Urban Planning and Innovation: The Strength Role of the Urban Transformation Demand. The Case of Kendall Square in Cambridge

Carmelina Bevilacqua and Pasquale Pizzimenti(✉)

Mediterranea University of Reggio Calabria, 89124 Reggio Calabria, Italy
pasquale.pizzimenti@unirc.it

Abstract. The paper discusses two interrelate aspects that have been emerging in the current phase of Smart Specialisation Strategies (S3) implementation, that is the concept of dynamic location advantages (cluster) and the change in social demand for urban transformation (urbanization). Both concepts contribute to redefine the role of the city in the innovation policy, athwart renovating the tools of urban policy and planning, underlined also by the Urban Agenda 2030. However, it is also widely recognized from combining Schumpeter (1934) and Jacobs (1969) that the concept of dynamic location advantages finds at city level the conditions to launch real change in regenerating local economic areas and valorize local assets. From these considerations, it follows that it is crucial to investigate how cluster-oriented policies and urban policy and planning are related in transforming cities. The aim of the paper is to figure out how the connection of urban policy with place-based innovation approach allows at reaching the knowledge convergence to activate informational spill-overs through zoning and urban planning tools. The paper examines the case of the Kendall Square area in Cambridge (MAPS-LED project -Horizon2020), which is analyzed through the lens of urban planning and zoning adopted for the area. The development of the Kendall Square area is characterized by a mixed-use approach, and innovation spaces are included as a zoning requirement for the foreseen development of the area. Conclusions highlight how urban planning and zoning are pushing factors in supporting the innovation-oriented demand of socio-economic and physical transformation.

Keywords: Urban planning and innovation · Zoning and social demand S3 and urbanization

1 Introduction

By 2050 the majority of the population, economic activities as well social and cultural interactions will concentrate in cities [1]. The challenges generated by rapid urbanization processes request an urban paradigm shift to reach a sustainable and inclusive development in the mid and long-term. The UN Agenda for Sustainable development 2030 [2] recognized "that sustainable urban development and management are crucial" for people's quality of life and "local authorities and communities should "renew and plan" cities fostering community cohesion, personal security and stimulate innovation

F. Calabrò et al. (Eds.): ISHT 2018, SIST 100, pp. 272–281, 2019.
https://doi.org/10.1007/978-3-319-92099-3_32

and employment". Particularly, the Goal No. 11 on sustainable cities and communities, represented the basis for the development of the UN Urban Agenda [1]. It represents a paradigm shift for cities underlying a new "recognition of the correlation between good urbanization and development" [1]. The implementation focuses on five main pillars: national urban policies, urban legislation and regulations, urban planning and design, local economy and municipal finance, and local implementation [1]. Therefore, urbanization represents an opportunity from which take advantage in the perspective of sustainable and inclusive growth [1]. If we take into account European – or widely western countries' – cities, the urbanization concept is often associated with urban areas' physical transformation and more precisely with the urban regeneration concept. Thanks to its comprehensive and integrated approach [3], urban regeneration has the potential to tackle the current urban challenges underlined by the UN New Urban Agenda. In Europe, the debate on sustainable urban development and urban regeneration as key elements in defining an EU urban policy [3], developed around the need to reach a smart, inclusive and sustainable growth (EU 2020 Strategy) consolidating an EU Urban Agenda for European cities and urban areas [3]. In 2016, with the Pact of Amsterdam [4], EU Member States has adopted the European Urban Agenda in order to disclose the potential of European cities and urban areas through a better Regulation, Funding, and Knowledge, in accordance with the Europe 2020 strategy and the Smart Specialisation Strategy. Particularly: "The EU and its Member States will seek to boost the potential of cities as hubs for sustainable and inclusive growth and innovation… In line with the UN's New Urban Agenda, they will promote sustainable land use planning, equitable management of land markets, sustainable urban mobility and smart, safe cities that make use of opportunities from digitalisation and technologies" [5]. The paper aims at figuring out how the connection of urban transformation with place-based innovation approach allows at reaching the knowledge convergence to activate informational spill-overs. The next section highlights the relevance of cities as the catalyst for innovation in the globalized economy triggered by creative, innovation and entrepreneurial activities. The central section examines the case of Kendall Square through the lens of zoning and urban planning tools adopted for the area. The choice of this case derives from the research activities conducted within the MAPS-LED Research Project (Horizon2020). The case analysis revealed how Kendall Square area presents a concentration of a high number of companies, start-ups - the highest density of start-up in the country [6] - incubators, research laboratories and facilities, and the presence of anchor institutions. Conclusions highlight how urban planning and zoning are pushing factors in supporting the innovation-oriented demand of socio-economic and physical transformation towards knowledge concentration. The risk of knowledge fragmentation or dispersion, which characterizes European cities, needs a policy action in order to favor Knowledge concentration and trigger a smart, inclusive and sustainable development.

2 Cities as Catalysts for Innovation: Towards Knowledge Concentration

Cities are increasingly becoming strategic hubs in the globalized economy triggered by creative, innovation and entrepreneurial activities [7]. As a result, cities and urban areas are becoming the dominant engines of economic growth in the current knowledge-driven innovation economy [8]. In EU, the need of an integrated and multilevel approach in urban policy stemmed from Lisbon strategy [9] and created the condition to reinforce the link between urban policy and regional innovation system through the Smart Specialisation Strategies (S3) approach. Particularly, the interaction among innovation, clusters, knowledge dynamics, and spaces provide interesting insights on the functional connection between urban policy and S3 through the concept of innovation-driven urban policy [10]. Clusters constitute "the breeding ground for innovation" [11] and cities can be considered as nodes of an international complex network [12], the center of economic activity, and the focal point of innovation [13]. The cluster provides a conceptual framework to describe and analyze important aspects of modern economies [14]. Its role does not lie in defining a specific area, but in characterizing the specific geographic area in terms of innovation, specialization, and capacity to activate competitive and comparative advantages [15]. In these areas, the social demand for innovation has become a source of urban form and its transformation. Hence, in order to better understand the connection of urban policy with place-based innovation approach it is relevant to take into account that a particular connection occurs between (cluster) policies in terms of factors related to the clusters' governance systems [10] and (spatial/urban) planning in terms of factors suitable to be mapped in physical terms (proximity and accessibility, spatial patterns etc.). In combining the contribution of Schumpeter on innovation [16] and those of Jacobs [17], also recalled recently by Florida et al. [8], it is arguable that this connection (cluster policies and spatial planning) starts at city level, where this it finds the "good atmosphere to nourish and feed knowledge dynamics and innovation in regenerating local economic areas and valorizing local assets". From these considerations, it follows that it is crucial to investigate how cluster-oriented policies and urban policy and planning are related in transforming cities.

3 Innovation and Zoning: A Focus on Kendall Square in Cambridge

Starting from the spatial configuration of clusters (based on Porter's definition) at city level developed for the MAPS-LED Project [18], we moved to the interpretation of the role played by those spaces (innovation spaces) expression of knowledge dynamics' source. The Greater Boston Area, as well many other urban regions in the US, present many interesting cases about the concentration of innovation and knowledge in the urban environment as a trigger for economic development. The cluster spatialization methodology developed for the MAPS-LED Project [18] and analysis of cluster-oriented initiatives as well the urban regeneration ones, revealed how the city of Cambridge

(US) offers interesting hints in providing (urban) innovation-oriented policy examples for boosting concentration of innovation, entrepreneurship, and creativity in reaching the knowledge convergence to activate informational spill-overs. Accordingly, the City of Cambridge performs two strongest Clusters: Education and Knowledge Creation and Business Services. The urban configuration proposed is a combination of the economic aggregation of Cluster with the City land use categories [18]. The city of Cambridge (MA) offers interesting insights on the process of knowledge convergence through the concentration of creativity, innovation and entrepreneurship [10]. The reason of their strength is mostly due to the presence of Research Institutions (Harvard, MIT) and a high number of related activities, remarking a high-density level of relationships among public, private sectors, cluster organizations, innovation stakeholders (such as start-ups, small-medium enterprises) and community [18]. During the last three decades, Kendall Square experienced a shift from a former industrial district to one of the world's leading centers for biotech research and innovation [19]. The development of the area started during the 1960s with the Kendall Square Urban Renewal Plan, which main aim was to locate the NASA's Electronic Research Centre [19]. During the 1970s, the willing of NASA to locate its facilities in other cities pushed the Cambridge Redevelopment Authority [20], owner of 70% of the land, to transfer the project for the construction of the Department of Transportation. This change signed the shift from a post-world war renewal phase to a significant physical transformation [20] of the area, which started being recognized as an opportunity for economic development through the exploitation of locational advantages [20]. During the last two decades, Kendal Square evolved into a livable mixed-use district thanks also to the attention of the City and of the Department of Community Development, which focused on crucial aspects such as housing affordability, open spaces and transportation accessibility.

3.1 The Vision for Kendall Square: The K2C2 Planning Study and Zoning Insights

The increased interest in the development of the Kendall Square pushed the City of Cambridge to coordinate a planning study for the area [19]. The vision of the study aims to inspire the Cambridge's sustainable and globally significant innovation community [21]. The K2C2 planning study focuses on four main pillars: Nurture Kendall's innovation culture; Create Great Places; Promote Environmental Sustainability; Mix Living, Working and Playing (see Table 1). The vision presents the characteristics of an urban regeneration scheme (social, economic and physical dimension) tailored on the local context characterized by an "innovation culture", which need to be nourished. In order to realize this vision zoning recommendation are needed. The vision aims to maintain the existing characteristics of a world center for biotech, entrepreneurship, high tech, and the knowledge economy, paying attention to livability aspects, housing and retail [19]. The approach is characterized by the willingness to increase density encouraging the development of housing, incubators spaces, open spaces and other amenities [19]. In order to achieve the goal of "Nurture Kendall's innovation culture" the strategy includes two actions: (a) Recognize that all aspects of the vision for Kendall Square need to work together if the innovation culture is to realize its full potential; (b) Retain and expand incubator spaces for entrepreneurs. The first

recognizes the need to increase the livability of the area - identified in the past as office district - with a low presence of small and medium businesses. These actions focus on the livability aspects as an important element in thriving innovation in Kendall Square together with businesses' support, incubators spaces and entrepreneurs. Kendall Square is acknowledged as attractive for multi-national corporations and for the local community of entrepreneurs. In this perspective, the role played by anchors institutions is crucial. In fact, the MIT is one of the privileged actors involved in the transformation process of the area. The City of Cambridge's aims to strengthen the connection with MIT in attracting innovative businesses, together with the involvement of other developers in participating in the efforts for a vibrant environment [19].

Table 1. Kendall square plan: summary of zoning & urban design recommendations.

Pillar	Actions
Nurture Kendall's innovation culture	- Expand opportunities for Kendall Square knowledge economy to continue to grow; - Foster a strong connection between the MIT campus and the rest of Kendall Square. Enable MIT to develop in a manner consistent with its academic and research mission, so that it continues to be a magnet attracting innovative businesses to the area - Support a vibrant environment for creative interaction; - Three themes (below) working together supporting the central theme of nurturing Kendall's innovation culture
Create great places	- Support open space and recreation needs of a growing neighbourhood; - Create lively, walkable streets; - Expand opportunities for Kendall's diverse community to interact; - Development and public place improvements must happen in tandem
Promote environmental sustainability	- Expand convenient, affordable transportation and access choices - Enhance streets as public places - Create a healthier natural environment - Reduce resource consumption, waste emissions - Leverage the environmental and economic benefits of compact development
Mix living, working and playing	- Leverage community and innovation benefits of mixed-use environment - Focus intensity around transit - Minimize development pressures on traditional neighbourhoods - Continue to support city and state economic development

Besides the traditional zoning categories, the City of Cambridge Zoning Ordinance [22] includes a set (19) of special "districts" categories with tailored regulations for specific areas of the city. The Kendall Square area is included in two of these specific districts: The Cambridge Centre Mixed Use Development District (MXD) and the

Planned Unit Development Districts (PUD). The first was created to guide development in the Kendall Square Urban Renewal Area and requires a balanced mix of uses (light industrial, office, retail, institutional and residential uses) with the requirement of extensive public open spaces. The PUD district is a special category district allowing a more intense and diverse mixed-use development and permits the coordination of public and private development to implement the urban design for these areas [23]. Furthermore, part of the MIT campus area within Kendall Square is identified as Institutional Overlay District, with more flexible institutional use regulations than in areas where non-institutional uses predominate [22]. The so-called Planned Unit Development Special District (PUD), indeed, defines zoning rules for Kendall Square [22]. In this case, the designated PUD Kendall Square District (PUD-KS) has the purpose "to provide for the creation of a mixed-use district of high quality general and technical office and retail activity, with a significant component of residential use" [22]. Particularly, the PUD-5 (see Fig. 1) is recognized by the Zoning Ordinance as "a world-renowned center of innovation and a vibrant neighborhood" which should become a "mixed-use district of high quality general and technical office and laboratory uses with significant retail activity proximate to the MBTA station" [22]. Within the PUD 5-KS the development proposals containing new Office Uses, must include Innovation Office Spaces as zoning requirement: the 5% of the Gross Floor Area approved for Office Uses by the development plan [22]. Furthermore, the zoning ordinance provides also the characteristics of innovation spaces [22]:

- "Durations of lease agreements (or other similar occupancy agreements) with individual business entities shall be for periods of approximately one (1) month;
- No single business entity may occupy more than 2,000 sq. ft or 10% of the entire Innovation Office Space required to be provided in the PUD-5 District, whichever is greater;

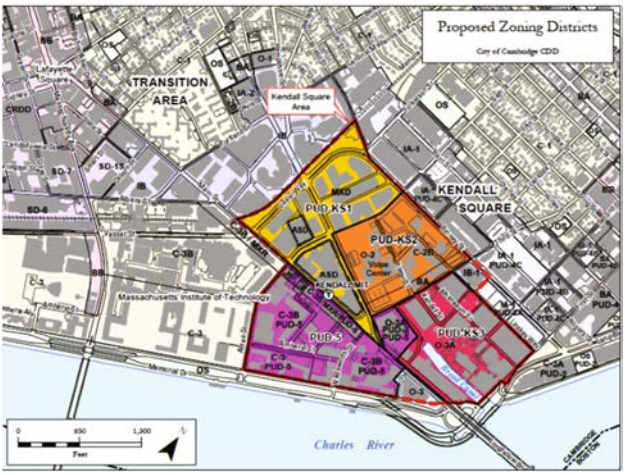

Fig. 1. Kendall Square Area Zoning - PUD KS Proposed Zoning District (Kendall Square Final Report 2013. City of Cambridge Community Development Department (2013).

- The average size of separately contracted private suites may not exceed 200 sq. ft of GFA;
- Innovation Office Space shall include shared resources (i.e., co-working areas, conference space, office equipment, supplies and kitchens) available to all tenants and must occupy at least 50% of the Innovation Office Space;
- Individual entities occupying Innovation Office Space may include small business incubators, small research laboratories, office space for investors and entrepreneurs, facilities for teaching and for theoretical, basic and applied research, product development and testing and prototype fabrication or production of experimental products".

In this case, the zoning recommendations [23] provide a specific innovation-oriented development trajectory for the physical development of Kendall Square. The requirement of innovation spaces is directly connected with the general vision of the city to empower the globally and knowledge-oriented features of the area. The link between innovation-oriented policies and urban transformation in the City of Cambridge has favored the concentration of knowledge-related activities in Kendall Square. Here, the presence of anchor institutions, private companies, a proactive entrepreneurs' community is stimulating the socio-economic and physical transformation. The City of Cambridge supports this attractive process with economic development measures. The Economic Development Division of the City of Cambridge set out specific measures in order to attract and support businesses in the highly innovative sectors such as Life Science and Technology. The awareness of the increasing role played by these sectors

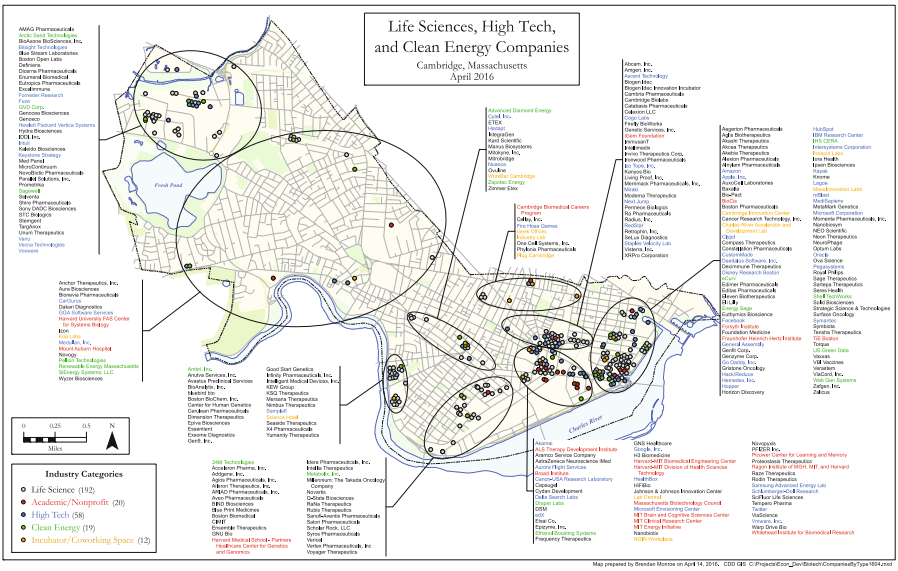

Fig. 2. Life Science, High Tech and Clean Energy Companies, City of Cambridge (2017). (http://www.cabridgema.gov/~/mdia/Files/CDD/Maps/techcompanies/cddmap_tech_companies_201705.pdf?la=en).

in the Cambridge economy, pushed the administration to provide assistance and services in order to attract and create companies, start-ups and industries. The area shows a high concentration of start-ups and companies for the Life Science and Clean Tech sectors located within or in close proximity to, the Kendall Square Area. Here are located approximately 70 Life Science related companies, 13 Academic/no profit institutions, 31 High Tech related companies/start-ups, 7 High Tech related companies/start-ups, and 6 Incubators/co-working Spaces.

4 Conclusions

The recent international official documents on cities highlighted [1, 2] how urbanization should be seen as an opportunity for a more sustainable and inclusive development model characterized by innovation, entrepreneurship and knowledge dynamics. The case of Kendall Square shows how knowledge dynamics and innovation-oriented policies are contributing to the physical transformation of the area. The connection of urban and innovation-oriented policy in the City of Cambridge reveals a sort of innovation production oriented approach, in order to boost competitiveness and attract exogenous resources. Furthermore, the analysis of urban planning tools, together with economic development measures, shows up two integrated outcomes. On one side, the public actors support the implementation of innovation-oriented policy, through economic development measures, for the retention and attraction of businesses (see Fig. 2). On the other side, the public actors enhance the above process through zoning and urban planning tools by adding innovation spaces requirement within mixed-use districts. In this case, innovation spaces represent the key triggering element in the socio-economic and physical transformation process in place in the area.

The presence of innovation spaces expands the opportunities for the knowledge economy facilitating knowledge sharing and transfer processes, the interaction among local communities, the promotion of more livable areas. The case of Kendall Square highlight how zoning and urban planning tools are contributing to support local innovation ecosystems acting as “big push” for innovation by setting new tools, or the adaptation of the existing ones, in response to the new and sophisticated socio-economic and physical demand of transformation. However, the innovation-oriented approach implemented in the Kendall Square case needs to be investigated in further studies in order to better understand the possible side effects/impacts especially in terms of gentrification phenomena, socially inclusive practices and urban governance. Cities, then, become crucial in the application of the desired bottom-up approach in S3 implementation, which needs innovation-driven urban regeneration interventions in order to calibrate the discrepancies in the demand/supply of services for innovation.

Acknowledgement. This work is part of the MAPS-LED research project, which has received funding from the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 645651.

References

1. United Nations: The New Urban Agenda, Habitat III, United Nations Conference on Housing and Sustainable Urban Development (2016)
2. United Nations: Transforming Our World: The 2030 Agenda For Sustainable Development, United Nations, United Nations Sustainable Development Summit (2015)
3. Couch, C., Sykes, O., Borstinghaus, W.: Thirty years of urban regeneration in Britain, Germany and France: the importance of context and path dependency. Prog. Plann. **75**, 1–52 (2011)
4. European Union: Establishing the Urban Agenda for the EU "Pact of Amsterdam" Agreed at the Informal Meeting of EU Ministers Responsible for Urban Matters on 30 May 2016 in Amsterdam, The Netherlands (2016)
5. European Commission: The New European Consensus On Development 'Our World, Our Dignity, Our Future, Joint Statement by the Council and the Representatives of the Governments of the Member States Meeting Within the Council, The European Parliament and the European Commission, European Commission International Cooperation and Development Building Partnerships for Change in Developing Countries (2017)
6. MIT New: Kendall Square: A global center for innovation grows alongside MIT. Once lined with old factories and abandoned buildings, Kendall Square is now a global center for innovation. Liz Karagianis | MIT Spectrum, 7 May 2015. http://news.mit.edu/2015/kendall-square-global-center-innovation-grows-alongside-mit-0507. Accessed 16 Nov 2017
7. Karlson, C., et al.: Knowledge, Innovation and Space, CESIS Electronic Working Paper Series Paper 367, CESIS (2015)
8. Florida, R., Adler, P., Mellander, C.: The city as innovation machine. Reg. Stud. **51**(1), 86–96 (2017)
9. Parysek, J.: Urban policy in the context of contemporary urbanization processes and development issues of polish cities. J. Urban Reg. Anal. **2**(2), 33–44 (2000)
10. Bevilacqua, C., Pizzimenti, P.: Urban innovation-oriented policies and knowledge dynamics: insights from Boston and Cambridge, US. In: Talia, M.: Un Nuovo Ciclo Della Pianificazione Urbanistica Tra Tattica E Strategia - A New Cycle Of Urban Planning Between Tactics And Strategies 2016, pp. 11–19. Planum, Roma-Milano (2016)
11. Ketels, C., Lindqvist, G., Sölvell, Ö.: Strengthening Clusters and Competitiveness in Europe. The Role of Cluster Organizations, The Cluster Observatory, Stockholm School of Economics, Center for Strategy and Competitiveness (2012)
12. Simmie, J.: Critical surveys edited by Stephen Roper innovation and space: a critical review of the literature. Reg. Stud. **6**(39), 789–804 (2005)
13. Tong Soo, K.: Innovation across cities, Economics Working Paper Series 2015/027. The Department of Economics, Lancaster University Management School, UK (2015)
14. European Commission: The Role of Clusters in Smart Specialisation Strategies. Directorate General for Research and Innovation (2013)
15. Porter, M.: Cluster and the New Economics of Competition. Harvard Business Review, Boston, pp. 77–90 (1998)
16. Schumpeter, J.A.: The Theory of Economic Development: An Inquiry into Profits, Capital, Credit, Interest, and the Business Cycle. Harvard University Press, Cambridge (1934)
17. Jacobs, J.: The Economy of Cities. Vintage, New York (1969)
18. Bevilacqua, C., Pizzimenti, P., Maione, C.: S3: Cluster Policy and Spatial Planning. knowledge dynamics, spatial dimension and entrepreneurial discovery. Second Scientific Report, MAPS-LED Project, Multidisciplinary Multidisciplinary Approach to Plan Smart

specialisation strategies for Local Economic Development, Horizon 2020 - Marie Swlodowska Curie Actions - RISE - 2014 - grant agreement No. 645651 (2017)
19. City of Cambridge, K2C2 Planning Study. Kendall Square Final Report 2013. City of Cambridge Community Development Department (2013)
20. Cambridge Redevelopment Authority: Kendall Square Urban Renewal Plan. http://www.cambridgeredevelopment.org/kendall-square-1. Accessed 16 Nov 2017
21. City of Cambridge, K2C2 Kendall Square Plan: Summary of Zoning & Urban Design Recommendation (2012)
22. City of Cambridge: Zoning Ordinance. http://www.cambridgema.gov/CDD/zoninganddevelopment/Zoning. Accessed 16 Nov 2017
23. City of Cambridge, the Zoning Guide Cambridge a User Guide to the City of Cambridge Zoning Ordinance 2nd edn. - Updated Fall, 2004. https://www.cambridgema.gov/~/media/Files/CDD/ZoningDevel/zoningguide/zguide.pdf. Accessed 16 Nov 2017