energies

MDPI

Article

Energy Urbanity and Active Citizen Participation

Alan Mee *, Madeleine Lyes and Philip Crowe

Space Engagers, D07 Y8N5 Dublin 7, Ireland; madeleine.lyes@spaceengagers.org (M.L.); philip.crowe@spaceengagers.org (P.C.)
* Correspondence: alan.mee@spaceengagers.org; Tel.: +35-3873-2237-909

Abstract: This paper poses the question: 'can energy innovation initiatives in Innovation Playgrounds foster a new 'energy urbanity' through active citizen participation in the energy transition?' The concept of 'Innovation Playgrounds' and an accompanying Framework are described and linked to implementation evidence of the EU H2020 positive energy research and innovation project +CityxChange, related to emergent active citizen participation in two cities: Limerick, Ireland and Trondheim, Norway. The purpose of the study is to demonstrate that spatially clustered energy innovation initiatives in urban areas involving active citizen participation contribute to a new 'energy urbanity' for the energy transition. The research methods are based on a comparative case study approach and close observation of two case sites, with a focus on the 'Innovation Playground' area of each city. The article's three main conclusions are: that a Framework approach to active citizen participation in energy innovation initiatives in urban areas facilitates new models of active citizen and community participation around energy innovation; emergent active citizen participation in energy innovation initiatives in urban areas suggests a new type of engagement that is information-rich, blended, action-led, citizen-focused, and spatial; and that a new paradigm of 'energy urbanity' for the energy transition can be proposed.

Keywords: active citizen participation; Innovation Playgrounds; energy urbanity

Citation: Mee, A.; Lyes, M.; Crowe, P. Energy Urbanity and Active Citizen Participation. *Energies* **2021**, *14*, 6515. https://doi.org/10.3390/en14206515

Academic Editor: Patrick Phelan

Received: 30 July 2021
Accepted: 19 September 2021
Published: 11 October 2021

1. Background

This paper deals with active citizen participation and the urban energy transition, exploring whether energy innovation initiatives in Innovation Playgrounds can foster a new 'energy urbanity'. The concept of 'Innovation Playgrounds' and an accompanying Framework are introduced and linked to implementation evidence related to emergent active citizen participation in two mid-sized cities, Limerick, Ireland and Trondheim, Norway. The purpose of the study is to demonstrate that spatially clustered energy innovation initiatives in urban areas involving active citizen participation contribute to a new 'energy urbanity' for the energy transition. We suggest that an Innovation Playground Framework prompts the emergence of a new type of active citizen engagement with five identifiable characteristics: information-rich, blended, action-led, citizen-focused, and spatial. We contend that Framework-led engagement offers new avenues of approach for those seeking to foster citizen participation in the energy transition. It is argued that spatially clustered energy innovation initiatives in urban areas contribute in turn towards sustainable, resilient built environments and communities.

1.1. Introduction

The context of this paper is the European urban energy transition in mid-sized cities, which coincides with a time of unprecedented global climate change, rapid technological development in response, and people reporting restricted agency as citizens participating in the energy system [1]. Continents and countries respond differently, and rural and urban cultures and communities also differ in levels of understanding, engagement and action in climate adaptation [2]. Although the European Green Deal strives for Europe to be the

first climate neutral continent, at national level the variations in approaches to action are evident in research projects like the EUH2020 +CityxChange (Positive City ExChange) project. +CityxChange is a H2020 SCC01 Smart Cities and Communities Lighthouse project. While many cities are active in citizen participation in the European energy transition, mid-sized cities are less examined than national capitals [3]. This paper assesses the strategies of the +CityxChange project in Limerick and Trondheim as exemplars of current practice in facilitating the energy transition within the European context, with a focus on Active Citizen Engagement. The work of the project involves the development of technological innovation and innovation in citizen engagement, and this paper focuses primarily on the latter.

In 2014, while over 40% of Europeans lived in urban environments, that figure for Norway was 25.7%, and for Ireland 33.7%, both well below the EU average [4]. Limerick city (population of almost 100,000, as of 2016), as Ireland's third largest conurbation, arguably has a hybrid European/USA version of urbanity, with significant recent suburban and rural population growth in the surroundings, economic and cultural links to USA through the international airport at Shannon, and a car-based, sprawl generating model of expansion as a given, in line with the current national development trajectory. According to the city authorities, the core of the city of Limerick has a total urban area of 59.2 km^2, with a population density of 1591 per km^2. Trondheim (population 205,000 approx.), situated in central (west) Norway, is also the third most populous city in its country, and the +CityxChange project documents state that the core of the city has a total urban area of just over 340 km^2, with a population density of 557 per km^2. The scope of this paper covers only the physical geographies of two of the +CityxChange Innovation Playgrounds (of the seven +CityxChange cities), which together have a total population of 14,341 inhabitants (Trondheim Demonstration District, 11,954, Limerick Demonstration Area, 2387). This paper is mainly based on a project deliverable [D3.3] [5], described in more detail below, which defines and details the concept of Innovation Playground for the project. The Innovation Playground concept was in use locally in Trondheim from around 2013, and then intentionally incorporated into the project from this previous experience, something which was co-developed with partners. This paper extends that report with further theoretical background, initial experiences gathered in the local implementation of the framework, and general collected project experiences and shared reflections of the co-authors of this paper, all part of Space Engagers, one of the project partners.

1.2. Active Citizen Engagement in the Energy Transition

The focus on active citizen engagement is driven by a recognised deficit in analyses of on-the-ground engagement activity in projects driving the energy transition. For example, Preston et al (2020) call for an evidence base "of how citizen engagement can be practically embedded in the smart city activities of municipalities" [6]. The particular challenge of engagement around energy is also acknowledged, with many citizens feeling "locked out of the decision-making processes of the energy transition" and disconnected from the systems of energy they use every day [1]. The current top-down supply dynamic is seen as a bulwark to engagement, as according to Coy et al (2021): "this nascent pathway to transformation faces challenges from incumbent centralised energy actors in the form of inadequate institutional design, business models and regulatory frameworks" and "community energy groups are often unable to reshape these political power structures" [7]. This top-down dynamic can be echoed in energy projects designed to secure engagement, including the +CityxChange project. This paper examines the ways an Innovation Playground framework can address some of these issues.

1.3. Definitions

This paper will firstly offer working definitions and understandings of what we mean by key terms like 'Innovation', 'Innovation Playground', 'energy urbanity', 'active citizen

participation', +CityxChange, and 'Framework for Innovation Playgrounds' before setting out the background to the +CityxChange project in more detail.

1.3.1. Innovation

For this project, we considered 'innovation' as defined in different fields including 'technology and innovation', where innovation can be understood as connected to knowledge spillovers which can improve energy efficiencies [8], also economics and business, where innovation is sometimes an entrepreurial aim related to profit, and also as understood in the social sciences, urbanism and urban studies fields, connected with justice [9], behaviour change post-Covid [10], learnings for social innovation [11] and about measurement and feedback [12] from emerging Positive Energy Districts (PED). However, as one aspect of the +CityxChange project is behaviour change, and about new and future ways to live and create in the city, we concentrate on bottom-up citizen participation and urban change [13]. In general terms, we accept the definition of Katz (2014) that 'Innovation is when new or improved ideas, products, services, technologies, or processes create new market demand or cutting-edge solutions to economic, social and environmental challenges' [14]. For us, a relevant input for an innovation pitch in the analysed cities could be a 'digital twin' (3d computer model of urban form) which measures and displays current energy load, while a relevant output for an innovation pitch in the analysed cities could be a flexibility market and community grid for the same part of the city which also demonstrates enhanced positive energy performance. Another example of outputs of an Innovation Playground could be visible evidence of clusters of renewable energy generation technologies (eg. solar panels, a tidal turbine) and indicators on streets, like EV charging points, display screens about the project, and public events locally about positive energy. The concept of the Innovation Playground was chosen collaboratively to be used by the +CityxChange project and its cities, as a targeted realisation of urban living labs. The main ambitions were:

- open governance aiming to provide better services and quality of life for all stake holders of the city
- creating an innovation ecosystem for participatory design and co-creation of processes and services using digital platforms and tools to provide openness and transparency
- facilitate an open community engagement process ensuring impact with leadership as a service tool
- developing a citizen-centered process enabling people to take part in developing visions
- Using a Living Lab and playground approach to enable the citizens to become a part of the solution

The concept was then further developed and refined within the project, as described in this article. Limited literature exists on the specific topic so far.

1.3.2. Innovation Playground

The concept of the Innovation Playground was developed within the +CityxChange project, and no significant literature exists on the topic prior to this. The term is used in a variety of discourses and is not well defined. For example, it can refer to an entire city in innovation management literature or a corporate use of co-working spaces in the innovation literature [15]. Similar terms appear such as 'innovation district' [16], referring to spatially defined areas that support innovation and entrepreneurship. The use of the term 'innovation playground' in the +CityxChange project originates with the ideas of urban living labs and open innovation. Within the +CityxChange project, Innovation Playgrounds are considered important in the implementation of a key aim: to support the planning, deployment and replication of "Positive Energy Districts" for sustainable urbanisation.

In the +CityxChange project, an Innovation Playground is an area of a city where different virtual and physical places and activities related to innovation are brought together into a coherent whole to facilitate collaboration, empower citizens, and find new ways of addressing challenges that matter to people. This definition is supported by the

aforementioned Framework document titled: 'Framework for Innovation Playgrounds' [5], one of six Frameworks which guide implementation of the +CityxChange project, one of six frameworks around citizen and community engagement (all described below). These frameworks were developed in the context of best practice general open innovation approaches [17] as well as regulatory, ICT, and energy system frameworks [18].

1.3.3. Energy Urbanity

Our conceptualisation of the term 'urbanity' for the purposes of this research accepts that there is broad application and there are multiple interpretations across disciplines, cultures and geographies and so it is limited in scope. Wirth (1938) offered a sociological definition of urbanism: "that complex of traits which makes up the mode of life in cities" [19] which we adopt here. However, the degrees of urbanity in the cities studied here is not the focus of this paper, but it can be assumed that certain geographical, social and cultural characteristics (population, etc.) can suggest more or less urban locations. For the purposes of this study, when we talk about energy urbanity we mean a 'way to be' in the city which foregrounds positive energy such that it relies on communal generation, production, and sharing, thus benefiting citizens in economic, social and environmental terms as a result.

1.3.4. Active Citizen Participation

In seeking to define active citizen participation for this research, we note the emphasis placed on citizen involvement in another paper related to the +CityxChange project. Ahlers et al (2019), acknowledging the challenge of the +CityxChange project, state: "Technological innovation is a necessary condition to make a city smart. However, the challenge of smart city innovation is not only on technology, but on service transformation, integration, and improvement" [20]. The paper goes on to recommend strong involvement of citizens and non-governmental associations, and the diffusion of innovative models of cooperation and social relationships.

Within this paper, the potential of the Innovation Playground Framework rests in part on its reorientation of the role(s) of active citizen engagement, in line with the analysis of participation in energy transitions by Chilvers and Longhurst [21]. They suggest a productive way to move beyond 'pre-given categories' of participation to ones that are "actively co-produced through the construction and mediation of collectives of participation" by understanding participation 'in the making' [21]. This active 'co-production' is key to observations and assertions this paper will make about the potential effectiveness of active citizen participation, which we define through five identifiable characteristics: information-rich, blended, action-led, citizen-focused, and spatial. In this working definition of what we mean by active citizen participation, the focus is on describing, comparing and analysing selected public engagement activities in the two Lighthouse cities at mid-implementation stage, concentrating on two types of activity: Climathons and Participatory Mapping.

1.3.5. +CityxChange

+CityxChange, as an EU Smart Cities and Communities project, has been granted funding from the European Union's Horizon 2020 research and innovation programme, and aims to develop feasible and realistic demonstration projects in each city related to the positive energy city. The +CityxChange non-technical project Glossary (related to 'Positive Energy City') explains that a positive energy balance within an area is possible where the annual energy production is greater than the energy consumed within the same area [22]. The +CityxChange Project has been running since November 2018 and finishes in October 2023, so this paper captures the mid-implementation stage, in June 2021. +CityxChange seeks the co-creation of Distributed Positive Energy Blocks (DPEBs) in the two Lighthouse Cities, of Limerick – Ireland's first Smart Cities and Communities Lighthouse City – and Trondheim, Norway. Five Follower Cities, who are to follow the experience of the Lighthouse Cities and replicate results, are Alba Iulia in Romania; Písek

in the Czech Republic; Võru in Estonia; Smolyan in Bulgaria, and Sestao in Spain (See Figure 1).

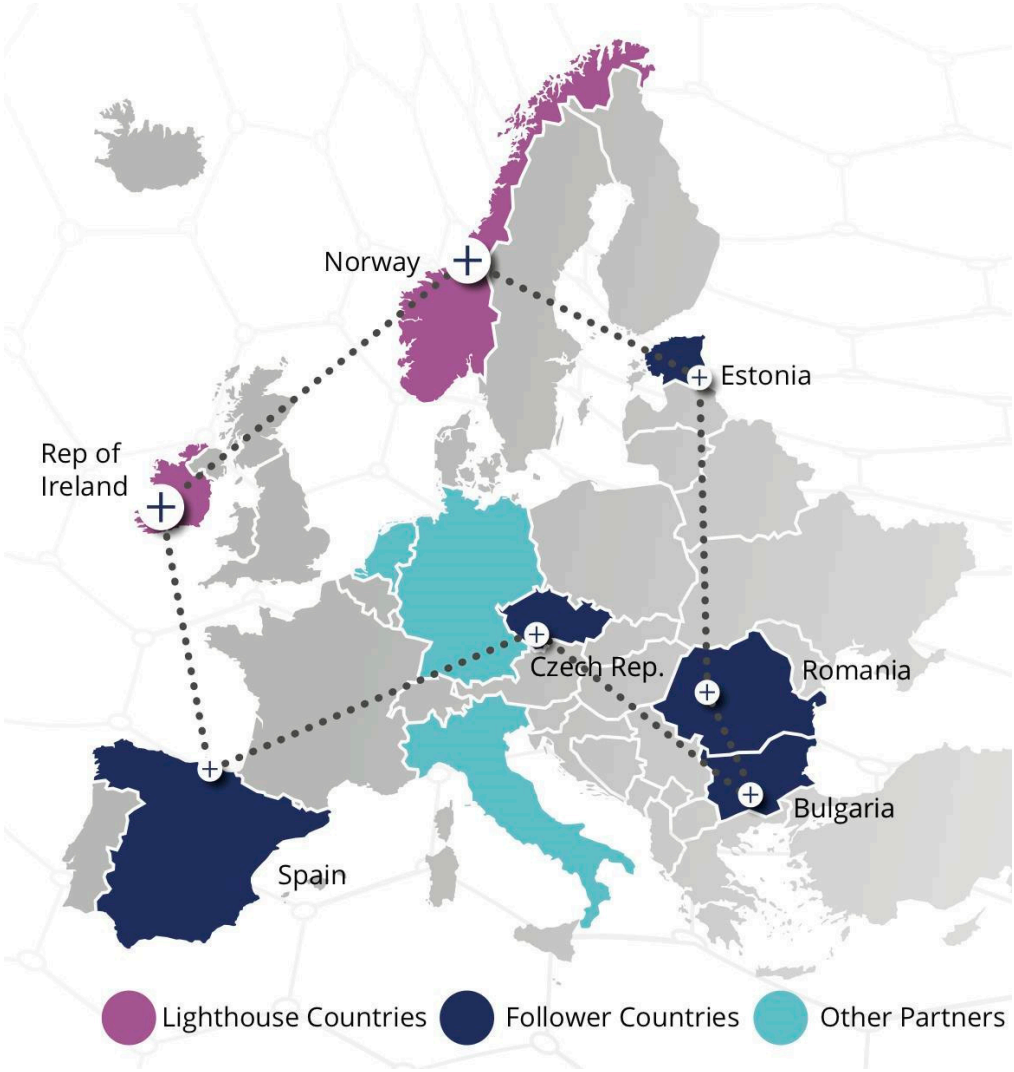

Figure 1. All +CityxChange project Cities Map (Source: [23]).

In line with the project 'vision' (See Figure 2), the eleven +CityxChange Demonstration Projects, developed in the Lighthouse Cities of Limerick and Trondheim, and replicated in the five Follower Cities, fall into three categories: enabling a common energy market, creating connected communities, and recommendations for new interventions, regulations and models. The second of these, creating connected communities, is of particular interest in relation to active citizen participation. CommunityxChange is the title for a +CityxChange work package comprising a group of six connected Framework documents which seek to set the context for participatory design and co-creation that will enable citizens, communities, organisations and others in the Innovation Playground of a city to develop the sense of involvement and ownership as a step towards living and doing business in a positive energy city. The Framework for Innovation Playgrounds is the focus of this paper, and is related to three selected CommunityxChange implementation Tasks.

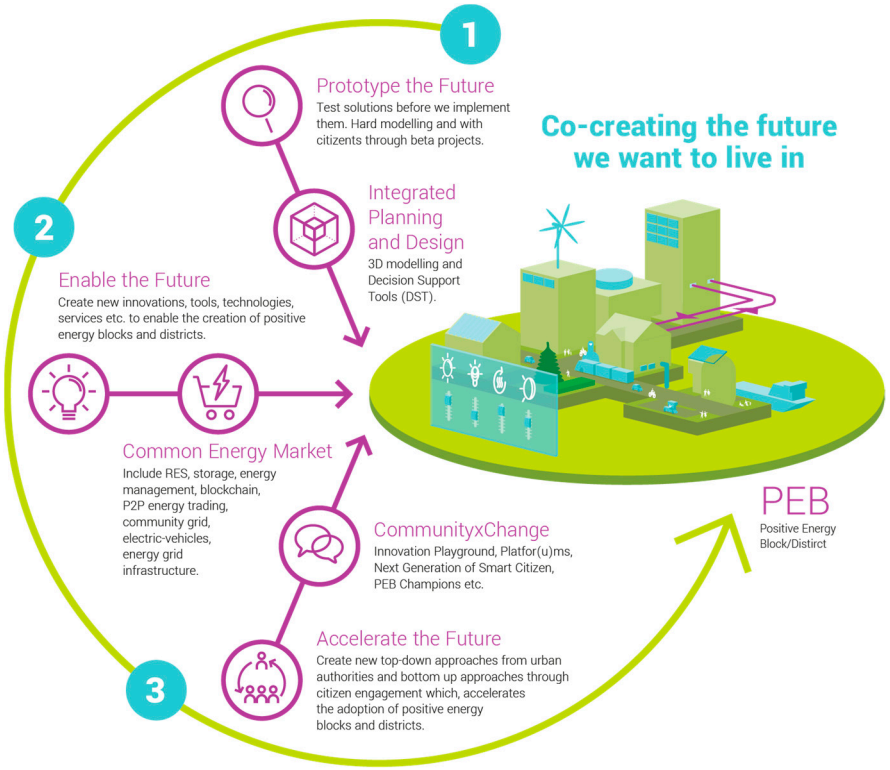

Figure 2. The +CityxChange project vision infographic (Source: [23]).

Five other integrated +CityxChange Framework documents set out roadmaps for distinct parts of the overall aim of a transition towards the European positive energy city, each of which is concerned with citizen's involvement as a core element, and each is connected to active citizen participation. The Bold City Vision (BCV) Framework incorporates the process of co-creating (citizens and cities) a city vision and goals [24]; The Citizen Participation Playbook is a catalogue of practices to empower citizens and communities [25]; The Framework for DPEB Learning and Education is an infrastructure for intergenerational learning initiatives [26]; The Framework for a Positive Energy Champion Network is a campaign to initiate a network of people associated with the clean energy transition [27], and The Framework for DPEB Innovation Labs [28] is a framework for the implementation of dedicated centres for digital innovation, located within the +CityxChange Innovation Playground. Limerick is developing a digital location associated with the DPEB Innovation Lab called citizeninnovationlab.ie. Data and visualisation tools are available to stakeholders using the DPEB Innovation Lab—citizens, business, academia and government agencies—to support activity, competition and innovation to progress the creation of DPEBs (Distributed Positive Energy Blocks). All of the Framework documents propose active citizen participation, all are in the early stages of implementation at the time of writing, and all of the Framework documents are available for download at the +CityxChange digital Knowledge Base [23].

1.3.6. Framework for Innovation Playgrounds

One Framework document in particular is concentrated on in this paper: The Framework for Innovation Playgrounds, and its relationship to active citizen participation and implementation of positive energy transition in cities is the focus. The document, like the +CityxChange in general, was a major collaborative output, and was authored by members of Space Engagers, (including co-authors of this paper) with contributions by NTNU and Officinae Verdi. The implementation of the D3.3 framework in Lighthouse cities is led by the cities (Limerick City and County Council, Trondheim Kommune), and other relevant work package and task leaders, partners and deliverable contributors are:

University of Limerick, Colaborativa, and ISOCARP. The document describes the spatial and socio-economic framework for developing an 'Innovation Playground'. This is a novel concept in urban energy transition terms, and is spatially focused in one part of a city.

For this paper, three key structuring parts of this Framework ('System', 'Journey', and 'localisation') will be reviewed mid-implementation for two cities.

A 'System', made up of four constituent parts, was proposed as the 'backbone' of the Framework: 'places', 'data', 'activities' and 'enabling mechanisms'. As described within the report, 'Places' refers to the physical or virtual locations where new ideas related to the energy transition emerge and evolve, and prototypes are made and tested. 'Activities' refers to events, meetings, mapping, co-creation workshops, etc. that are connected to the energy transition (in the case of +CityxChange) and are related to energy and innovation in the city. 'Data' refers to existing or new data relevant to the energy transition that provides an evidence base for the generation, monitoring and evaluation of innovations. 'Enabling Mechanisms' refers to mechanisms that enable stakeholders to put in place different aspects of an Innovation Playground (D3.3) [5]. The relationship between these four parts of the System is indicated in Figure 3.

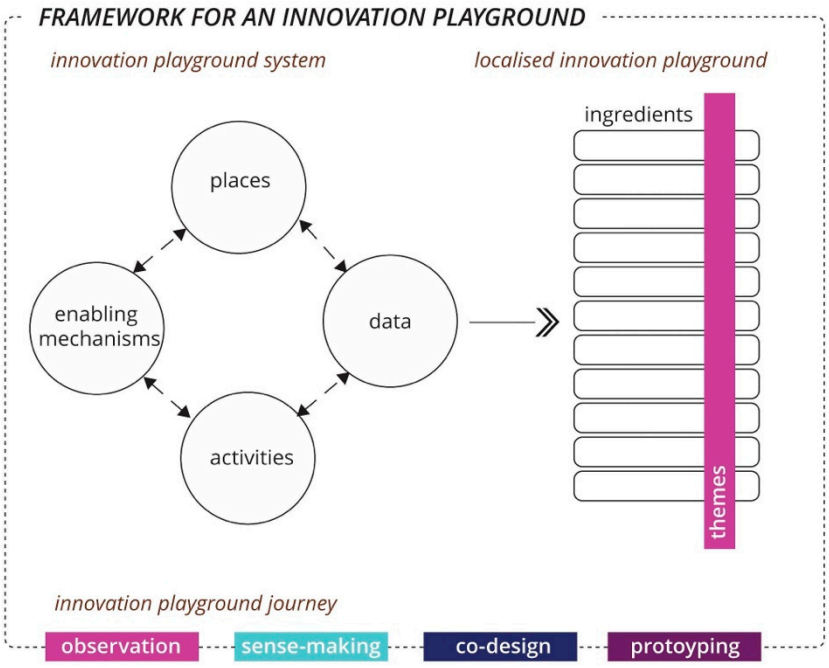

Figure 3. Innovation Playground Framework definition image (Source: [5]).

A coherent 'Journey' over time in four stages, (observation, sense-making, co-design, prototyping) spanning from the identification of what needs to change to the implementation of innovative solutions for energy transition. According to the Framework, the four Innovation Playground 'Journey' stages span from the identification of what needs to change to the implementation of innovative solutions for energy transition. 'Observation' involves activities that gather data and knowledge at the hyperlocal level to understand the lived experience of citizens in the past, present and possible future of a place. 'Sense-making', involves interpretation, analysis and synthesis of available information, that can help make sense of the bigger picture. 'Co-design' or 'Co-creation' involves a creative approach to problem-solving where experts and non-experts come together to solve shared problems, and 'Prototyping', the final stage, involves innovative solutions being tested in the Innovation Playground as beta projects. An activity such as mapping is an example of the 'Observation' stage, while Climathon is an example of the 'Co-design' stage.

A 'localised' Innovation Playground is seen as a result of the interplay of the inter-related places, activities, data and enabling mechanisms of the Innovation Playground

System. It was suggested in the Report that 'Ingredients' of a localised Innovation Playground could focus on different themes. Together, the parts of the System were intended to generate the 'Ingredients' of a localised Innovation Playground in a city. In summary, active citizens operate within a System, using the Journey structure to innovate together in order to seek new ways of doing things related to the energy transition in a Localised Innovation Playground and beyond (See Figure 4).

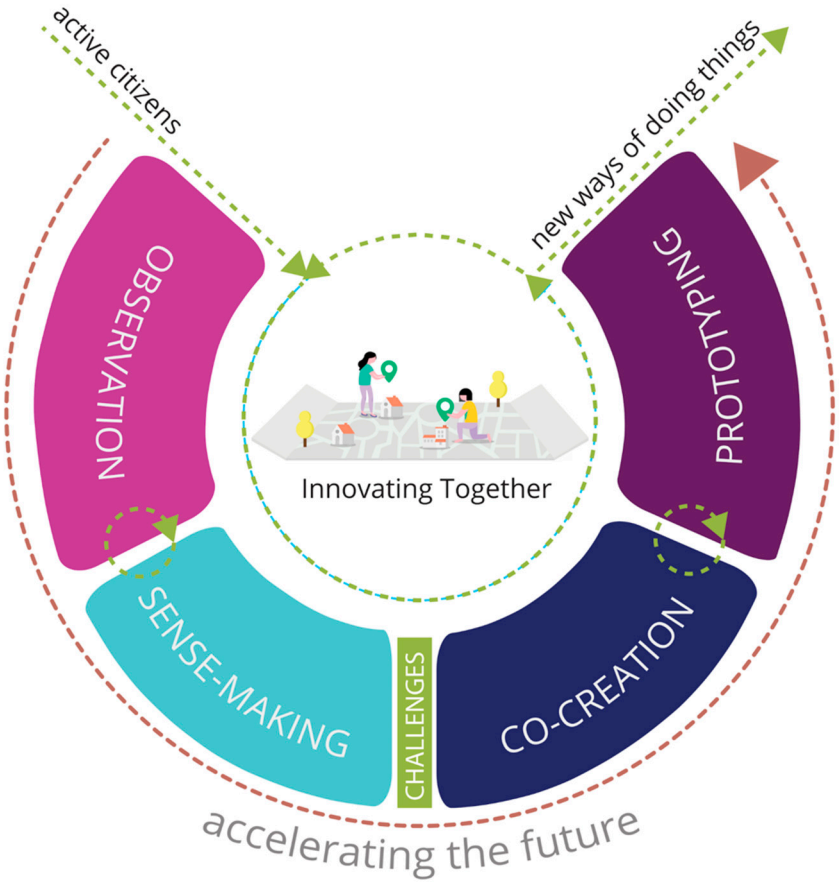

Figure 4. Innovation Playground 'Journey' (Source: [5]).

The two Lighthouse cities which are the focus in this paper, Limerick and Trondheim, have most advanced the use of the +CityxChange Frameworks, so there is emerging evidence of impact, change and new levels of active citizen participation in energy transition, in and around Innovation Playgrounds. The link between Innovation Playgrounds as spatially clustered innovation activities and citizen engagement is that both have potential to generate a virtuous circle of impact, once considered and facilitated together. While a future study could examine implementation of all six of the CommunityxChange Frameworks, this paper reports on the Framework for Innovation Playgrounds only. Having defined these six working definitions and understandings of what we mean by key terms and set out the background to the +CityxChange project in more detail, we can now define the objectives of this scientific research: to review an EU Smart Cities and Communities project mid-implementation, and to demonstrate that spatially clustered energy innovation initiatives in urban areas involving active citizen participation contribute to a new 'energy urbanity' for the energy transition.

2. Methods

In this section, we outline our research purpose, approach, method, and structure of reporting. The purpose of this research is to demonstrate that spatially clustered energy innovation initiatives in urban areas involving active citizen participation contribute to a

new 'energy urbanity' for the energy transition. This research adopts an exploratory and descriptive multiple case study (qualitative) method, in that it explores those situations in which the intervention being evaluated has no clear, single set of outcomes, and when the case study is used to describe an intervention or phenomenon and the real-life context in which it occurred [29].

Selection of cases is based on the prior experience of the authors working on the +CityxChange project, and close observation of the two case sites, which are pre-selected by the +CityxChange project for Lighthouse status. The selected unit of analysis of the cases is the Innovation Playground area of each city, and the time boundary is from the start of implementation to mid-implementation. The research design also involves a comparative method, in that the two cities are cases of distinct and contrasting conditions for testing a Framework, so reporting includes comparison between cases. Each case serves a specific purpose within the overall scope of the enquiry. While Trondheim has created Innovation Playgrounds for four physical areas in the city (Elgeseter, Sluppen, Brattøra, and Midtbyen), and one digital Innovation Playground (the digital platform Decidim), Limerick has a single Innovation Playground in the historic Georgian Neighbourhood of the city centre, and a prototype for a 'digital Innovation Playground' on the Limerick city website.

Structure of Paper

The mid-implementation progress on the three key aspects of Innovation Playgrounds are reported on using a Table of Implementation, with further description of two embedded cases (including four further Tables), which are citizen engagement 'Activities' (Climathon and Participatory Mapping). The emphasis is on describing, comparing and analysing together the two selected citizen engagement activities. Both are examined in implementation stages in both cities, to form a rich perspective on distinct and contrasting conditions, descriptions of characteristics of each city's Innovation Playgrounds in operation, and learnings from mid-implementation. The understanding of 'who' engaged with the +CityxChange project in implementation is also briefly explored. The structure for reporting is set out in Figure 5 'Structure of this paper', (below).

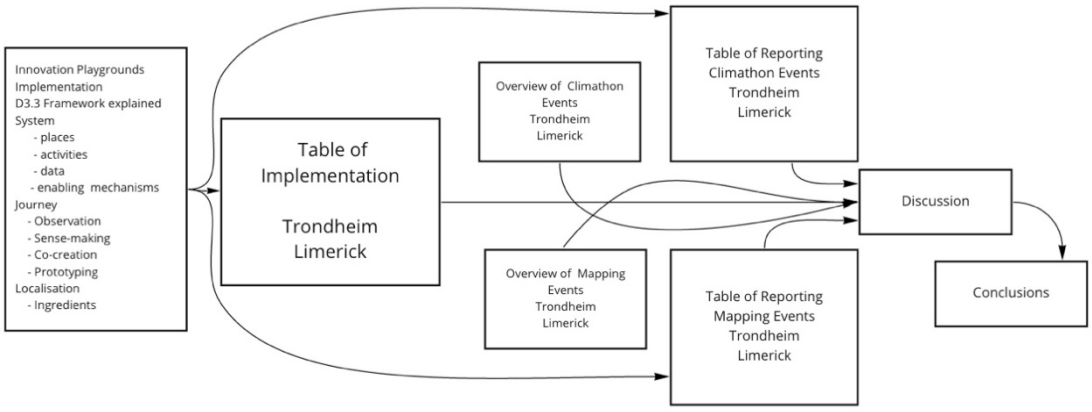

Figure 5. Structure of this paper.

3. Results

This section considers results on the three key 'Framework' aspects of Innovation Playgrounds: system, journey and localisation, in the two cities, and describes two embedded cases (Climathon and Participatory Mapping) in their implementation stages. In outlining the results of this paper and this project, it is important to note that Covid-19 restrictions throughout 2020 and 2021 had a significant impact on the active citizen engagement activity of the +CityxChange project, curtailing many plans for in-person activity. The level of impact across the seven cities of the +CityxChange project was determined by two

major factors: the type and duration of restrictions imposed, and the capacity of the local +CityxChange team to reorient engagement activities to a virtual arena.

The three key structuring parts of the Framework for Innovation Playgrounds and their implementation in the two cities are described in Table 1. (Table of Implementation of Innovation Playgrounds), and aspects further described are implementation features, implementation examples, and comments on localisation in both case cities. Figure 6 (above) indicates the spatial boundaries of the two Innovation Playground 'places' in both cities, at comparable scale. Two key activities (Climathons and Mapping) reported on below give a more detailed impression of local conditions in the two Lighthouse cities at mid-implementation stage.

Table 1. Table of Implementation of Innovation Playgrounds.

Framework	Trondheim Innovasjons-sandkasse	Limerick Innovation Playground
System: Places	**Physical** (Innovation Playgrounds) "Knowledge Axis": Elgeseter/ Campus NTNU Gløshaugen, Sluppen, Brattøra, Midtbyen) **Digital** (Innovation Playground) Trondheim Digital Innovation Playground	**Physical** Innovation Playground FabLab, Innovation Lab and Citizens Observatory (co-located) Engine Innovate building Limerick River (Turbine location) **Digital** (Innovation Playground) Limerick Digital Innovation Playground
System: Activities	Energy and sustainability workshops (with secondary students) Mobility scavenger hunt (with residents) Walk and map events (with residents) Energy flexibility market webinar (for business/industry) Open call for climate/energy proposals (for residents) Climate hackathons - Climathons (with university students) Visioning workshop for local renewable energy (for municipal departments and project partners) 40 +CityxChange project events/activities 19 January–30 September 21 Total participants 2151 persons	City Engage Week Events Owner/occupier meetings Open Call meetings Positive Energy Champions Meetings Public Walking/mapping events Online energy Workshops 35 +CxC events/activities 19 September–21 June Total participants 1613 persons (approx.)
System: Data	Open Source online engagement Citizen ideas Site/project specific graphical maps Open data platform Trondheim SDG data	Building characteristics dat a.csv files of participatory mapping Geolocated, uploaded photos Geolocated, uploaded comments, remarks/locations of participatory mapping
System: Enabling Mechanisms	New SE GISCloud Protocols Protocol for participatory mapping, developed for Trondheim +CityxChange Climathon Playbook Local 'Guidelines for Experimentation' (Trondheim) Local 'Political Guidelines' (Trondheim) Experimental approaches to upgrades (tilskuddsordninger)	New SE GISCloud Protocols Protocol for participatory mapping, developed for Limerick +CityxChange Climathon Playbook Open Call mechanisms Small Business Innovation Research Mentoring mechanisms, business and investment
Journey: Observation	**Physical** Meetings, walks, Climathons, mapping events **Digital** Online Meetings, debates, proposals of website (Digital Innovation Playground)	**Physical** Meetings, walks, Climathons, mapping events **Digital** Mapping as shared observation portal (Laneways, Solar, Open Calls Themes)
Journey: Sense-making	Citizen Jury Digital Voting facility Resource Allocation	Post mapping meetings, online commentary, use for local campaigns
Journey: Co-creation	'Walk and Map' event design with Midtbyen community Climathons co-creation outputs	Positive Energy Champions (PEC) co-create individual 'Journeys' (Limerick) Climathons co-creation outputs

Table 1. *Cont.*

Framework	Trondheim Innovasjons-sandkasse	Limerick Innovation Playground
Journey: Prototyping	Adapting Decidim to local conditions	Open Calls site selection/mapping, making/outputs
Localisation	Adapting GISCloud mapping tool to local Trondheim conditions and public space Use of the term innovasjons-sandkasse or "innovation sandbox", a local adaptation of the Innovation Playground concept and name, incorporating sandboxing	Adapting mapping tool to PEC Mapping projects
Localisation: Themes	Participatory Budgeting Enterprise/business focus in Sluppen, Brattør aSustainable Development Goals (SDGs) Mobility/streets (Pilots)	Laneways Historic buildings Solar potential in Innovation Playground Shared 'ownership' of problems and opportunities
Localisation: Ingredients	Climathons, Renewable Energy Mobility transition 'Openness' for citizens	Open calls, City Engage weeks, Climathons, Positive Energy Champions Campaign Participatory Mapping workshops

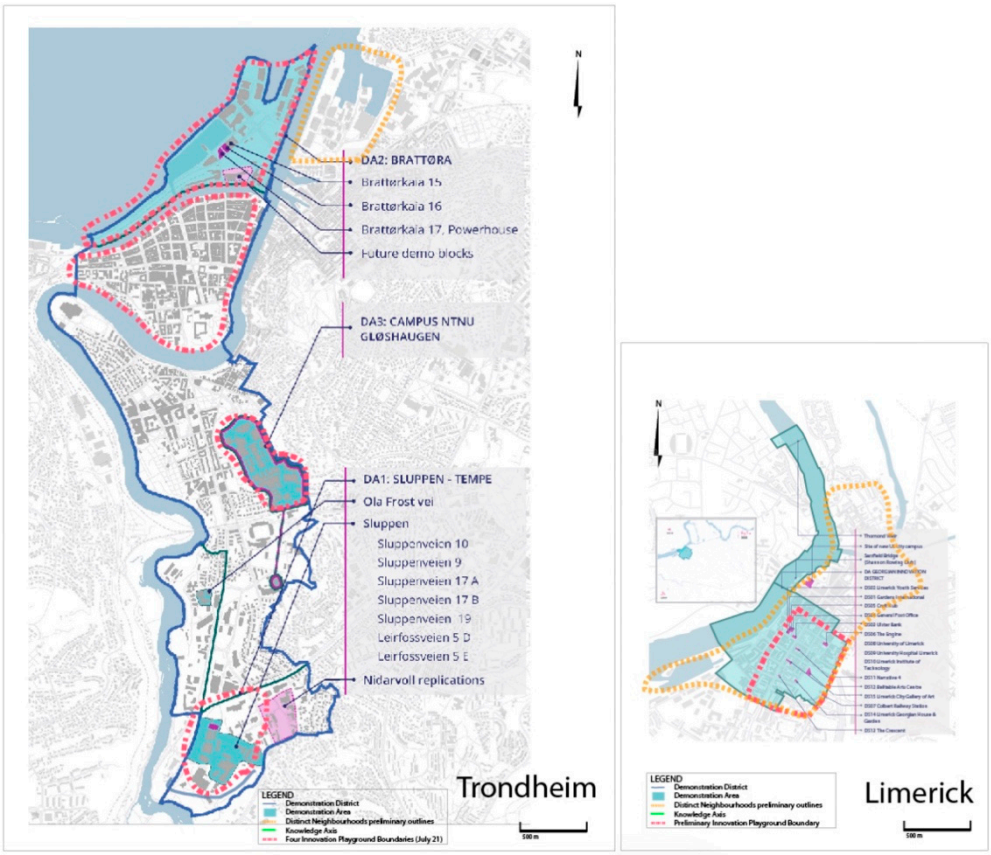

Figure 6. Trondheim and Limerick Innovation Playground Maps (Source: +CityxChange [5]).

3.1. Climathons

As part of the Active Citizen Engagement priorities of the +CityxChange project, 7 Climathon events were held between 2019 and 2021 (See Table 2). This paper looks closely at the four events hosted in Limerick (2) and Trondheim (2).

Table 2. Overview of +CityxChange Climathon Events (2019–2020).

City	Date(s) and Format	Mode	Challenge/Theme Set	Winning/Final Projects
Limerick (2019)	24–25 October 12 h + 6 h	In-person	Energy Transition and Housing	Reusing and Retrofitting Vacant Buildings
Trondheim (2019)	24 October 24 h	In-person	Co-Creating Positive Energy Districts	Crowdfunding PVs and Energy Incentives
Limerick (2020)	12, 19 October and 2, 13 November 2 h × 4	Virtual	Sustainable Cities	School Streets and Citizen Sensors
Trondheim (2020)	13 November 12 h	Virtual	Clean Energy Transition	Using VR for Sustainable City Planning

In relation to the Innovation Playground 'System' concept (See Table 3), as a pre-existing event programme, the aims and structure of Climathon fit well with the remit of +CityxChange active citizen participation. Climathon is an 'ideathon', a way to help people generate and develop their ideas. EIT Climate-KIC, the EU-funded organising body for Climathon, defines Climathon as a city-based programme that "offers a clear pathway to action and interaction - an opportunity for cities and citizens to co-create local ideas to shared climate challenges" [30]. In both Limerick and Trondheim, Climathon structures were adapted in line with +CityxChange Frameworks, to mirror elements of the Innovation Playground 'Journey'. Participants worked through a structured ideation process, with several clear stages including challenge co-creation, sense-making, development, pitching, and judging. Participants were guided through the different stages, with local experts providing insight into Climathon challenges and helping with the refinement of group ideas. A final pitching session gave participant groups an opportunity to share the progress of their ideas with a panel of judges, other teams, and the local public.

Table 3. Table of Reporting Climathon Events (2019–2020).

	Climathons: Trondheim and Limerick
System	Places: Trondheim 2019—NTNU, local university / 2020—virtual space using NTNU network facilities. Limerick 2019, Council-owned building/2020—virtual space incl. Zoom and MURAL for online collaboration. Activities: Climathon connected to other +CxC activities and to networks of activity in the city Data: New observations and ideas generated during the events.
Journey	Enabling mechanisms: "+CxC Climathon Playbook" adapted from Climate-KIC documents in light of +CxC activity Climathon aims to encapsulate, in a confined period, the journey of the Innovation Playground. TD Climathons focus on observation and sense-making due to the cohort of international students.
Localisation	Traditional Climthon format and aims adapted and embedded within +CityxChange: energy themes, project partners as experts/mentors, winning projects supported by project.

In Trondheim, where Climathon activity pre-dates the +CityxChange project, the municipality runs its Climathons in collaboration with the Norwegian University of Science and Technology (NTNU), the local university, a contributor, and the Coordinator of +CityxChange. Climathons are run in English, which combined with the location has resulted in the events being populated by international students, who make up a significant cohort of the NTNU student body. In the 2020 virtual Climathon, international students who had not yet arrived in Norway participated in Trondheim's Climathon, and organisers adapted to this by creating videos introducing local areas and challenges. In Limerick, the Climathons have drawn on other +CityxChange engagement activity to develop networks and build momentum, as well as tapping into pre-existing local community and activist groups to identify participants and challenge topics.

As regards the 'Journey', the second of the three key structuring parts of the Framework, Climathon covers the steps of observation, sense-making, co-design and prototyping within the timeframe of the event (traditionally 24 hours, adapted recently to more fluid timing). Participants are presented with a number of challenges facing their city and are en-

couraged to brainstorm solutions drawing on their local knowledge or 'observation'. Local experts give insights on the developing projects and contribute to sense-making activity. In Trondheim, project groups were steered by representatives from the local university, the municipality, and sustainable energy company TronderEnergi. Depending on participant capacity and local support, some ideas are then prototyped, as for example in Limerick with a local project sharing basic sensors among a small group of neighbours to monitor traffic in their area. This prototyping is currently ongoing and has the potential to expand beyond this neighbourhood in the coming months.

In relation to 'Localisation' within the +CityxChange project, the organising teams in Limerick and Trondheim worked together to adapt the Climathon format and embed the activity of the events within the project. Challenges were designed to echo project goals and the key roles required by Climathon—mentors, subject experts, judges—were played by project partners. Winning projects were offered support to implement their projects, including access to project partners already involved in related areas within the +CityxChange project. At the same time, the need to encourage participation was prioritised by the different city organisers, and this sometimes resulted in thematic challenges which ranged beyond a strictly faithful focus on +CityxChange project goals.

3.2. Participatory Mapping

In terms of active citizen participation, ten participatory mapping events or activities were held focused on the Innovation Playground of Limerick between the end of 2019 and Summer 2021. The first Table below (Table 4) and the second Table below (Table 5) gather together the data on these mapping activities related to the Innovation Playground.

Table 4 shows the extent of the mapping activities in the two cities including dates, mode, participants, challenges and final project outcomes. Table 5 summarises how mapping fits within the Innovation Playground Framework in the two cities, including System, Journey and Localisation features.

As regards the 'System', the first of the three key structuring parts of the Framework, participatory mapping includes 'places' (website; app; locations for mapping); 'activities' (mapping; analysing; visualising and displaying; encouraging discussions); 'data' (maps and datasets on various topics/themes); 'enabling mechanisms' (the data gathering Protocol for Citizens). Individual and group geolocated mapped observations are uploaded in real time onto a shared map that everyone can view to reveal the bigger picture. The mapping data generated by events is displayed on the website of the city, and can become a resource for the planned physical and digital Citizens Observatory and Innovation Lab. Although some 'outlier' locations of mapping are evident, in general the visualisations show a spatial concentration or clustering of 'places' of the Innovation Playground, through indicators of where people have mapped while moving around Limerick. Enabling Mechanisms include Protocol documents such as the 'Protocol for Citizen Mapping', to be used by a new member of the public or group with no previous mapping experience.

Places, Activities, Data and Enabling Mechanisms of participatory mapping in Trondheim, together describing the System of the local Innovation Playgrounds in implementation, give a distinct and contrasting picture of the related concepts being put into practice, (when compared with Limerick) as well as reflecting the broader geographical scope and overlapping themes of Trondheim city authorities. There are four physical Trondheim Innovation Playgrounds, so the number of physical places used for mapping is potentially high, and could lead to multiple spatial clusters of activity being evident. Even before participatory mapping begins in Summer 2021, online mapping information of Trondheim is extensive, as part of the +CityxChange project and other 'Smart Cities Trondheim' activities.

Table 4. Overview of +CityxChange Mapping Events (2019 to mid-2021).

City	Date(s) and Format	Mode	Participants	Challenge/Theme Set	Final Projects/Outcomes
Limerick (City Engage Week One 2019-21)	Event 1 (16 September 2019, 2 h) Event 2 (17 September 2019, 90 min)	In-person	35 attendees 8 attendees	Community Mapping Laneways Community Review—Sharing Laneways	Physical and digital mapping generated Discussion of sharing resources using and generating maps
Limerick (City Engage Week Two 2020)	Event 1 (14 September 2020, 90 min) Event 2 (15 September 2020, 60 min)	Online	21 attendees 20 attendees	Mapping Solar Potential Community Auditing Renewables	Meeting combining digital twin and community mapping Review of auditing and mapping renewables
Limerick (City Engage Week Three 2021)	Event 1 (29 April 2021)	Online	24 attendees	Empowering Communities	Community mapping projects progressed
Limerick Positive Energy Champions public mapping	Five Activities July–August 2021	In-person and Online	5 Projects, ongoing	Mapping Safe Routes to School	School Routes mapped
Trondheim (2021)	Community Walk and Map Summer 2021	In-person and Online	upcoming	Energy related interventions	Elgeseter Festival Map App testing

Table 5. Table of Reporting Mapping Events (2019 to mid-2021).

	Mapping Trondheim	Mapping Limerick
System	Places: Virtual space, facilitated by a mapping tool supplied by GIS Cloud and adapted for the +CxC project. Activities: Consultation with +CxC partners and affiliates to define event aims, location, target participants. Data: To be generated by citizen mapping projects Enabling mechanisms: Customisation of mapping tool "skin" to locate the project and familiarize users with key parameters	Places: Virtual space, facilitated by a mapping tool supplied by GIS Cloud and adapted for the +CxC project. Individual mapping projects will define sections of the city for particular focus. Activities: Mapping (various tools deployed: ESRI, GIS Cloud, etc) Data: Being generated by citizen mapping project, to be displayed via Citizen Observatory and Innovation Lab Enabling mechanisms: Protocols for citizen takeover of mapping tool, for public users sharing data.
Journey	Observation: Structuring of mapping tool to provide useful field of engagement Sense-making: n/ aCo-creation: n/ aPrototyping: n/a	Observation: Public mapping participants identifying key sites /opportunities/obstacles to share, related to Lanes, solar potential, etc Sense-making: Analysis of received data: geolocated photos and comments about public space and buildings int he Innovation Playground Co-creation: Mapped observations developing clusters of information to be used in citizen projects Prototyping: n/a
Localisation	Related to Trondheim Themes Sustainable Development Goals (SDGs) Mobility/streets (Pilots) Mapping tool adapted to a general audience (rather than energy specific theme)	Related to Limerick Themes Building a Renewable Energy Community Mobility and safe streets Laneways—the sustainable city PV panels in the Innovation Playground area

As regards the 'Journey', the second of the three key aspects of the Framework, Observations about general characteristics of the built environment, and broadly connected

Limerick Themes such as public realm condition (laneways), building fabric (solar potential) and traffic (bicycle school routes for children, see Figure 7) dominated. Intentions for Observation, Sense-making, Co-design, and Prototyping around mapping in Trondheim (at planning stage), have focused both on broad observations of the built environment as well as potential opportunities for energy sustainability in the city.

Figure 7. Limerick Innovation Playground Sample citizen mapping project "Safe Routes to School in Limerick," (Source: [31]).

In relation to 'Localisation', Limerick citizens quickly demonstrated that mapping needed to be exploratory and general in this first instance, and related closely to local Themes, in order that groups could use map results in order to have public discussions not happening elsewhere in the city. So, for example, a public meeting for mapping solar potential of the Innovation Playground generated a small number of mapped locations, but a lot of discussion about the concepts of sharing properties for mutual gain, and clusters of solar generating potential above publicly owned buildings in the Innovation Playground. Reflecting on these events for this paper, they do demonstrate a type of energy urbanity, in that new 'ways to be' in the city, (discussing energy provision related to an actual urban environment), cause a type of shared public conversation to emerge, which is spatial in its focus. 'Ingredients', as regards mapping Trondheim, would also seem to be generated so far at a very general level, partly because local businesses are in the foreground of some public initiatives, related to awareness raising about energy related interventions in the city.

4. Discussion

This paper asks, as its central question, whether energy innovation initiatives in 'Innovation Playgrounds' can foster a new 'energy urbanity' through active citizen participation in the energy transition. This section considers this core question by analysing some of the active citizen engagement activities of the +CityxChange project. We suggest that an Innovation Playground Framework prompts the emergence of a new type of active citizen participation with five identifiable characteristics: information-rich, blended, action-led, citizen-focused, and spatial. We contend that this Framework-led engagement offers new avenues of approach for those seeking to foster citizen participation in the energy transition.

The engagement activities analysed in this paper do not represent the totality of active citizen participation in energy transition in the +CityxChange cities, with five other Frameworks of CommunityxChange also implementing at this time. However, we propose that they represent a rich and diverse set of activity examples and could be expanded in later studies post-implementation to give a fuller picture of impact and effect on the emergence of the positive energy city, and therefore its new (but fragile and contingent) Energy Urbanity.

4.1. Information-Rich

We found that information-rich engagement activity gave participants a sense of empowerment, and contributed to demystifying the processes of the energy transition. Climathons are information-rich activities which work with public groups of varying levels of awareness – from international students who had yet to visit the city (Trondheim 2020) to highly engaged activist citizens already embedded within other +CityxChange activity (Limerick 2020). The format, in providing a primer on a local issue or 'challenge' and giving access to experts and mentors, provides participants with an in-depth overview before facilitating their own research on potential solutions. The participants then bring their own knowledge of the issue and the locality, in turn informing the experts and representatives of conditions on the ground. In Trondheim, where the 'challenges' of their Climathon events were more tightly focused on the work of the +CityxChange project, the events were information-rich in that technical definitions of units of the Positive Energy City (eg. PEDs) needed to be understood by participants in advance of engagement regarding solutions.

Participatory mapping events, primarily in Limerick, also included 'information-rich' engagement, whereby many technical concepts and ideas were communicated at different levels of specificity, according to the event planned and profile of citizens targeted. Therefore, for example in the first mapping event (Mapping Laneways), although some introductory information was provided in advance for participants about the phone-based mapping map and portal, many people walking the Laneways and simultaneously geolocating photos and observations commented on the glitches of mapping together, whether related to different time taken to upload images, apparent lack of access per phone, or failure to 'see' mapped data immediately. Engaging with fellow participants became a necessity, and was part of the learning of the workshop. The need to be simultaneously generating information, sharing observations with fellow walkers and following guidance of workshop leaders 'in the field' left some workshop participants feeling confused, but others enjoyed the challenge to work and learn together with energy transition as a focus.

4.2. Blended

Engagement activity which blended in-person and virtual approaches was a necessity under Covid restrictions, but it offered new opportunities for different forms of engagement. In 2020, Limerick and Trondheim worked together to design 'blended' Covid-era Climathons dependent on their city's restrictions and on the capabilities of their citizenry to engage with virtual events. In Limerick, the stretched timetable of the virtual Climathon process required participants to commit to regular sessions across a 5-week period. This timetable worked well, but this was because the participant groups were already made up of those capable of thriving in online collaborative activity. Virtual activity removed

the difficulties posed by in-person participation faced by some in earlier activities, where physical attendance over long periods of time brought many constraints.

Within our mapping activity, the 'blended' nature of data generation, whereby, for example, stories about places were being told in a Lane, (analogue data generation) and geolocated photos by the people telling the story, were being uploaded onto a shared map (digital) had already brought challenges for overall understanding of event outputs before February 2020. Totally online engagement brought new challenges and opportunities in participatory mapping events. Although blended elements moved the dynamic of 'mapping together' from a physical meeting to a more mobile and digital interface, the usefulness of considering energy and urbanity together in a blended way included the opportunity to (digitally) 'map from anywhere', as well as visiting real urban sites when it suited a participant or group in their own time.

4.3. Action-Led

An action-led approach to engagement, we have found, matched the sense of urgency felt by citizens driven to participate in finding solutions in the energy transition. Our adaptation of the Climathon formula, with the specificity of the challenge set, and its connection to the wider aims of the +CityxChange project, meant that Climathons were 'action-led' events, with a focus on a live problem currently affecting the city and structures in place to support public interventions. Similarly in Trondheim, participants were asked to develop citizen-focused ideas that addressed the public engagement gap in the energy transition, and winning projects were offered mentorship opportunities to embed their ideas.

In our mapping activity, the fact that the data collection in mapping events is 'action-led' brought new levels of engagement for some participants; instead of passive listening as others mapped, each participant was expected to generate their own 'personal' geolocated story related to the mapping theme. So, for example, when potential solar generation locations were being mapped for the Limerick Innovation Playground, (Mapping Solar Potential event) each participant had to 'locate themselves' and their chosen building in relation to the rest of the city, in order to contribute meaningfully and publicly to the event. At the same time, the fact that these events were digital (on Zoom, etc) meant people were contributing individually from a distance, and often found it difficult to 'self-locate' without assistance.

4.4. Citizen-Focused

Citizen-focused activity is challenging, and both cities struggled at times to connect with local publics. Although, for example, Climathon events were designed to be citizen-focused, the 2020 virtual Climathon in Limerick drew together a narrower type of participants than the 2019 in-person event, with those more likely to be already active citizens involved in the virtual event. Moving beyond a core cohort of already engaged citizens has been a challenge for Limerick across all +CityxChange activity. In Trondheim, while the focus of Climathon activity is on its Innovation Playground areas, some participants and event locations are outside the core city, in the university, and impact beyond that sphere has been limited. At the same time, the citizen-focused nature of Climathon resulted in a more informal and open engagement between city authorities and citizens. These groups collaborated to explore potential solutions to shared challenges, rather than the more usual formal processes of citizen consultation. The final 'pitching' sessions, which acted as cumulative co-design events, brought together those with new ideas (citizens), those with insights (independent experts), and those with the power to test and implement (local authorities).

Citizen-focused mapping changed the dynamic of typical public engagement events, in that active participation was core to achieving event aims, and opportunities were offered for citizens to lead mapping priorities, once these were agreed by a participating group.

4.5. Spatial

Spatial concentration is a core attribute of the Framework for Innovation Playgrounds, which has driven our engagement activity. One focus of a Climathon can be spatial, wherein a particular area of the city is selected for concentrated focus by participants.

In our mapping activity, we aimed to generate participatory mapping in each city so that the communication of observations, ideas and projects would be spatially organised through a map of the city/district, using interactive mapping to engage citizens with their place and local issues. Focusing the participatory mapping on Innovation Playgrounds had the benefit of allowing visualisations of the cluster effects on one place or neighbourhood, so that the public could see in which area of the city energy related initiatives could lead to multiplier effects, or attract other energy related new innovations. However, in implementation, it was clear that people in a city don't necessarily want to map in the geography officially suggested, and in the case of Limerick especially, it was clear that people's perceptions of the Innovation Playground as a spatial focus were not apparent at the start. In Trondheim, where the Knowledge Axis (an important area of innovation and knowledge based businesses, which includes the city campus of NTNU) had been initially indicated as their Innovation Playground, similar questions of spatial focus were apparent. This suggests that the choice of area for a city's Innovation Playground (or similar spatially bounded energy-focused activity) is crucial, and should be delineated carefully in collaboration with local citizens.

Based on evidence about early 'implementation' of energy 'Innovation Playgrounds' in two cities, a new paradigm of 'energy urbanity' for the energy transition can be proposed. In reorienting traditional consultation practices and using a new Framework structure, the active citizen engagement within the project suggested a new kind of energy urbanity, where citizens were recognised as equal partners with local knowledge and inherent expertise. Local authority representatives shared their perspectives on the projects, explaining the possibilities and limitations of their role in the city, demystifying their work and suggesting productive avenues for future action. This confluence of local actors and the space offered by the Innovation Playground Framework structure, although challenging to bring together, offers an emergent example of 'energy urbanity', and a communally developed approach to challenges posed by the energy transition in cities. The participatory mapping initiatives suggested an emergent energy urbanity in the way that energy topics were discussed and mapped 'in the field', physically walking the city, as well as digitally on a geolocating app, so that all citizens could feel included in a new type of conversation about both urbanity and energy simultaneously. One aspect of this new suggested 'way to be' in the city is that it is likely to be blended, and that raises new questions about the 'right to the city', the populations who may feel excluded, and how that is addressed by the city. By focusing on action-led activity which is co-designed and publicly produced, it cannot so easily be directed by top-down initiatives.

5. Conclusions

This paper posed the question: 'can energy innovation initiatives in 'Innovation Playgrounds' foster a new 'energy urbanity' through active citizen participation in the energy transition? The purpose of this research was to demonstrate that spatially clustered energy innovation initiatives in urban areas involving active citizen participation contribute to a new 'energy urbanity' for the energy transition. Adopting an exploratory and descriptive multiple case study approach, two cities were selected and examined for evidence of active citizen participation mid-implementation, while participating in an EUH2020 Innovation Action project which adopts a structured approach to positive energy in the city. 'Innovation Playgrounds', concentrating spatially clustered energy innovation initiatives in urban areas, build a new kind of public engagement around energy topics in cities, and therefore strengthen public moves towards sustainable, resilient built environments and communities.

In summary, the three conclusions of this paper are: firstly, that in early 'implementation' of energy 'Innovation Playgrounds', active citizen participation is enhanced by a Framework approach. The benefit of the Framework approach is demonstrated by reporting on two embedded case examples of activities and events (Climathons and Participatory Mapping) using the structure of the Framework document as a guide. In defining what we mean by active citizen participation, the focus has been on describing, comparing and analysing together selected public engagement activities in the two Lighthouse cities at mid-implementation stage, concentrating on the two types of activity: Climathons (Limerick & Trondheim, others), and Participatory Mapping (Limerick mainly). Secondly, it is concluded that active citizen participation in energy innovation initiatives in urban areas suggests a new type of engagement with five identifiable characteristics: information-rich, blended, action-led, citizen-focused, and spatial. Lastly, a new paradigm of 'energy urbanity' focuses attention on the energy related aspects of urbanity. This research has therefore demonstrated that spatially clustered energy innovation initiatives in urban areas involving active citizen participation contribute to a new 'energy urbanity' for the energy transition.

Author Contributions: Conceptualization, A.M., M.L. and P.C.; methodology, A.M., M.L. and P.C.; validation, A.M., M.L. and P.C.; writing—original draft preparation, A.M. and M.L.; writing—review and editing, A.M., M.L. and P.C.; visualization, A.M. and M.L.; supervision, P.C.; project administration, P.C. All authors have read and agreed to the published version of the manuscript.

Funding: This research was partly funded from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 824260.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: We gratefully acknowledge numerous partners' contribution to this paper, especially those located in Trondheim and Limerick. In particular, we acknowledge the following partners (some of whom have multiple roles): cities (Limerick City and County Council, Trondheim Kommune) relevant work package and task leaders, partners and deliverable contributors, University of Limerick, Norwegian University of Science and Technology (NTNU), Colaborativa, Officinae Verdi, and ISOCARP. This work has been performed within the +CityxChange (Positive City ExChange) project under the Smart Cities and Communities topic that has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 824260. All +CityxChange project figures are used courtesy of the +CityxChange (Positive City ExChange) project, available at the main project website: https://cityxchange.eu/ (accessed 18 September 2021).

Conflicts of Interest: The authors are partly working on the project described in this paper, and have received funding from these projects, and are partners and leaders in implementing parts of the project described.

References

1. Lennon, B.; Dunphy, N.; Sanvicente, E. Community Acceptability and the Energy Transition: A Citizens' Perspective. *Energy Sustain. Soc.* **2019**, *9*, 35. [CrossRef]
2. Bukvic, A.; Harrald, J. Rural Versus Urban Perspective on Coastal Flooding: The Insights from the U.S. Mid-Atlantic Communities. *Clim. Risk Manag.* **2019**, *23*, 7–18. [CrossRef]
3. Beveridge, R.; Ridgway, M.; Kern, K.; Stroia, C.; Fujiwara, N.; Dupas, S.; Sterzel, T. Leading Mid-Sized Eu Cities in Post-Carbon Transitions: Towards a Preliminary Typology. *Sustainability* **2015**, *7*. [CrossRef]
4. EFTA Statistics Office. Available online: https://www.efta.int/Statistics/news/Urban-Iceland-suburban-Switzerland-and-rural-Norway-61466 (accessed on 17 June 2021).
5. Mee, A.; Crowe, P. "D3.3 Framework for Innovation Playgrounds." +CityxChange. 2020. Available online: https://cityxchange.eu/knowledge-base/d3-3-framework-for-innovation-playgrounds/ (accessed on 29 July 2021).
6. Preston, S.; Mazhar, M.; Bull, R. Citizen Engagement for Co-Creating Low Carbon Smart Cities: Practical Lessons from Nottingham City Council in the UK. *Energies* **2020**, *13*, 6615. [CrossRef]
7. Coy, D.; Malekpour, S.; Saeri, A.; Dargaville, R. Rethinking community empowerment in the energy transformation: A critical review of the definitions, drivers and outcomes. *Energy Res. Soc. Sci.* **2021**, *72*, 101871. [CrossRef]

8. Huaping, S.; Bless Kofi, E.; Anthony Kwaku, K.; Samuel Asumadu, S.; Farhad, T.-H. Energy efficiency: The role of technological innovation and knowledge spillover. *Technol. Forecast. Soc. Chang.* **2021**, *167*, 120659.
9. Adam, X.H.; Annika, S.; Paul, B. Innovative but unjust? Analysing the opportunities and justice issues within positive energy districts in Europe. *Energy Res. Soc. Sci.* **2021**, *78*, 102127.
10. Clerici Maestosi, P.; Andreucci, M.B.; Civiero, P. Sustainable Urban Areas for 2030 in a Post-COVID-19 Scenario: Focus on Innovative Research and Funding Frameworks to Boost Transition towards 100 Positive Energy Districts and 100 Climate-Neutral Cities. *Energies* **2021**, *14*, 216. [CrossRef]
11. Baer, D.; Loewen, B.; Cheng, C.; Thomsen, J.; Wyckmans, A.; Temeljotov-Salaj, A.; Ahlers, D. Approaches to Social Innovation in Positive Energy Districts (PEDs)—A Comparison of Norwegian Projects. *Sustainability* **2021**, *13*, 7362. [CrossRef]
12. Erba, S.; Pagliano, L. Combining Sufficiency, Efficiency and Flexibility to Achieve Positive Energy Districts Targets. *Energies* **2021**, *14*, 4697. [CrossRef]
13. Neumann, H.-M.; Hainoun, A.; Stollnberger, R.; Etminan, G.; Schaffler, V. Analysis and Evaluation of the Feasibility of Positive Energy Districts in Selected Urban Typologies in Vienna Using a Bottom-Up District Energy Modelling Approach. *Energies* **2021**, *14*, 4449. [CrossRef]
14. Katz, B.; Wagner, J. The Rise of Innovation Districts: A New Geography of Innovation in America. In *Brookings Institute Report*; The Brookings Institute: Washington, DC, USA, 2014; Available online: https://www.brookings.edu/wp-content/uploads/2016/07/InnovationDistricts1.pdf (accessed on 29 July 2021).
15. Fuzi, A.; Gryszkiewicz, L.; Sikora, D. Using the city as an innovation playground: Getting corporations into the game of urban innovation. In Proceedings of the RSA annual conference, Lugano, Switzerland, 3–6 June, 2018; Available online: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3191472 (accessed on 29 July 2021).
16. Moonen, T.; Gille, B.; Nunley, J. *Hubs of Innovation The Role of Districts, Corridors and Quarters as Hubs of the Covid-Adjusted Innovation Economy*; The Business of Cities, Connected Places Catapult: London, UK, 2021; Available online: https://www.thebusinessofcities.com/publications/the-success-models-for-innovation-locations-worldwide (accessed on 23 September 2021).
17. Curley, M.; Salmelin, B. *Open Innovation 2.0: The New Mode of Digital Innovation for Prosperity and Sustainability*; Springer: Berlin/Heidelberg, Germany, 2017.
18. Cambini, C.; Congiu, R.; Jamasb, T.; Llorca, M.; Soroush, G. Energy systems integration: Implications for public policy. *Energy Policy* **2020**, *143*, 111609. [CrossRef]
19. Wirth, L. Urbanism as a Way of Life. *Am. J. Sociol.* **1938**, *44*, 1. [CrossRef]
20. Ahlers, D.; Driscoll, P.; Wibe, H.; Wyckmans, A. Co-Creation of Positive Energy Blocks. In *Paper Presented at the IOP Conference Series: Earth and Environmental Science*; IOP Publishing: Bristol, UK, 2019.
21. Chilvers, J.; Longhurst, N. Participation in transition (s): Reconceiving public engagements in energy transitions as co-produced, emergent and diverse. *J. Environ. Policy Plan.* **2016**, *18*, 585–607. [CrossRef]
22. +CityxChange, Knowledge Base, Glossary. Available online: https://cityxchange.eu/article-categories/glossary/ (accessed on 5 July 2021).
23. +CityxChange, Knowledge Base. Available online: https://cityxchange.eu/knowledge-base/ (accessed on 5 July 2021).
24. Tanum, Ø.; Mjøen, K.; Berthelsen, B.O.; Reeves, K.; Næss, K.S. Deliverable D3.1 Framework for Bold City Vision, Guidelines, and Incentive Schemes (SDG City Transition Framework). +CityxChange Project Deliverable. 2020. Available online: https://cityxchange.eu/knowledge-base/framework-for-bold-city-vision-guidelines-and-incentive-schemes/ (accessed on 4 October 2021).
25. Burón García, J.; Mora, M.S. Deliverable 3.2 Development of Citizen Participation Playbook and Platform. +CityxChange Project Deliverable. 2020. Available online: https://cityxchange.eu/knowledge-base/delivery-of-the-citizen-participation-playbook/ (accessed on 4 October 2021).
26. Avram, G. Deliverable 3.4 Framework for DPEB Learning and Education +CityxChange Project Deliverable. 2020. Available online: https://cityxchange.eu/knowledge-base/d3-4-framework-for-dpeb-learning-and-education/ (accessed on 4 October 2021).
27. Fitzgerald, H.; Mee, A. Deliverable 3.5 Framework for a Positive Energy Champion Network, +CityxChange Project Deliverable. 2020. Available online: https://cityxchange.eu/knowledge-base/d3-5-framework-for-a-positive-energy-champion-network/ (accessed on 4 October 2021).
28. Fitzgerald, H.; Burón García, J.; Mora, M.S. Deliverable 3.6 Framework for DPEB Innovation Labs +CityxChange Project Deliverable. 2020. Available online: https://cityxchange.eu/knowledge-base/d3-6-framework-for-dpeb-innovation-labs/ (accessed on 4 October 2021).
29. Yin, R.K. *Case Study Research: Design and Methods*, 3rd ed.; Sage Publications: Thousand Oaks, CA, USA, 2003; Volume 5.
30. Climate-KIC. Available online: https://climathon.climate-kic.org/en/about-us/ (accessed on 23 July 2021).
31. Limerick Community Mapping. Available online: https://pluscities.giscloud.com/ (accessed on 23 July 2021).