, and, ultimately, how they may support a broader range of initiatives.

4.2 Project Advisor

This project will be hosted at Télécom Paris, Institut Polytechnique de Paris. It will be hosted by the DIVA group (Design, Interaction, Visualization & Applications) team. **Simon Perrault (Télécom Paris, IPP)** will be the main PhD supervisor. He is a full professor and his work focuses on online deliberation, online community engagement, and urban planning.

5 Contribution to Digital Collaboration: Expected Results and Impact

Given a focus on increased participation and sustainability of citizen-led approaches, our contributions are mostly on a practical level, towards the citizen. We look for difficulties and stressing points on implementing tools with and for the community. Barriers can unravel their inadequacy to the provided context, as well as the need for further specialisation. We seek to develop alongside and provide tools to the concerned communities, best tailored to their requirements. The design for offline participation enables the participation of citizens with lower knowledge of or access to digital tools. We will release our prototypes to make them available for any interested party and present the results of our studies in research papers and technical reports. Leveraging different data governance structures and enabling their civic use allows to account for knowledge gaps or practical barriers inhibiting their adoption. The project itself represents a direct intent on choosing engagement in detriment of data extraction, a practice noticed on academic projects relying on OSM [18]. Assessing the combination of multiple tools and tasks allows to uncover those leading to an increase in citizen participation.

Combining the developed tools with the participatory and governance mechanisms employed by the OSM data ecosystem allows to empirically assess participatory [4] and governance frameworks [24], exposing eventual fragilities in their application, or the need for their further refinement.

Overall, we direct our efforts towards reducing gaps between digital tools, citizen needs and civic action.

6 Positioning in the eSEMBLE program

This research aims at fostering collaboration and introducing new users to a large scale digital platform (OSM). It thus fits the scope of PC4 CONGRATS, especially as we aim at (1) getting an understanding on what enables successful collaboration, how contributors may join the project, (2) provide digital artefacts and tools to foster collaboration through OSM. We believe the project to be especially relevant to *WP 4.4 Understanding socio-technical collaborative systems in action*, including its subtask 4.4.1, as our project is one of the few covering OSM and its community, and highlighting its unique characteristics and challenges. We propose deliverables aligned with the eSEMBLE program, such as design principles for fostering deliberation and recommendations for knowledge accumulation platforms.

This proposal complements works from other eSEMBLE/CONGRATS funded projects, such as **Chloé Berut**'s work on online community databases, where our proposal focuses on OSM instead of Wikipedia. This proposal also synergizes with **Aurore Deramond** on the collaboration dynamics around a default common good, as our project aims at improving citizen participation and sustain the OSM community. **Emmanuel Courtoux**'s work on collaborative knowledge creation on repair communities also aims at addressing how to compile new knowledge, and scattered contributions on collaborative platforms, in a significantly different context.

Finally, we will also leverage already existing projects funded by PC4 at Télécom Paris. **Silvia Cazacu**'s postdoc (at Télécom) includes a participatory design approach we will likely use in our unique context. This proposal could

also benefit from inputs from the people involved in the “**Scalable governance structures for open source projects**” project to get a better understanding of governance within OSM.

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