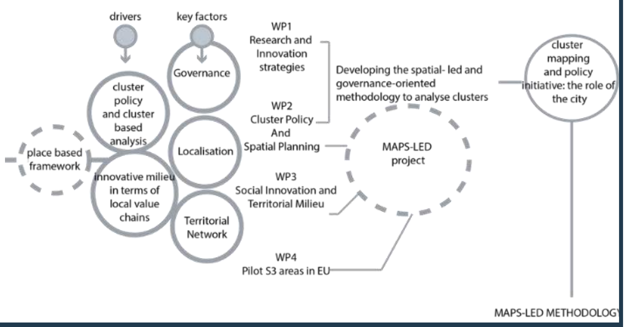
S3: CLUSTER POLICY & SPATIAL PLANNING

KNOWLEDGE DYNAMICS, SPATIAL DIMENSION AND ENTREPRENEURIAL DISCOVERY PROCESS



RESEARCH FINDINGS

BOOK OF LESSONS LEARNED ON SUCCESSFUL CLUSTERS FROM THE BOSTON CASES

MARCH 2017

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Multidisciplinary Approach to Plan Smart specialistation strtaegies for Local Economic Development
Work Package no.2

S3: CLUSTER POLICY & SPATIAL PLANNING

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KNOWLEDGE DYNAMICS SPATIAL DIMENSIONAND ENTREPRENEURIAL DISCOVERY PROCESS
BOOK OF LESSONS LEARNED ON SUCCESSFUL CLUSTERS FROM THE BOSTON CASES

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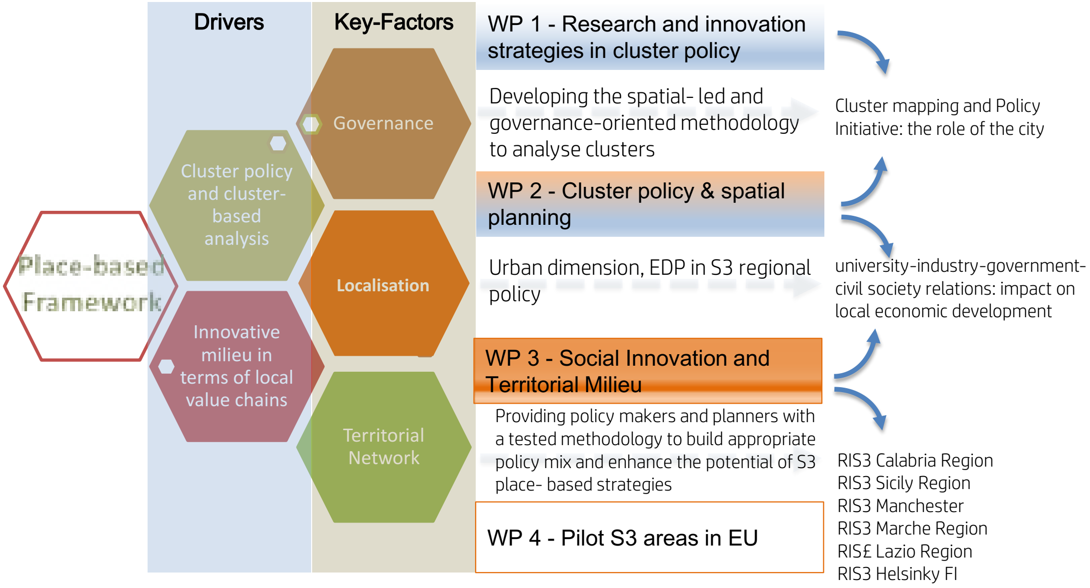
Introduction

The spatial/territorial dimension of Smart Specialisation Strategies – MAPS-LED project

This report presents the findings of research conducted on the spatial/territorial dimension of Smart Specialisation Strategies. In particular, the report integrates the preliminary findings of research activities accomplished during the first year of the MAPS-LED Project to search, across the whole domain of innovation policy and its practical expression, **a methodological framework in which the "place" acquired a specific connotation in designing "tailored policy" for innovation and knowledge spillovers.**

The structure of MAPS-LED project is described in the figure below. Following the Smart Specialisation Platform (European Commission), the general track of the project is to implement smart specialization as a key element for place-based regeneration policies for local economic areas.

Figure 1- The Maps Led research work plan



1. The general methodological framework

Carmelina Bevilacqua

The MAPS-LED project has been structured and orgainsed with the aim of examining how S3 can be implemented, with respect to the new agenda of Europe 2020, by incorporating a place-based dimension. The main aims are: 1) to identify and examine S3 in terms of spatial, social and environmental factors; 2) to take into account local needs and opportunities driving regional policy interventions not only to emphasize "Key Enable Technologies", but also to empower local innovation process – tacit knowledge, embedded social networks, innovative milieu.

The concept area of the research is articulated among four relevant topics:

<u>Research and Innovation Strategies</u>: recognizing that the dynamic process due to innovation and research defines different influence areas that can be better explained by the territorial distribution of competitiveness factors.

- technology transfer based on "business process"
- business models and partnership research groups and strategic action plan
- entrepreneurship in the research community and social innovation
- clustering entrepreneurial

Spatial Planning Factors suitable to be mapped in physical terms, such as:

- Proximity and accessibility (to gateway cities, to infrastructural nodes, to HEI (Higher Education Institutions) Centres, to broadband facilities...);
- Spatial pattern ("boundary" of the cluster, network of connections, localisation of place of production and distribution...9
- -Size (dimensional data of the cluster)
- - Critical mass (number of enterprises, size of urban centres involved, number of jobs created....).

Cluster Policy Factors related to the governance systems of the clusters

– - institutional networks, entrepreneurial networks, the global-local nexus between the local area and global systems, the organisation of local value chains, a suitability to be mapped through stakeholder analysis.

Social Innovation Responses to social needs that are developed in order to deliver better social outcomes.

– - (Spatial) identification and GIS mapping of new/ unmet/ inadequately met social needs, related to vulnerable groups.

The methodological framework is based on the implementation of a spatial-led approach to the analysis of US clusters.

The economic concept of Cluster became popular during the last two decades as a main driver for regional policy in order to accelerate economic growth and development attracting public/private and national/international investments. The European Union has placed those issues at the core of the Smart Specialisation Strategies in order to achieve the goal of a smart, sustainable and inclusive growth in boosting innovation and guaranteeing a more socially-oriented development pattern of European regions.

"The potential advantages of clusters in perceiving both the need and the opportunity for innovation are significant" (Porter M., 2000: 24). Hence, it is important to find a policy framework in which clusters can be considered as tools in boosting innovation and competitiveness. Further, it is likely important to characterise these policies from a spatial/territorial perspective considered the relevance of the local business environment for clusters and the relevant ways in which locational factors can influence them.

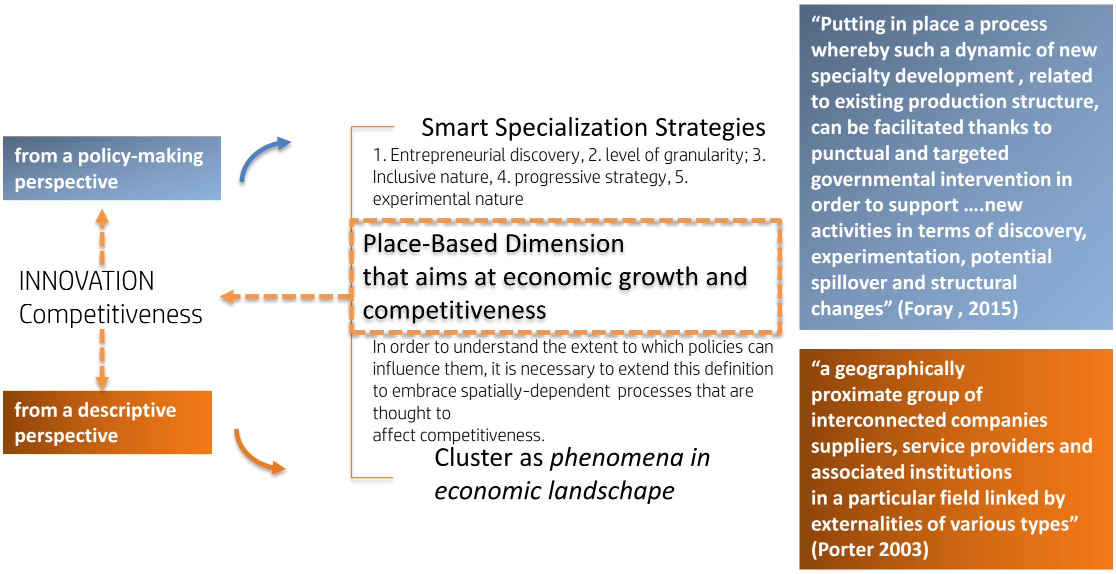
The main concern, arose during the last programming periods in Europe, relates with the effectiveness of public investments and thus of the regional policies undertaken in order to tackle socio-economic disparities in poor regions and to boost economic development in the rich ones. For a long time, the attention of scholars about competitiveness and economic development have been focused on the national dimension, identified as target of development policies. However, the economic performance of regions is different, suggesting that regional economic performances play a relevant role in determining the overall macro big-picture of a national economy (Porter, 2003).

Among the theoretical approaches that explained how Cluster and S3 share many similarities in their rationale, the research activities led to focus on the place-based approach as nexus in spurring the innovation process by emphasizing the role of the city.

Thanks to the exchange scheme of RISE programme, the MAPS-LED project has delivered a methodology to spatialize economic clusters in Boston, as expression of how innovation is experimented in the modern economy and how the "place" works.

The research activities on Clusters in Boston are grounded on the common feature that characterizes both S3 and cluster, and lies on conceptualizing and practising of a way to implement a place-based approach (Figure 2).

Figure 2 - S3 and Cluster: from policy to actions



1. Entrepreneurial discovery, 2. level of granularity; 3. Inclusive nature, 4. progressive strategy, 5. experimental nature

Place-Based Dimension that aims at economic growth and competitiveness

In order to understand the extent to which policies can influence them, it is necessary to extend this definition to embrace spatially-dependent processes that are thought to affect competitiveness.

"Putting in place a process whereby such a dynamic of new specialty development , related to existing production structure, can be facilitated thanks to punctual and targeted governmental intervention in order to support ….new activities in terms of discovery, experimentation, potential spillover and structural changes" (Foray , 2015)

"a geographically proximate group of interconnected companies suppliers, service providers and associated institutions in a particular field linked by externalities of various types" (Porter 2003)

Quoting Huggins and Thompson (2017):

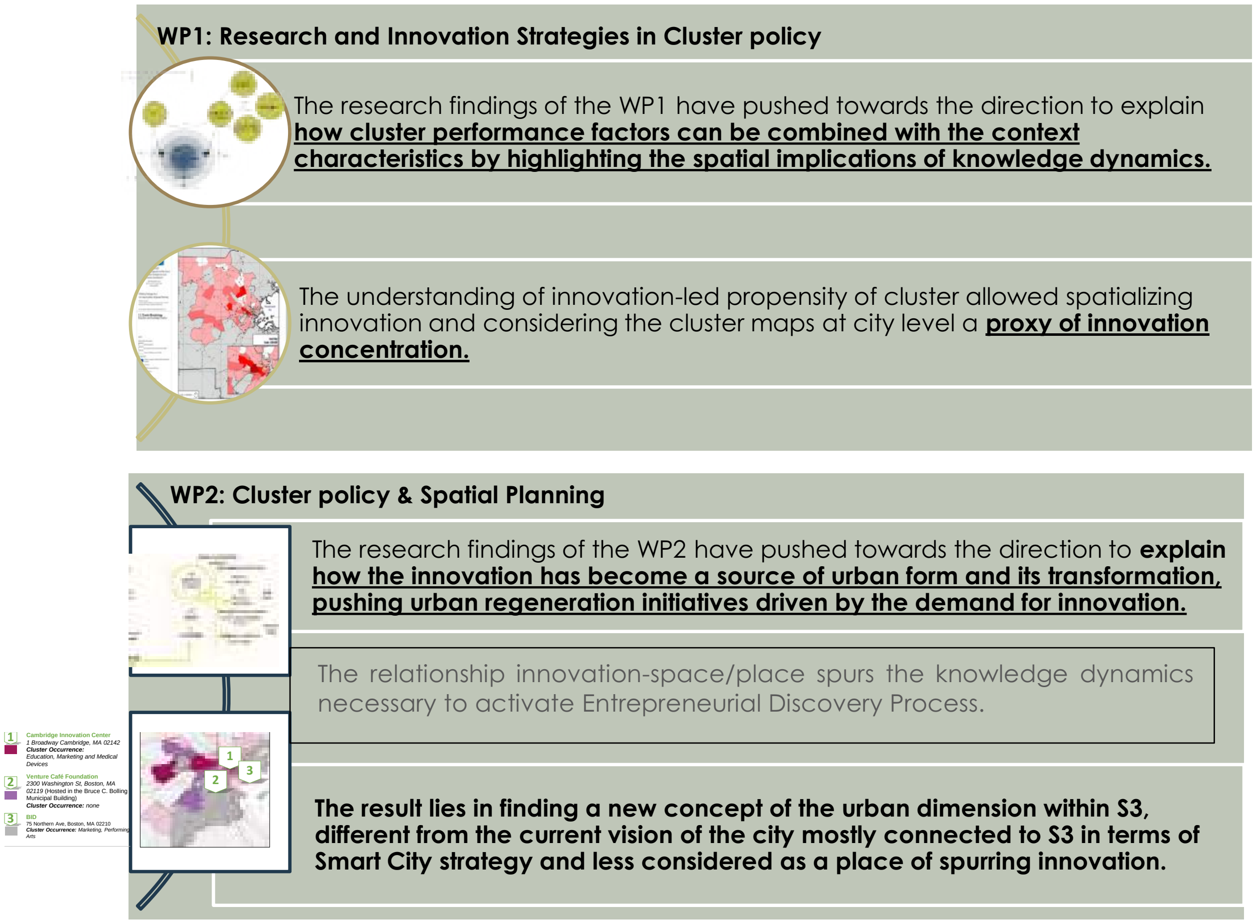
> *(…) the development of regional competitiveness as a powerful policy discourse has been built on the co-evolution of academic literature and policy practice around a series of influential place-based concepts such as regional innovation systems and clusters. It also coincides with evolving theory and practice in policymaking, by which policy is increasingly seen as an outcome of dialogue and decision-making processes among networks of place-based agents, breaking down the traditional public-private divide. The confluence of these trends is very clearly evident in newly popular debates on territorial strategies (Ketels, 2015; Valdaliso and Wilson, 2015; Warwick, 2013), which in Europe have taken shape around the notion of regional innovation strategies for smart specialization (European Commission, 2011, 2012; Foray, 2014; McCann, 2015.);*

the contribution of MAPS-LED project in the debate above mentioned concerns the explanation of how territorial strategies can be part of “regional innovation strategies for S3”.

The methodological approach is characterised by a heuristic method, namely an analogical method of approach to the solution of problems in order to generate new knowledge. The process of investigation on linkages between space/place with innovation was conducted according to different phases, each of which has added cognitive elements converged in the identification of a new concept of the urban dimension in the context of innovation policies and, therefore, consistent with the application of the S3.

The Figure 3 is a synoptic frame of the macro stages that structured MAPS-LED project, which highlights the cognitive elements to define the main pillar of the research: the urban dimension.

Figure 3 MAPS-LED project, the synoptic frame of the macro stages



WP1: Research and Innovation Strategies in Cluster policy

The research findings of the WP1 have pushed towards the direction to explain **how cluster performance factors can be combined with the context characteristics by highlighting the spatial implications of knowledge dynamics.**

The understanding of innovation-led propensity of cluster allowed spatializing innovation and considering the cluster maps at city level a **proxy of innovation concentration.**

WP2: Cluster policy & Spatial Planning

The research findings of the WP2 have pushed towards the direction to **explain how the innovation has become a source of urban form and its transformation, pushing urban regeneration initiatives driven by the demand for innovation.**

The relationship innovation-space/place spurs the knowledge dynamics necessary to activate Entrepreneurial Discovery Process.

The result lies in finding a new concept of the urban dimension within S3, different from the current vision of the city mostly connected to S3 in terms of Smart City strategy and less considered as a place of spurring innovation.

The next activities will include the territorial milieu in order to complete the context of territorial strategies within regional innovation strategies, across the network of the territorial/urban system.

The report "Cluster policy and Spatial Planning" is structured in four parts.

The introduction explains the context of the research with respect preliminary results from the Work package no. 1 "Research and innovation strategies in Cluster policy" by focusing on the relationships among knowledge dynamics, spatial dimension and entrepreneurial discovery process.

The First Part "Cluster Policies and Spatial Planning: Urban Dimension of S3" aims to contribute to the current academic discussion and policy debate on Cluster, Smart specialization strategies and place-based approach by combining the urban dimension and innovation policy on a thorough conceptual discussion on the advancing tools in urban policy and urban management tools.

The Second part "knowledge-based urban area case studies: the construction of target areas" explains the methodological approach to build the target areas in Boston for case studies analysis on relationship between concentration of innovation (cluster) and urban fabric on a thorough investigation on the role of zoning in special districts planned for urban regeneration and innovation spaces. The urban dimension inside the S3 implementation becomes part of the entrepreneurial discovery process in building innovation spaces. It is possible to group under the innovation-oriented urban policy's concept the increasing phenomena of innovation districts (in a broadly sense) to refine a different perspective of the role of the city in the creation of an innovation ecosystem.

The Third part "the strategic role of innovation spaces" deepens the analysis of three important policy initiatives, included in the target areas, by highlighted the strategic approach and the governance system to enhance knowledge spillover. The analysis is always grounded on spatial factors with a focus on strategy and governance.

2. Knowledge dynamics, spatial dimension and Entrepreneurial Discovery Process

The Smart Specialization Strategies (S3) has been designed in order to capture knowledge and innovation dynamics strictly connected with characteristics of context (Foray, 2015). The priorities of Europe 2020 find in S3 "the response in the challenges of innovation policy and regional development" (Dasì, 2014). It is also argued that introducing smart specialisation in regional policy agenda allows at reinforcing territorial knowledge dynamics connected with place-based approach in designing local economic development (McCann & Ortega-Argilès, 2015).

According with Valdaliso and Wilson (2015), the new context of S3 within Cohesion Policy underpins the role of "territorial strategies" for enhancing competitiveness as a "diffused process carried out among different agents and organisations within the territory – what in the smart specialisation literature is referred to as process of entrepreneurial discovery". In the same time, the way in which territorial strategies can effectively design a process of "shaping competitiveness in the specific context of different territories" is still fuzzy (Valdaliso & Wilson, 2015).

The Entrepreneurial Discovery Process (EDP) is a crucial stage in policy design of S3 since it drives to identify priorities by focusing on exploration of new opportunities and their experimentation in order to transfer them in a clustering phase -increasing returns- (Foray, 2015). Cluster based on a modern concept of agglomeration describes the economic ecosystem in which firms, institutions, infrastructure are connected in order to create a good atmosphere for increasing competitive advantages (Porter, 2004). About lagging regions, a debate arose on the opportunity of underpinning cluster, cluster organizations and cluster initiatives. A recent case study in Romania leads to conclude that "local production systems of industrial-district type are an appropriate organisational form for cluster development in the two analysed regions (cf. Romania), with a special emphasis on 'soft' measures that are able to strengthen the local networks and to ensure cluster identity" (Constantin et al., 2011). Notwithstanding these arguments, the MAPS-LED project considers fundamental the clustering phase in encouraging the policy design for S3 based on 5 strategic focuses (Foray, 2015): EDP, level of granularity, inclusive nature, progressive nature of the S3 strategy, and experimental nature of S3 strategy.

It is possible to argue that the inclusion of the spatial dimension in the entrepreneurial discovery process is an important factor to diffuse the clustering phase because allows at highlighting:

1) Economic agglomerations where innovation may occur, 2) The concentration of resources, critical mass (physical, social, financial) for knowledge convergence.

If we consider the theoretical background of S3 (Foray, David & Hall, 2011) as "a process addressing the missing or weak relations between R&D and innovation resources and activities on the one hand and the sectoral structure of the economy on the other", the link between S3 and place-based approach is envisaged twofold.

The former is based on their characterization of a development policy; the latter is based on the value of the different geographical, social, economic features that each territory can express. The transformation of these two theoretical approaches into policy, within the cohesion policy reform, is recognizable in two drivers for programming the new Agenda 2020. The first is the Theory of Change as a fundamental approach to be followed in building the programming process (why those output/results are necessary to reach the "change"). It implies the use of "indicators", as expression of a policy and related to the value that different territories can express to control and measure the expected change. The second is more related to stimulate at regional level an integrated approach to reach a critical mass of the investment effects/impacts.

Since the 80s, the main aim of the Cohesion Policy has been to strengthen the economic and social cohesion in order to reduce disparities among more and less developed regions. Although the term "territorial" is not clearly emerging from the Cohesion concept, it is (and it was) embedded and implicit and it is crucial in order to reduce the disparities among European regions (it has been included in EC Treaty in 1997, art. 3 of TEU and art. 2 of TFEU). Territorial Cohesion principle is about to ensure the harmonious development of all places in order to make their citizens able to take maximum advantage from the intrinsic characteristics of their territories (EC, 2008). As stressed by D. Hübner (Böhme et al., 2011), Territorial Cohesion "is a fundamental objective of regional planning in the Union and provides the raison d'etre for regional development policy". European Union is characterised by a huge territorial diversity among regions that makes necessary the inclusion of territorial aspects in implementing the European Policies. Finally, "Territorial Cohesion, if taken seriously and on condition that is given a broader interpretation than simply the provision of services of general economic interest, will feed into existing EU Policies by adding a territorial dimension to them, thereby making them more effective and efficient" (Zonneveld&Waterhout, 2005 quoted in Waterhout 2008).

According with Waterhout (2008), when referring to policies it is more appropriate to use term "spatial" rather than "territorial" assuming that "territory refers to socially constructed places, whereas spatial refers to less clearly defined areas, which seem to be of a larger scale encompassing territories" (Waterhout 2008).

This conceptual issue has been the core of the scientific debate that have brought to consider the spatial dimension in EU policies and to take into account the spatial impacts of their implementation. Arguably, the key challenge for integrating territorial dimension in EU policies is to develop convincing scenarios about the added value of a spatial approach and to create a sense of urgency in order to get the players mobilised (Waterhout 2008).

In 2010, the European Commission launched the Europe 2020 strategy, as the Road Map of EU policy targets within this decade in regards to central policy fields (Schmitt, 2011). Just one year later, the Ministers of Spatial Planning and Territorial Development have reviewed the Territorial Agenda drawn up in 2007 adapting it to the Europe 2020 Strategy (TA2020). The TA2020 reinforces the relevance of the Territorial Cohesion for the Union because "it enables equal opportunities for citizens and enterprises, wherever they are located, to make the most of their territorial potentials" (EC, 2011a).

Along this overview on the territorial dimension in implementing EU Policies, two main key aspects arise: the "territorial potentials" and the "equal opportunities" principles that represent the basis of the Place-based approach introduced by Barca (2009) considered the core of the European regional development policy for the programming period 2014-2020 together with the concept of Smart Specialisation Strategy.

This new "regional-economic thinking", as defined by Faludi (2015), is a new paradigm arising thanks to the Barca Report (2009) that highlight the importance of local contexts on grounds of both efficiency and equity (Faludi 2015).

The need to rethink on economic development strategies, both on national and regional/local level, highlights the importance of factors "such as human capital and innovation (endogenous growth theory), agglomeration and distance (new economic geography), and institutions (institutional economics)" (Barca, McCann & Rodríguez-Pose 2012: 136). These factors are the results of a period of radical political, institutional and economic change started in the late 80s that brought to the revision of regional economic development policies. Within this context, "innovation" acquired an increasing importance as a cross-cutting process able to empower the potentials of places in achieving a more balanced and sustainable development. This is the new paradigm at the core of the new Cohesion Policy for the programming period 2014-2020.

According to Foray (2015), smart specialisation is 'the capacity of an economic system (a region for example) to generate new specialities through the discovery of new domains of opportunity and the local concentration and agglomeration of resources and competences in these domains'.

As previously highlighted, the "Entrepreneurial Discovery Process" (EDP) represents the core of the "Smart Specialisation" policy design, since it is strongly endorsed for prioritization process. "The policy process will manage the transition from the entrepreneurial discovery phase (bottom up) to the increasing returns – clustering – phase (…) having this vertical policy schema in addition to horizontal programmes in order to enable a region to diversify through the development and consolidation of new specialities or new activities that will facilitate the transformation (..) and generate spillovers towards the rest of the local economy" (Foray, 2015).

The new European development policy has tried to adopt the 'place-based' approach (Barca, 2009) in order to identify the peculiarities that each Region should exploit for a successful innovation process. This approach implies collaboration and sharing of information between local actors and all levels of government in order to enhance the 'place-based' factors, which can create knowledge and transform it in sustainable innovation.

Quoted the "Research Innovation strategies in Cluster policy" (WP1 – Scientific Report 2016):

> *One of the most important factors for innovation is knowledge creation because it can reduce transaction costs, if it is enacted (Storper & Scott, 1995). Knowledge concerns local learning processes, human capital, specialized labour force and labour market. Consequently, formal and informal communication between specialized workers generate knowledge, makes knowledge sharing more fluid and is essential for innovation. While codified knowledge can be transmitted in large distances and in culturally different Regions, the tacit knowledge, which is also the cornerstone of knowledge creation, is (geographically) bounded and is a result of historical evolution, incorporated in the people (Becattini, 1998). A reason why Boschma (2005) explains that proximity is a key issue for learning and sharing to take place. The concept of proximity encourages the relations and networking between firms and other actors.*

Consequently, Clusters (Porter, 2004) in succeeding as the main expression of these interactions, ensure the proximity. "It is commonly understood that clusters constitute open environments with companies, public organisations, research organisations, education organisations and capital providers that compete and cooperate in various ways. Dynamic clusters tend to have strong social fabric and dense local networks where new ideas emerge, are tested and brought to use and commercial value. Thus clusters constitute the breeding ground for innovation." (Ketels, Lindqvist & Sölvell, 2012).

The S3 approach is focused on specific innovation-intensive sectors aiming at transforming regional economies on new or existing knowledge-based domains. Conversely, cluster policies interest a wide range of economic sectors enhancing the performance of related companies and firms operating within the cluster favouring the creation of a critical mass. However, these two approach presents two main similarities: "(i) focus on productivity and innovation as key drivers of competitiveness; (ii) fostering regional embeddedness with a view to capitalise on the advantage of proximity" (EC, 2013 The role of clusters).

These points of convergence mark the possibility to adopt clusters as smart specialisation strategies key implementation tools. The aim of the adoption of a cluster-led approach in S3 design and implementation lies on the need to capitalise the proximity advantages, such as economies of scale and agglomeration, social networks, and (local) innovation (EC, 2013 the role of clusters). The European commission (2013, the role of clusters.) identified six leverage points for the the use of clusters in S3, reported in the figure 4.

Figure 4 Cluster Leverage points for S3 implementation

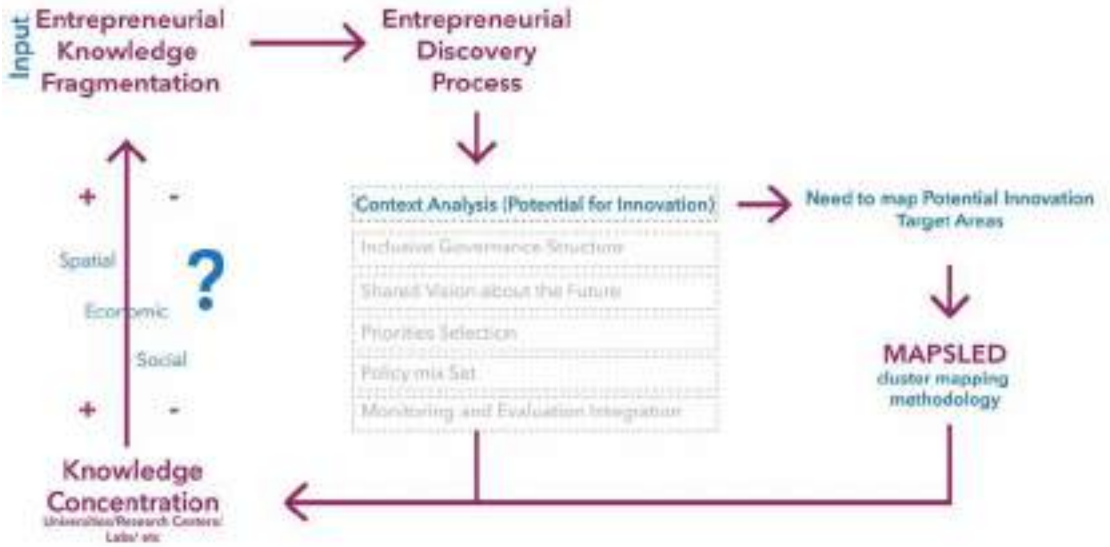
Source: Elaboration MAPS-LED project from The role of Clusters in S3 (EC, 2013)

The S3 process, which need to be translated into Regional Plans (RIS3) can help in the identification of those factors, especially spatially and context dependent, that can contribute to understand where innovation occurs and how to boost it in order to reach a smart, inclusive and sustainable growth. It is arguable that a possible point of contact in this direction can be represented by the Entrepreneurial Discovery Process.

The Entrepreneurial Discovery Process (EDP) is the key to identify and select the existing/potentials domains on which a region should concentrate its own efforts. The Entrepreneurial Discovery Process is an inclusive and interactive bottom-up approach (S3 platform, 2013), which thanks to the engagement of different actors, contributes in discovering and producing information for potentials new activities and potentials opportunities facilitating policy makers in finding appropriate strategies in the realisation of this potentials. EDP "pursues the integration of entrepreneurial knowledge" which is fragmented and distributed through the building of partnerships and connections, thus favouring the entrepreneurial knowledge concentration. Finally, it drives to the exploration and opening of new domains of opportunities from the technological and market perspective starting from the consideration that "entrepreneurs and small firms are the main engines of innovation and growth" (Simmie, 2005: 790).

The key of providing a spatial perspective (Figure 5) to S3 implementation has been experienced on the inputs, namely Entrepreneurial Knowledge dispersion/concentration, which trigger the Entrepreneurial Discoveries Process defined by Foray (2015). As stated by Foray (2015) the entrepreneurial knowledge fragmentation and dispersion generates the need of a policy action (in this case S3) due to uncertain locability factors.

Figure 5 EDP and Cluster mapping methodology



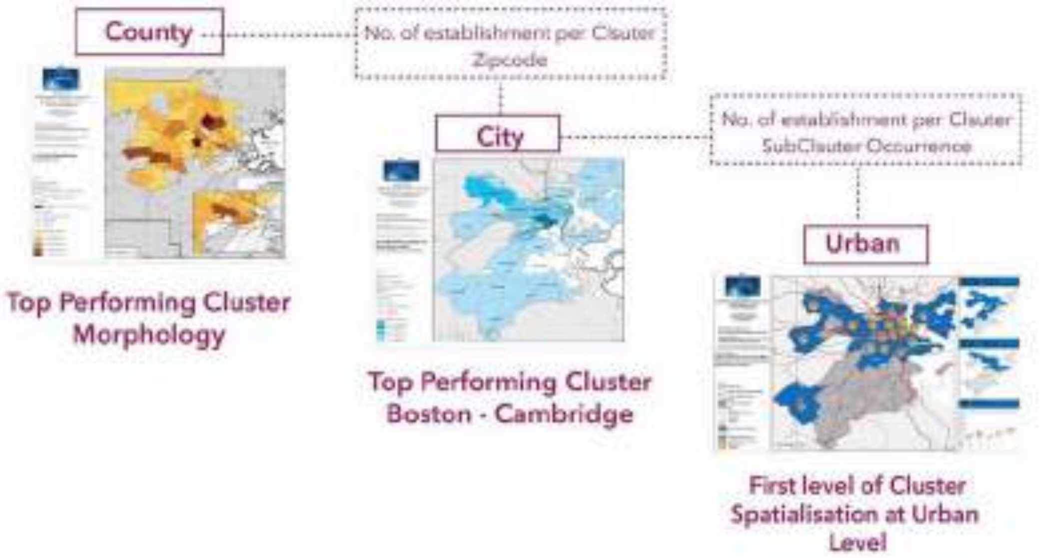
Source: MAPS-LED project elaboration

The Cluster spatialization methodology evidenced that the geographic concentrations relating to Clusters, is characterized by a multiscalar and multivariable geography, in the sense that, in each territorial dimension (from state level to city level), the cluster provides a conceptual framework to describe and analyse important aspects of modern economies of that territorial dimension. 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 (Porter, 2013).

It is possible to argue that Cluster captures “the concept of dynamic location advantages” (Simmie, 2001:101) in which “… local efficiency factors, like geographical and organizational proximity, external economies promoting a sort of industrial atmosphere, are overcome by more dynamic spatial elements like dynamic synergies and collective learning which explain innovation processes at the spatial level.” (Simmie, 2001:102).

The dynamic location explains the different stages of cluster spatialization methodology (Figure 6).

Figure 6 The different stages of Cluster spatilaization



Source: MAPS-LED project elaboration

Porter identified 51 traded clusters and 16 local clusters. All these clusters are distributed on the territory of US, among the three territorial units (State, Metropolitan Area, and County). Each territory has a cluster portfolio that indicates the top clusters by specialized employment, including both traded and local typologies.

The spatialization cluster methodology led to consider the cluster even with a physical configuration as proxy of innovation concentration because its occurrence is strictly connected (by definition because of the Porter’s model) to innovation, specialization, job creation that are the success factors of cluster.

The shift from success factors of cluster (that are naturally included when a cluster is identified) to the atmosphere (as defined by Schumpeter), which is due for the presence of cluster (the innovation concentration, thereby) or affects the innovation when is concentered, led to define two research questions:

1. what happens when innovation is concentered and why it happens

2. To booster research and innovation, as precondition of S3 implementation, what are the factors that can affect innovation process in a particular context.

This kind of research questions comes also from what Porter says about localization:

> *Clusters are not unique, however; they are highly typical—and therein lies a paradox: the enduring competitive advantages in a global economy lie increasingly in local things—knowledge, relationships, motivation—that distant rivals cannot match.Untangling the paradox of location in a global economy reveals a number of key insights about how companies continually create competitive advantage. What happens inside companies is important, but clusters reveal that the immediate business environment outside companies plays a vital role as well. This role of locations has been long overlooked, despite striking evidence that innovation and competitive success in so many fields are geographically concentrated.*

Started from the consideration that "*When specialised and higly innovative small and medium-sized firms cluster in a particular area of the city, (…) an interesting question emerges on weather the innovative activities of these firms is more influenced by dynamic urbanization economies, i.e by the more traditional advantages stemming from an urban atmosphere,. (…) or by milieu economies, i.e. by collective learning of specialized knowledge, by specialization process of local specilaised human capital. (..) In a milieu, the more traditional and static elements of Smithian division of labour, of Marshallian externalities, generated by a common industrial culture and by dense input-output exchange, coexist with more dynamic elements, like Schumpeterian entrepreneurial spirits enhanced by long-standing and specific skills (..) (Simmie, 2001),* it can be argued that the business environment or the atmosphere for innovation is connected on what the entrepreneurial characteristics is perceived in the contemporary economies.

The business environment or the atmosphere for innovation acquire an important role in what Foray calls *structuring entrepreneurial knowledge*.

The research activities have deduced that the city level is more appropriate to analyze the surrounding conditions in innovation concentration, based on the assumption that the localization of clusters allow to consider them as innovation concentration proxy.

The case studies in Boston, organized at city level, have been divided in two parts:

1. The identification of target areas based on the innovation concentration (the cluster mapped at city level) by incorporating the parcel and census track dimensional levels. In this way, the analysis of socioeconomic aspects and urban phenomena (real estate, facilities and transports) was possible.
2. The identification of innovation spaces (innovation districts, innovation hub) to analyze the role of community with respect the innovation process connected to cluster occurrence.

From the first point, the role of the city in terms of innovation-oriented urban policy emerged. The connection of urban planning tools with the cluster highlighted how urban policy is including innovation as part of the urban space to be organized.

The analysis of surrounding conditions has been considered important to give a practical explanation of how the entrepreneurial discovery process (Foray 2015) could be structured as policy action (Foray, 2015). Among the theoretical approaches that explained how Cluster and S3 share many similarities in their rationale, the research activities led to focus on the role of the city in spurring the innovation process and in particular, how it can be the start point of the entrepreneurial discovery process, in terms of public policy action.

The result of these research activities lies in finding a new concept of the urban dimension within S3, different from the current vision of the city mostly connected to S3 in terms of Smart City strategy and less considered as a place of spurring innovation.

The urban dimension inside the S3 implementation could be part of the entrepreneurial discovery process in building innovation spaces. It is possible to group under the innovation-oriented urban policy's concept the increasing phenomena of innovation districts (in a broadly sense) to refine a different perspective of the role of the city in the creation of an innovation ecosystem.

Another aspect emerged from the research activities in Boston is connected to how the innovation has become a source of urban form and its transformation, pushing urban regeneration initiatives driven by the demand for innovation.

The city-innovation nexus is widely discussed in the literature. It is possible to extract two main interrelated directions for explanatory design of this nexus. Innovative cities and Smart Cities.

Innovative cities emphasize the urban location for knowledge intensive process.

> *The innovative city is actualized and characterized by knowledge-intensive locals within the urban fabric. Based on these considerations the concept of an innovative city may be defined as an urban location that actively promotes and highlights the role of knowledge-intensiveness and technological advancement as one of the defining characteristics associated with the city. (..) the innovative city should be considered as a meta-concept reflecting the "feeling" or the "spirit" of that particular location (Inkinen, 2015).*

Smart cities emphasize the use of information technology to meet the challenges of cities within a global knowledge economy.

> *The point of departure is the definition which states that a city may be called 'smart' "when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory government. This holistic definition nicely balances different economic and social demands as well as the needs implied in urban development, while also encompassing peripheral and less developed cities (...)Whereas until now the role of cities and regions in ICT-based innovation mostly focused on deploying broadband infrastructure, the stimulation of ICT-based applications enhancing citizens' quality of life is now becoming a key priority. As a next step, the potential role of cities as innovation environments is gaining recognition (Schaffers et alii, 2011).*

The innovative cities seems more connected to the increasing role that "innovation spaces" have been playing in urban development pattern and urban policy towards an evolutionary concept of the urban fabric settlement, the innovation becomes a service and a requirement in the zoning rules.

The smart city recalls the so-called cognitive-era "Computer code and digital data have become powerful influences in the social organization and governance of education. At the same time, cities are being reconceived as composed of code, driven by data, and made 'smart', 'programmable' or even 'sentient'" (Williamson, 2015).

Based on this synthetic literature recalls, the research activities mostly focused on:

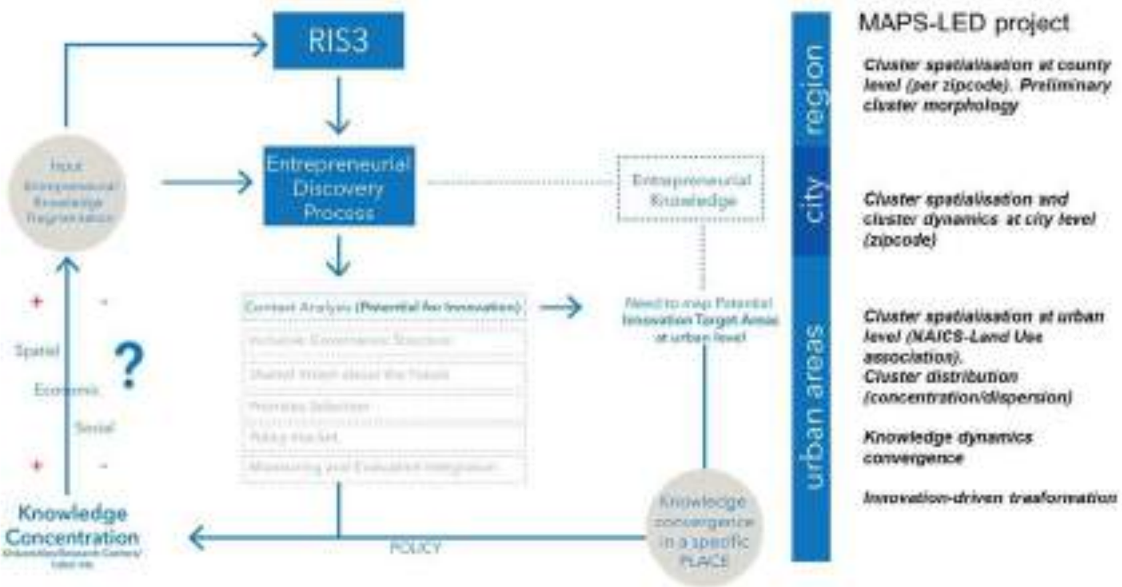
1) *how the combination of organically embedded locations suitable for knowledge-intensive work and production could be contrasted with specifically designed (planned) areas that aim to create and establish something definable as knowledge-intensive local* (Inkinen, 2015)
2) *How extensive are these locations and how numerous are they in relation to explanatory variables such as population, education, income, and economy* (Inkinen, 2015)

The MAPS-LED spatial oriented approach to US cluster highlighted the relevance of the urban dimension in concentrating knowledge resources and linking them to economic activities.

Particularly, Knowledge dynamics act at urban level involving Higher Research Institutions, local institutions and local community (*entrepreneurs and citizens*). Cities offer *proximity, density, variety* and offer *specialised knowledge-based labour force*...they facilitate *networking and knowledge exchange* (Athey, 2008)...and are implementing a *new urban innovation-oriented development paradigm*, characterised by the creation of *innovation district* both in Europe and US.

In the S3 perspective (place-based approach) innovation-oriented urban policies, which are bottom-up tailor-made policies, can help in driving an innovation-oriented transformation (Figure 7).

Figure 7 MAPS-LED project - Knowledge convergence and innovation-driven transformation



Source: MAPS-LED project elaboration

3. Synoptic WP1 - Research and innovation strategies in cluster policy

The general objective of the MAPS-LED project is to examine how S3 can be implemented, with respect to the new agenda of Europe 2020, by incorporating a place-based dimension. The main aims are: 1) to identify and examine S3 in terms of spatial, social and environmental factors; 2) to take into account local needs and opportunities driving regional policy interventions not only to emphasize "Key Enable Technologies", but also to empower local innovation process – tacit knowledge, embedded social networks, innovative milieu.

The originality and innovation in the methodological approach stems from the spatial-led approach to the analysis of US clusters, allowing researchers to draw evidence for a S3 place-based theory testing and implementing pilot S3 areas in European regional contexts. The research project stages matches the implementation of Research and Innovation Strategies for Smart Specialisation (RIS 3) regional plans, that are required as ex ante conditionality for Research and Innovation of the current programming period.

The WP1 "Research and Innovation Strategies in Cluster Policy" recognizing that the dynamic process due to innovation and research defines different influence areas that can be better explained by the territorial distribution of competitiveness factors:

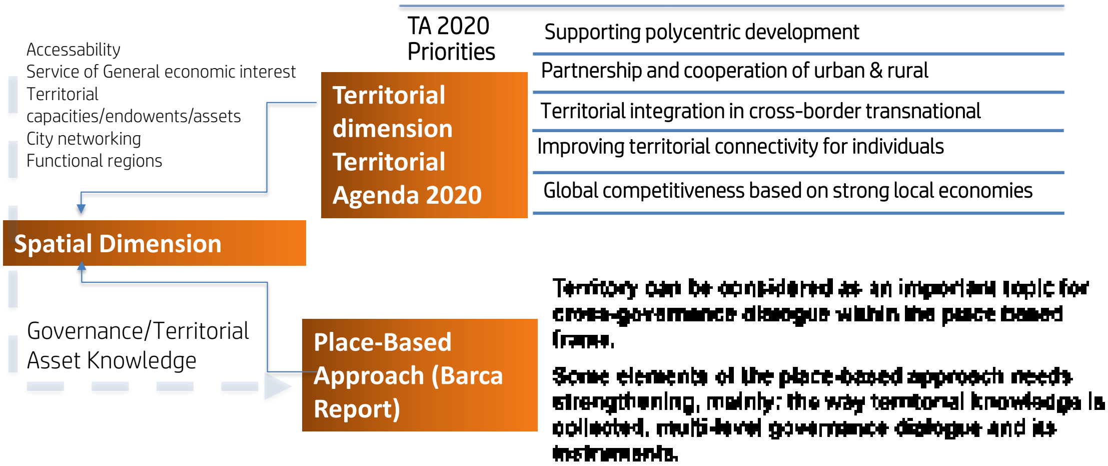
- technology transfer based on "business process"
- business models and partnership research groups and strategic action plan
- entrepreneurship in the research community and social innovation

- clustering entrepreneurial.

The WP1 specific objective has been established on building a methodology based on spatially-led approach and governance-oriented to trace the behaviour of "place" in fostering knowledge dynamics to promote innovation.

The introduction of spatial dimension in knowledge dynamics and innovation led to specify the contexts of "spatial dimension" (Figure 8).

Figure 8 - : The spatial dimension into methodological approach to cluster analysis

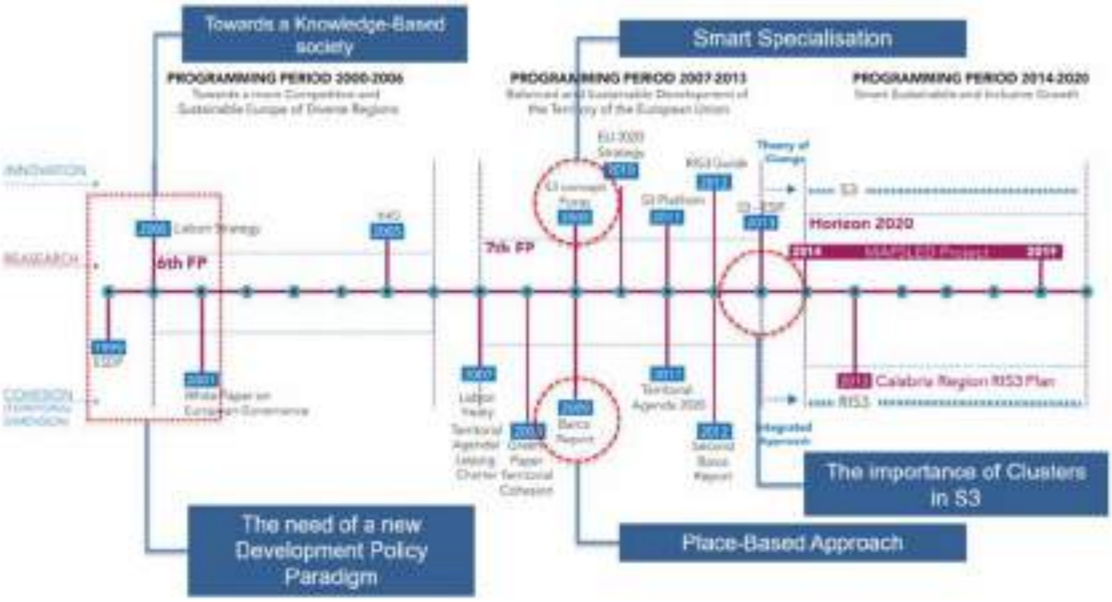


Source: MAPS-LED Project elaboration

Cluster-based analysis is structured in a spatially oriented logical frame, where the spatial dimension is treated as a combination of the territorial dimension rationale within Cohesion Policy and place-based approach in reforming the Cohesion Policy, both related to Europe 2020 strategy.

The path of the Cohesion Policy during the programming periods, started from 2000, allowed at identifying the main domains of research in building a methodological approach spatially based to investigate innovation and space/place linkages (Figure 9).

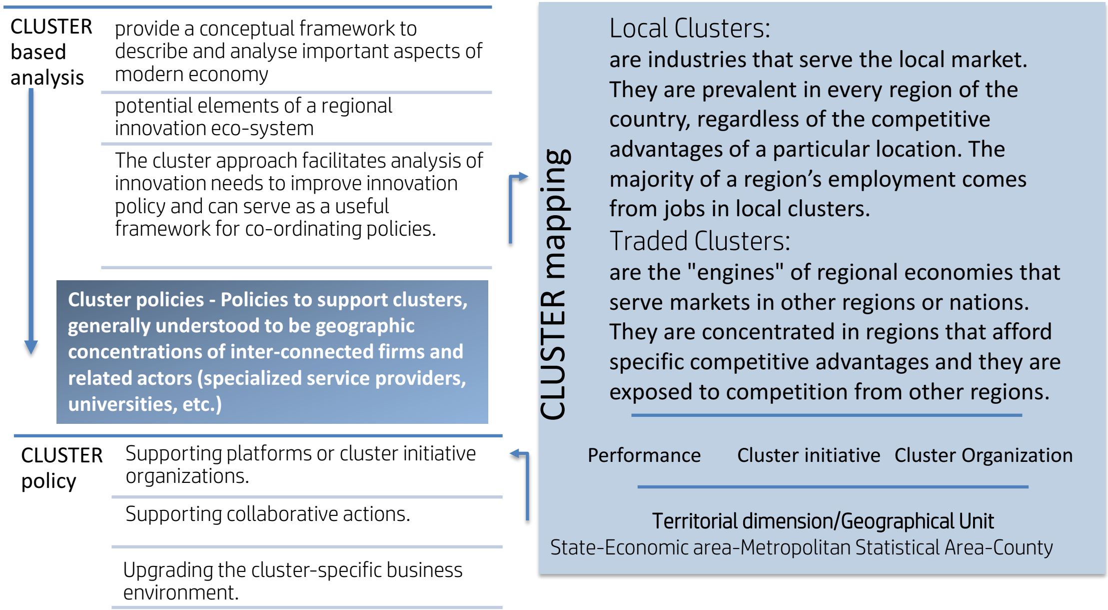
Figure 9 EU Cohesion Policy: Territorial Dimension and Research and Innovation



Source: MAPS-LED Project elaboration

The cluster based analysis in Boston finds its justification in the spatially-led approach to innovation and knowledge dynamics, because cluster includes in its occurrence the specialization process towards innovation (Figure 10).

Figure 10 – Cluster based analysis



CLUSTER based analysis

provide a conceptual framework to describe and analyse important aspects of modern economy

potential elements of a regional innovation eco-system

The cluster approach facilitates analysis of innovation needs to improve innovation policy and can serve as a useful framework for co-ordinating policies.

Cluster policies - Policies to support clusters, generally understood to be geographic concentrations of inter-connected firms and related actors (specialized service providers, universities, etc.)

CLUSTER policy

Supporting platforms or cluster initiative organizations.

Supporting collaborative actions.

Upgrading the cluster-specific business environment.

CLUSTER mapping

Local Clusters:
are industries that serve the local market. They are prevalent in every region of the country, regardless of the competitive advantages of a particular location. The majority of a region's employment comes from jobs in local clusters.

Traded Clusters:
are the "engines" of regional economies that serve markets in other regions or nations. They are concentrated in regions that afford specific competitive advantages and they are exposed to competition from other regions.

Performance Cluster initiative Cluster Organization

Territorial dimension/Geographical Unit
State-Economic area-Metropolitan Statistical Area-County

Source: MAPS-LED Project elaboration

Spatializing cluster acquires the meaning to spatialize innovation, namely, to investigate the nexus between innovation and space/place.

The methodological approach has been built on two main dimensions:

- The spatial dimension
- The dimension of governance.

Both dimensions are integrated in the comprehension of innovation process in specific context. The first stage of the methodology developed the spatial dimension towards cluster physical configuration. The main findings is related to investigate in terms of localization how cluster interacts with the dimension of governance.

The cluster spatialization methodology

The methodological framework is grounded on a case studies analysis developed on two US cities, Boston and Cambridge, where Clusters are particularly proactive in sustaining the economic performances of these areas.

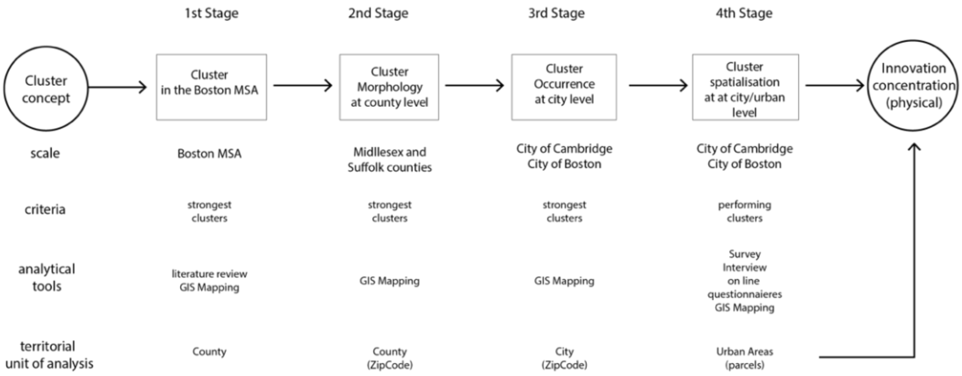
The analysis of US Clusters in the Boston area (following a multi scalar approach started from the MSA level, to the county level and then to the city level) has pointed out how spatial factors – localization of universities, real estate conditions, housing, public transportation, services' supply – can affect the performance level of Clusters, identified by Porter (Delgado et al. 2012).

The research activities demonstrated that the cluster geographic concentration is characterized by a multi scalar and multivariable geography, in the sense that in each territorial dimension (from state level to city level), clusters provide a conceptual framework to describe and analyse important aspects of modern economies of that territorial dimension.

Its role is not to demark a specific area, but to characterize that specific geographic area in terms of innovation, specialization and capacity to activate competitive and comparative advantages (Porter, 2013).

Accordingly, the cluster, even with a physical configuration, has been considered as a proxy of innovation concentration because its occurrence is strictly connected (by definition from the Porter's model) to innovation, specialization and job creation.

. Figure 11 - Cluster Spatialisation Methodology



Source: MAPS-LED Project elaboration

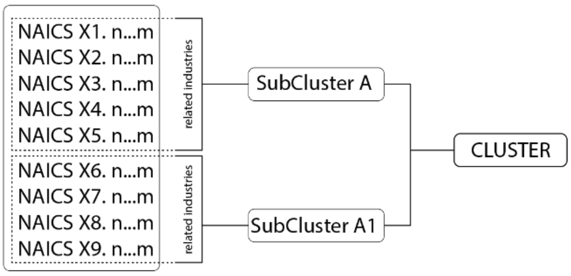
The main data source used to investigate clusters in this geographic area stems from the US cluster mapping portal, organized and continuously updated by the scientific team led by M.E. Porter from the Harvard Business School.

The website provides detailed data sets concerning all clusters in US following the distinction between Traded (51) and Local (16). This distinction derives from the difference between traded (geographically concentrated) and local (geographically disperse) industries highlighted by Porter (2003). Starting from this distinction, Delgado et al. (2013) developed a methodology to distinguish traded and local clusters. The distinction between traded and local clusters can allow regions to easily compare their economic performance in particular clusters to other regions that have the same clusters (Delgado, 2013: 4).

> *"Traded clusters tend to locate in specific regions where the level of specialisation and high share of the national employees in the cluster". "Local clusters generally serve the local market. They appear in almost every region, regardless of the competitive advantages of a particular location. They also are exposed to little competition from other regions". Their presence in a particular region tends to be proportional to the region's size, since these industries primarily serve the local market".*

Clusters have been mapped and reported in the US cluster mapping portal providing insights on three main socio-economic indicators: Performance, Business Environment, Demographic and Geography. Each indicator groups a series of sub-indicators useful to identify the economic potential of a region or of a specific geographic area. In order to provide a synthetic insight on the used MAPS-LED mapping method is useful start from the methodology used to identity clusters. The classification draws from data concerning different NAICS – North American Industry Code System. Each of them represents one industry sector. Hence, different NAICS, according to criteria further illustrated, are aggregated into a "sub-cluster". More sub-clusters are grouped into a single "cluster", as shown below.

Figure 12. - Cluster structure



Source: MAPS-LED project elaboration based on Porter et a.l (2013)

The initial stage of the analysis started from the Boston Metropolitan Statistical Area (MSA). MSAs are urban regional units defined by the U.S. Census Bureau. Kenneth and Kort (2004) provided an exhaustive definition "Metropolitan and Micropolitan statistical areas (metro and micro areas) are geographic entities … Each metro or micro area consists of one or more counties and includes the counties containing the core urban area, as well as any adjacent counties that have a high degree of social and economic integration (as measured by commuting to work) with the urban core".

The definition of Metropolitan Statistical Area provided by Kenneth and Kort (2004) helps in the understanding the multiple relational capabilities of cluster in a region.

From the 51 Traded cluster list available from the Boston MSA, 11 Traded Cluster have been identified as strongest according with data provided by US Cluster Mapping Portal.

As reported by Delgado et al (2014), the "Strong clusters" are defined as those where the location quotient, i.e. the cluster's relative employment specialization, puts them into the leading 25% of regions across the U.S. in their respective cluster category. Furthermore, considered that Traded clusters tend to locate in specific regions (Delgado et. al, 2013) they can be considered as a preliminary or indicative proxy of innovation and specialisation concentration. The data concerning the Boston MSA Strongest Clusters have been compared over the seven counties belonging to the MSA (Tab. 1).

Considered the impact in terms of employment, the Middlesex County and the Suffolk County have been selected among the 7 counties belonging to the Boston MSA.

The US cluster mapping portal contains a wide and variegated amount of data and indicators about clusters and their performance related to different geographic units.

The maps provide information on the performance of clusters based on the main indicator categories – Performance, Business Environment, Demographics Geography – related to the geographic areas (State, Metropolitan area, Economic area, County).

Table 1- Boston MSA (7 Counties) employed per Strong Clusters

Strong Traded Clusters	Boston MSA	Middlesex	Suffolk	Essex	Norfolk	Plymouth	Rockingham	Stratford
Aerospace	12.128			6.506	995			
Biopharmaceutical	8.971	3.109	2.685	2.245			925	
Business Services		121.847						
Education	170.429	94.784	56.632	7.427	10.087			
IT	62.031	36.731		9.720	9.071	1.154	2.274	
Financial Services	82.468		57.918	6.022	7.158	1.780	2.643	
Fishing	1.238		398	480		80	185	20
Footwear	752			250		335	20	
Marketing	40.038	15.585	15.068	4.482	3.348		1.346	
Medical Devices	7.018	3419		945	929	433	1.172	175
Performing Arts	7.322		3.587		2.006	669		
Insurance	41.202		14.706		10.130	2.324	2.550	3820
Total	433.597	***153.628***	***150.994***	38.077	43.724	6.775	11.115	4015

Source: MAPS-LED project elaboration on data from usclustermapping.org

The occurrence of clusters in terms of territorial localisation is not provided. In order to individuate the characteristics of the contexts related more to places than geographical areas, the analysis has been directed to find a correlation between the compositions of Cluster (Sub cluster organized in different NAICS).

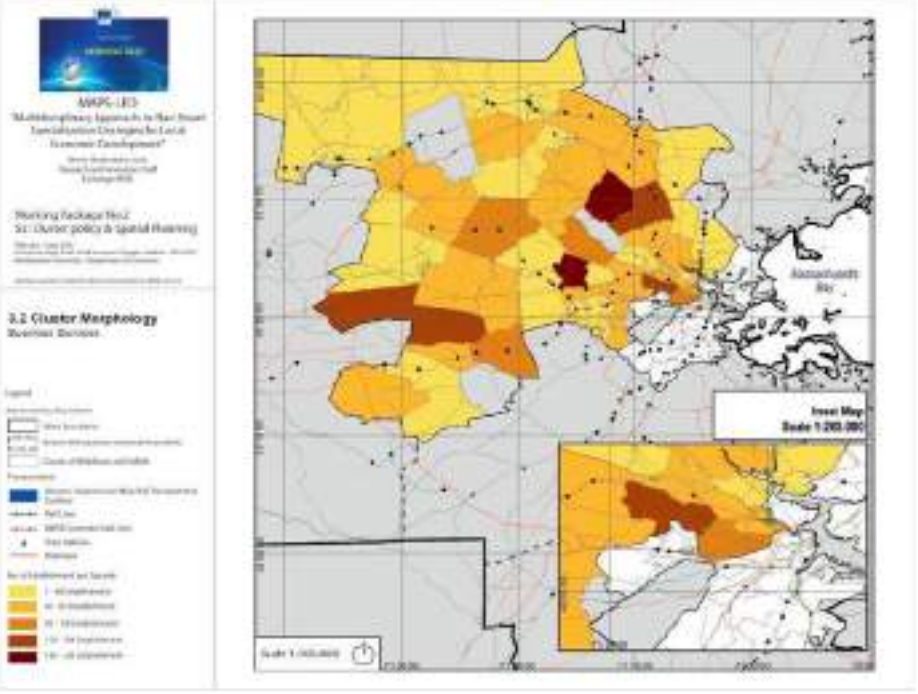
The assumption is that the simultaneous occurrence, in a specific localisation, of the aggregation of all NAICS that constitute a particular Cluster allows at identifying, in addition, the territorial dimension of cluster.

At this purpose, the two counties of Middlesex and Suffolk have been analysed using the Zip Code as territorial unit of inquiry. ZIP Codes identify the individual post office or metropolitan area delivery station associated with mailing addresses. USPS ZIP Codes are not areal features but a collection of mail delivery routes (US Census Bureau, 2015).

Created by the U.S. Postal Service to deliver the mail, ZIP Codes do not represent standard census geographic areas for data reporting. Because ZIP Codes boundaries are not contiguous with census areas or stable over time, data estimated for ZIP Codes are also subject to change (ESRI, 2016).

The US Bureau of Census provides statistical data about establishments per Zipcode through the Community Business Pattern. Each establishment is codified by the related NAICS code. The result consisted in mapping, at county level, the concentration of those establishment related to the NAICS belonging to a specific cluster (Figure 13). This process allows at providing a physical configuration of cluster at county level.

Figure 13 Business Services Cluster Morphology County of Middlesex and Suffolk



Source: MAPS-LED project elaboration

The maps at regional level shows where the dimension of cluster industries tend to concentrate even the dimension of cluster still remain explained per territorial unit, where "place"/space as expression of local asset and "actors" is not displayed.

The spatial relationship among actors (firms, institutions, public and private research centers and universities etc.) and subsequently between innovation and space have needed a further stage in mapping cluster.

For this reason, research activities focused on a more detailed territorial dimension that can include place/space characteristics moving from the attempt to provide a spatial morphology to clusters at regional level to the cluster spatialisation at city and urban level. This passage confirms the multi scalar and multivariable geography of clusters. As shown in Table 2 the occurrence and typology of clusters varies depending on the geographic scale of inquiry. The 11 strong clusters selected accordingly with the cluster mapping portal for the Boston MSA decrease when the analysis referred to the county level (County of Middlesex – 5, County of Suffolk - 7) and to the city level (City of Cambridge – 4, City of Boston - 6). The occurrence of clusters at city level has been established following the definition of Porter: if the sub-clusters belonging to the cluster occur in a ZipCode at city level then the cluster occurs. It does not mean that not occurring firms related to clusters are not located in the area, neither that these firms do not contribute for innovation and competitiveness. It simply means that the inter-linkages between related industries in that city is weaker or probably contribute to the completion of the cluster (Porter's definition) in a wider area than the city considered.

Table 2 - - Multi-scalar and Multi-variable geography of clusters from the Regional to the Urban level

Geographical unit	***Strongest Traded Cluster***												
	Aerospace	***Biopharmaceutical***	***Business Services***	***Education and Knowledge Creation***	***Information Technology***	***Financial Services***	***Fishing and Fishing Products***	***Footwear***	***Market, Design and Publishing***	***Medical Devices***	***Performing Arts***	***Insurance***	***ToT***
Boston MSA	X	X		X	X	X	X	X	X	X	X	X	11
County of Middlesex		X	X	X	X				X	X			6
County of Suffolk		X		X		X	X		X		X	X	7
City of Cambridge			X	X					X	X			4
City of Boston				X		X	X		X		X	X	6

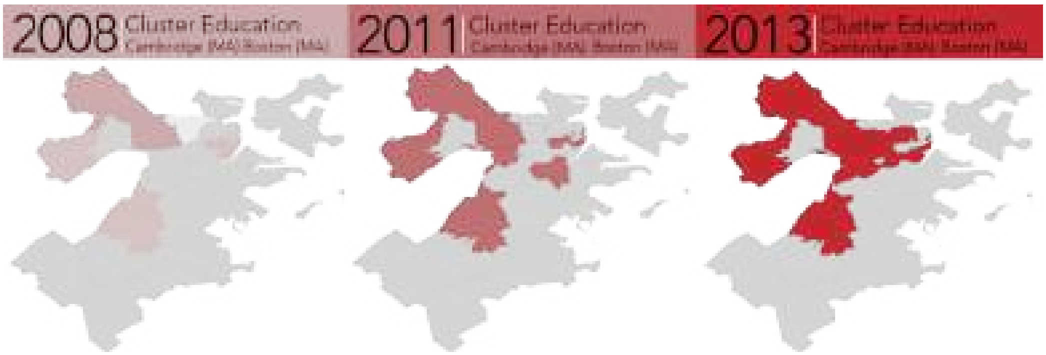
Source: MAPS-LED Project elaboration

The table above shows how the occurrence of clusters varies depending on the geographic area taken into account. Only few clusters occur from the Metropolitan

Statistical Area level to the city level i.e. Education and Knowledge Creation. Conversely, strong cluster such as Aerospace, Vehicle and Defense are localised outside the cities of Boston and Cambridge. The mapping activity at County level provide and indicative cluster concentration within the county of Middlesex and Suffolk. The shift from the regional to the city level has been mapped (Fig. 3) following the same process and using the same territorial unit (the zip code) to verify strong clusters occurrence at city level, where spatial factors such as proximity and accessibility play a crucial role for industry clustering and innovation concentration.

Taking into account the Education and Knowledge Creation cluster –among all the clusters analysed per county- for the cities of Cambridge and Boston, the mapping activity allowed to identify those zip codes where the cluster is occurring in terms of number of establishments belonging to sub-clusters and then to the cluster selected (in this case Education and Knowledge Creation). The higher number of related establishments are localised in the inner-city areas of Boston and Cambridge and it is possible to note a geographical contiguity between those zip codes with the highest number of establishments along the administrative borders of the two cities. Even in this case the simple concentration of establishments provided information about cluster concentration at city level highlighting that the Education and Knowledge Creation cluster is localised in the inner-city areas. The example on the Education and Knowledge Creation cluster for the period 2008-2013 (Figure 13) reveals how between 2008 and 2013 related "industries" in the education sector expanded in the inner city areas, especially along the Charles River where a series of leading Anchor Institutions are located (Harvard, MIT, Northeastern University, Boston University, Berkely College of Music etc.).

Figure 14 Cluster Education and Knowledge Creation Occurrence per Zipcode between 2008 and 2013 City of Cambridge and Boston



Source: MAPS- LED project elaboration

The Zip code, as geographic unit of analysis, has been useful at county and city level in order to understand where clusters are located and concentrated.

In order to identify the relationship between innovation and space it is necessary to localise where industries tend to locate and the spatial factors related to their localisation in specific urban areas. This represents the last step of the cluster spatialisation process and it has been provided by the connection between NAICS

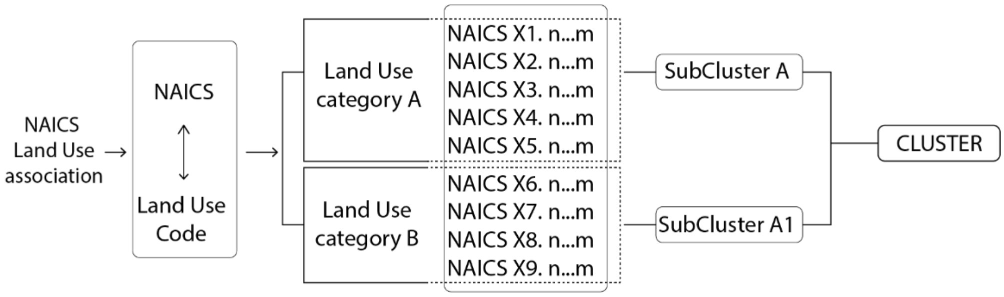
(North American Industry Codes Sectors) and Land Use. NAICS sectors are strictly connected to the classification of Clusters operated by Delgado et al. (2013).

Drawing insights by the idea developed by the City of Commerce in Colorado, which combines land use development codes and NAICS, the methodology developed aims at displaying where clusters are physically localized within a urban territorial scale.

In particular, the methodology's rationale is based on the explanation that a specific land use code can be combined to a set of economic activities classified within NAICS codes, and subsequently to sub-clusters and then to clusters.

The spatialisation at urban level through the association between NAICS and Land Use using the parcels as reference unit allows at detailing the specific localisation of clusters at urban level. The following schemes show the rationale of this methodology starting by the cluster definition provided by Porter.

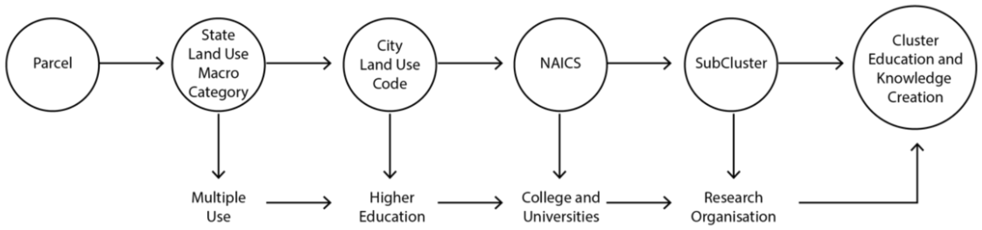
Figure 15 Cluster Spatialisation through NAIC-Land Use Association



Source: MAPS-LED project elaboration

The association between Land Use categories with NAICS codes per parcels was targeted to the spatialization of clusters at the urban scale. It aims at providing a highly-descriptive and updated "picture" of clusters at the local/city level. Land Use codes have been obtained aggregating parcel data available from the Assessing Departments of the City of Cambridge and Boston available as open-data source.

Figure 16 Example of NAICS - Land Use association through parcels



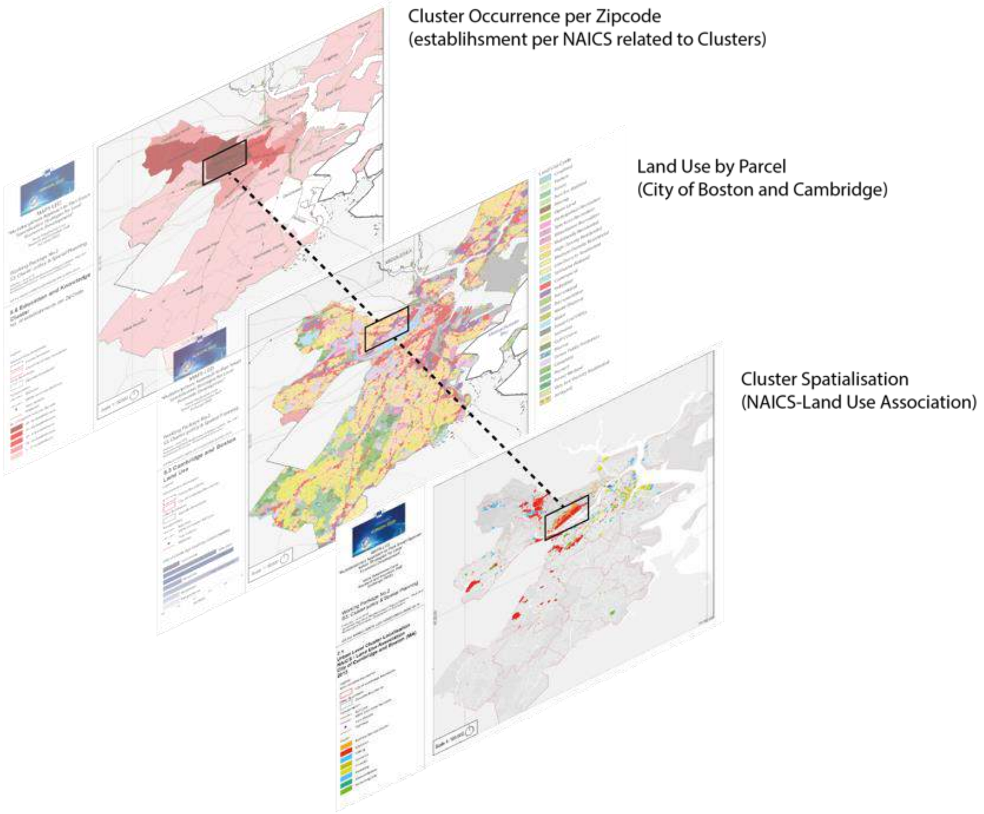
Source: MAPS-LED project elaboration

The typology of land use is ascertained for each parcel and established by the municipalities of Massachusetts, accordingly with the Property type classification code[1], which refers to the Chapter 59 -Massachusetts General Law2. It intends to provide guidelines for the proper classification of parcels according to their use, but at the same time lets each City to identify specific Property/parcel type classification code within the range provided at State level.

The land use open access data of the City of Cambridge and of the City of Boston have been used, in order to connect land use of parcels with NAICS.

Specifically, the current land use has been built through GIS starting from the zoning provided by the Parcel Assessment Fiscal Year 2016 of both cities. Each use destination has been put in relationship with NAICS codes for the year 2012, which is used as main reference.

Figure 17 Cluster Spatialisation: From Cluster occurence at City level to Cluster definition at urban level



Source: MAPS-LED project elaboration

This association allowed at directly relating land use category with clusters, producing maps of Cluster spatialization in the cities of Boston and Cambridge,

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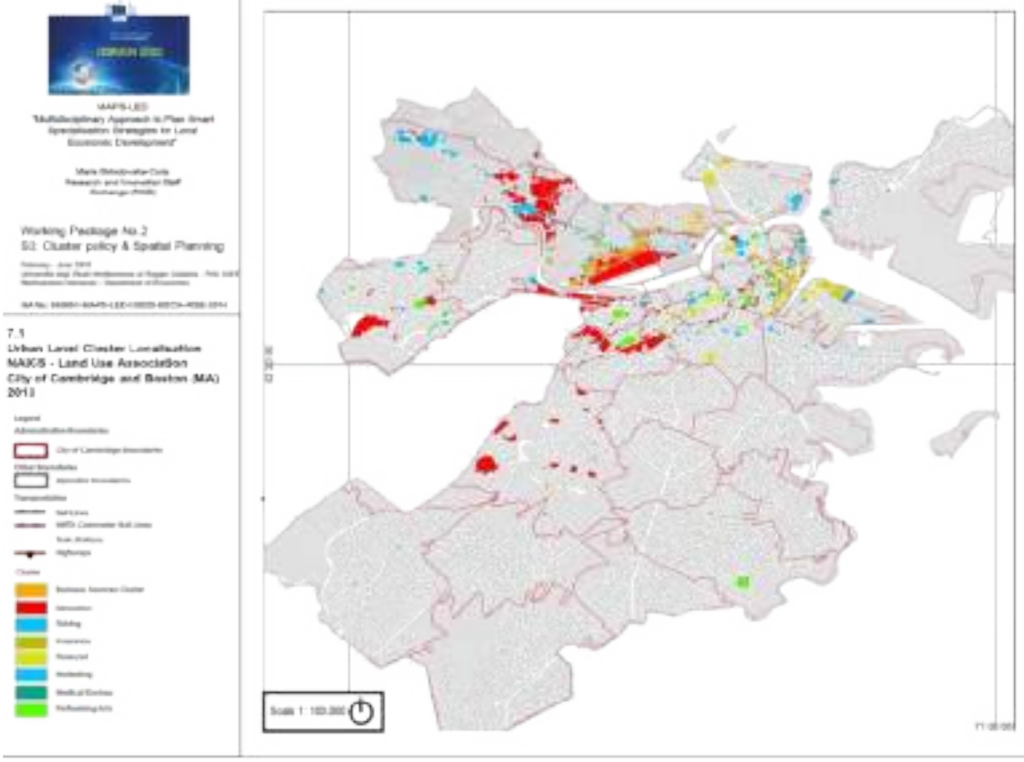
[1] http://www.mass.gov/dor/docs/dls/bla/classificationcodebook.pdf

[2] Chapter 59- Mass General Law reference: https://malegislature.gov/Laws/GeneralLaws/PartI/TitleIX/Chapter59/Section59

The mapping activity, characterised at parcel level, allowed understanding where clusters are more concentrated and where it is possible to observe a high or low level of concentration. The Figure 18 provides the distribution of Cluster at urban levels. The city of Cambridge has a major concentration of establishments due to the presence, not only of two of the most important and recognised academic institution of the world (Harvard and MIT), but also for the presence of high number of related activities, accordingly with the definition of cluster provided by Porter and the US Cluster Mapping Portal which include: Training Programs; College, Universities and Professional Schools; Educational Support Services; Research Organisations; Professional Organisations.

Figure 18. Cluster spatialisation in Cambridge and Boston (MA)



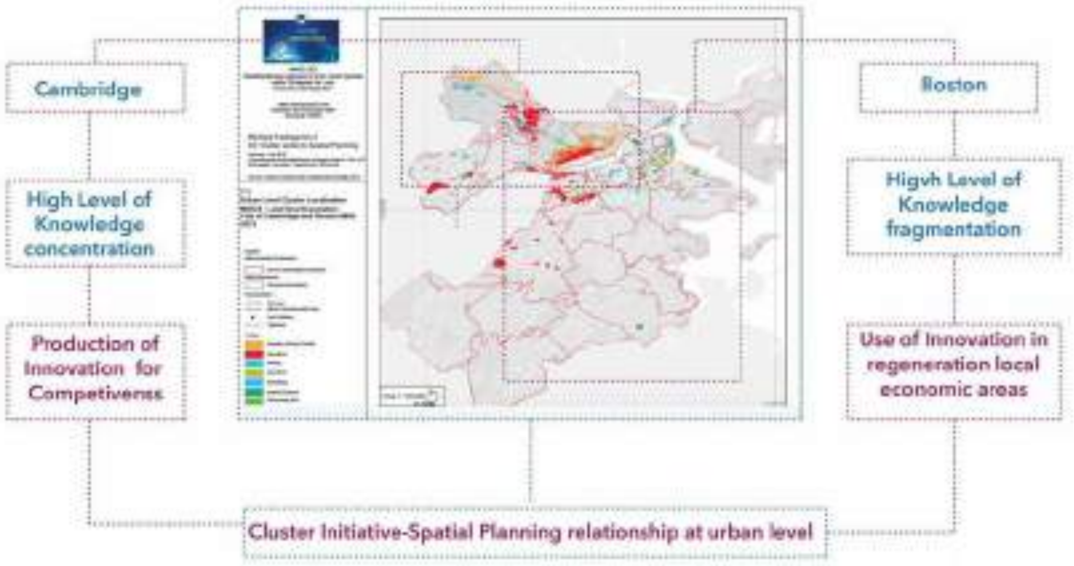
Source: MAPS-LED project elaboration

The map shows a cluster concentration in the City of Cambridge (Education and Knowledge Creation, Business Services, Market and Design and Medical Devices). If we look at the Business Services cluster, it is possible to note how it is concentrated around the Education and Knowledge Creation cluster. In addition, the Market and Design as well as the Medical Devices clusters are localised very close to the Education and Knowledge clusters and distributed along the main roads. The city of Boston presents a different cluster spatial distribution pattern.

Although clusters are concentrated in the inner city area, they look more geographically dispersed. Following the Porter definition of cluster, the map (Figure 19) highlights those areas where specialisation, innovation and firms are concentrated. The cluster spatial distribution scheme could be due to the different size of cities and other factors such as proximity and accessibility to other services or transportation facilities and city urban policies, all factors that can affect the location of an economic activity. The presence of clusters highlights a high propensity to (physical) transformations driven by urban planning tools that translate innovation objective in innovation space requirements.

It is not a case that the Kendall Square area, in Cambridge, is the one that is facing the major changes during the last decades. The presence of Anchor Institutions, companies, start-ups, business incubator and accelerators is pushing the demand of innovation-related space and the offer of traditional public services in the area. Conversely, the City of Boston is focusing its attention to urban distressed areas outside the inner city, i.e. the Boston Innovation District, Roxbury, and South End, highlighting a sort of expansionary innovation shift from the urban core of the city to the suburbs (Figure 19).

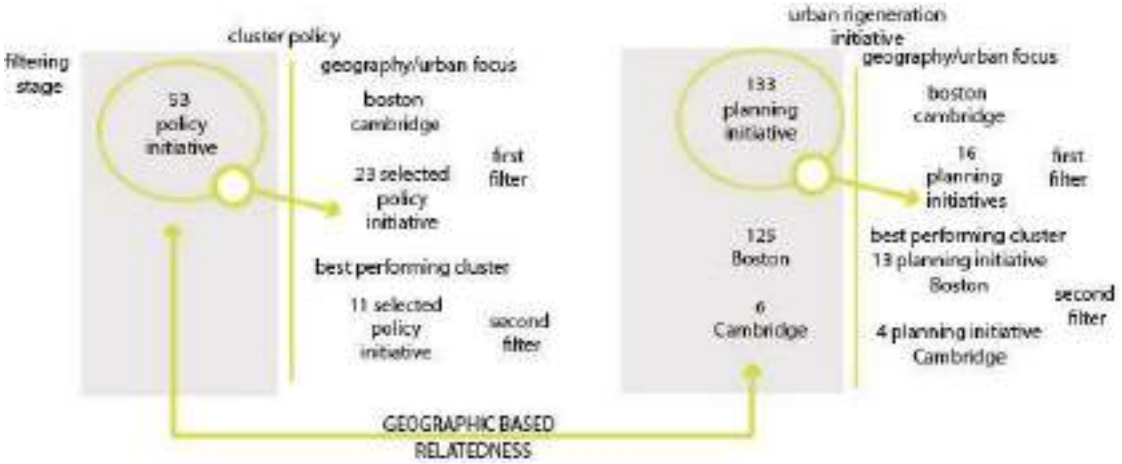
Figure 19 Innovation concentration vs. innovation expansion



Source: MAPS-LED project elaboration

The nexus of cluster spatialization at city level and urban regeneration initiative is the core of the WP2 “Cluster policy and Spatial planning”, where different typologies of cluster localised at city level have been correlated with the so called “innovation spaces” occurred in those localisations. The innovation spaces analysed has been considered as policy initiatives, in terms of interaction between urban policy and cluster organisation/cluster initiatives promotions, but also as an emerging factor of new demand of innovation-oriented physical transformation.

Figure 20 Cluster Oriented Policy initiatives and Urban Regeneration Linkages



Part I

Cluster Policies and Spatial Planning: Urban Dimension of S3.

1. The context of innovation policy

Carmelina Bevilacqua, Pasquale Pzzimenti

The relationship between innovation and space towards the evolving concept of cluster

The interest in industrial clusters aroused academics and policy-makers' agenda in a remarkable way during the 1990s and the beginning of 2000s, together with a certain attention on local specialisation to face the negative effects of globalisation and global networks (Cruz and Texeira, 2009). It is possible to argue that the origins of cluster dates back to the end of the 19th century, and precisely to the theories and contributions of prominent economists such as Alfred Marshall (1919) on agglomeration economy and industrial districts.

The Marshallian model has been influential on geography of innovation studies during the 20th century (Florida et al. 2017), and ultimately on cluster studies, especially for the spatial implications of economic activities. Traditionally, from a spatial perspective, studies on competitiveness tended to focus on nations as unit of analysis (Porter M, 2003). The attention of economic geographers during the 1970s and the 1980s started to focus on regions, which seem to reveal "high level of spatial agglomeration, intra-local business networking, innovation and growth" (Scott, 2000: 492). Since the 1980s with the increasing interest in globalisation phenomena, location and spatial proximity aspects were loosing interest in the debate of competitiveness of economies (Sassen, 2011). During this period, theories and models have been developed on competitiveness of specific geographic areas (Table 3), which would deeply affect the current concept of cluster.

Table 3 - Post-Fordist economic geography thought between the 1970s and the 1980s

School of Thought	*Main Characteristics*
Italian School (Beccatini)	Industrial Districts (Marshallian) to account the dramatic rise of neo-artisanal manafucturing in North-east Central Italy after the 1970s
Californian School	Peculiarities of Southern California: vertical disintegration, inter-industrial transactional networks, local labour markets (and the concomitant increasing returns effects)
GREMI (Milieu Innovateur)	Innovative forces contained in the multiform texture of local economic and social life

Source: MAPS-LED project elaboration from Scott (2000)

The studies on the Italian industrial districts match the Marshallian model in terms of specialised labour market, access to specialised services and to non-excludable knowledge (Marashall, 1919), anticipating the current concept of cluster. The Italian industrial districts have been integrated with studies on local labour markets (Californian School) and with the attention about the relationship between space and innovation (GREMI Groupe de Recherche Européen sur les Milieux Innovateur) with the introduction of the "milieu innovateur" concept.

The GREMI group paid "specific attention to the role of space in innovative and localised processes. A region's development is not merely subordinated to its capacity to attract external firms but it also depends on its capacity to promote local initiatives, to create a wave of new forms and to activate a territorial dynamic of innovation in identifying new relationships between space and innovative processes.

The accent is placed on the endogenous dimension of the creative (innovative) process and on an active role of space, in which the region is integrated in a process of creation/destruction, of diffusion/concentration of technological innovation" (Bramanti, 1998). Studies on localised production system and milieu innovateur have demonstrated how the "complex interaction of demand, increasing returns, transport costs, as well as learning processes and other relevant elements, yield to performances even spatially differentiated, with areas which become losers or winners in the new competitive environment" (Bramanti, 1998: 3).

During the 1990s these approaches led studies and researches to focus on the effects generated by globalisation processes on the economic environment. The market openness due to globalisation process generated an increasing demand of competitiveness to which firms were called to meet. In particular, the challenge of competitiveness caused "an acceleration in the rate of technological change and the pre-requisites necessary to participate effectively in globalisation are making it more difficult for many developing countries to compete" (Dahlman, 2007: 29). The panorama depicted competitiveness and globalisation has been shaping the response of development policies arising the issue of geographical agglomeration as main source of competitive advantage (Porter, 2003).

Consequently, the period between the 1990s and the 2000s highlighted the importance of clusters in boosting competitive advantages. In "*The Comparative Advantage of Nations*", Porter (1990) developed a micro economically based theory in understanding competitiveness in the global economy enhanced by the occurrence of clusters (Porter, 1990).

The high presence of clusters in regional economies reveals an important insight into the role played by locational aspects in determining competitive advantages and triggering local and national competitiveness, especially about the complex and dynamic knowledge-based economy (Porter, 2000).

Following Porter, clusters are defined as "geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institutions (e.g., universities standard agencies, trade associations) in a particular field that compete but also cooperate (Porter, 1990: 15). Although the above definition is widely recognised, differences in cluster's definition can be highlighted following three "of most its relevant elements elements" (Cruz and Texeira, 2009: 4).

Table 4- Main Cluster characteristics according to Crux and Texeira, 2010

Main elements	*Description*	*References*
geographical proximity	…among clusters' component which generates agglomeration economies (scale and scope economies) through internal specialisation and the division of labour	Doeringer And Terkla, 1995; Swann And Prevezer, 1996; Commission Of The European Communities, 2008
social networks	…which involve the web of connections within the cluster, leading to the formation of various types of proximities (sharing of common technologies, labour, and infrastructures) and to the transmission of knowledge and collective learning	Roelandt And Den Hertog, 1999; Rosenfeld, 2005; Asheim, 1996
culture and business climate	…(institutions, common values and beliefs) (such as trust, informal ties, and cooperation), that enables the development of new ventures and thus, the evolution of the cluster itself	Saxenian, 1994; Maskell, 2001; Rosenfeld, 2005

Source: MAPS-LED project elaboration from Cruz and Texeira 2009

Spatial proximity, interrelatedness of capabilities/activities, interaction between agents, and institutional endowment are, therefore, key element of clusters (Cruz and Texeira 2009:5). In spite of the clearly recognised "geographic" concentration, it is not well investigated the role of "places" (context thereby) with different characteristics in enhancing cluster performance and boosting competitiveness. "Geographic concentration" and characteristics of "places" led to consider cluster connected with a "geographical space" (Mazúr & Urbánek, 1983) where is important the distance over which informational, transnational, incentive, and other efficiencies occur" (Porter, 2000: 16). Clusters can help the understanding of these processes not from a merely basic economic concept favouring competitiveness but as "phenomena that exist in the economic landscape of regions" (EC, 2013) able to distribute competitive advantages in the same territory.

Recently the concept of cluster has been understood in a more dynamic system characterised by the presence of a network of agents (regional innovation system) or based on the technological paths of regions and their historical trajectories (institutions and cultures) (Cruz and Texeira, 2009: 5). "In order to understand the significance of clusters as phenomena and the extent to which policies can influence them, it is necessary to extend this definition to embrace spatially-dependent processes that are thought to affect competitiveness (EC, 2013). This need calls for a better inclusion of the spatial dimension in designing innovation and competitiveness oriented policies, especially in order to understand where innovation is concentrated and spread its positive effects in a smart, inclusive and sustainable perspective.

Florida et al. (2017) identify in the city the proper geographical space where innovation, creativity and entrepreneurship merged, in boosting economic growth and in defining a new environment. confirming also the Schumpeter's ideas on cities as ideal place where innovation can flourish and be nourished. Innovative activity is far more clustered and concentrated than population and/or production activity

(Florida et al. 2017), then it is useful to take into account those local aspects that contribute to the concentration of innovation from a bottom-up approach. Applying this connection at the regional dimension helps in terms of providing a "big picture" of the ongoing phenomena and address the major issues but it is at local/city level that innovation seems to be concentrated. As a matter of fact, the geography of innovation as well the economy of innovation privileged the regional dimension (Shearmur, 2012) but it is on the city level that this connection produces the real change in regenerating local economic areas and subsequently valorises the local assets (material and immaterial) reinforcing the existing domains and identifying the new ones.

2. A glimpse on Italian context

Policies towards Smart Specialization Strategies in Italy. Inland areas and clusters

Michele Talia

The territorial imperative

As many scholars have highlighted, a major part of Italian territory is characterized by the presence of a settlement system based on "minor centers", often small or very small. In many cases they are able to provide to residents only a limited accessibility to basic services. The specificity of this territory can be summarized using the term "inland areas".

Proposing itself as "territorial capital unused", the inland areas aim to define a development path based on the sharing by the actors of real opportunities for productive specialization. A path, in other words, that aims to create favorable conditions for the market and the reorganization of basic community services (health, education, mobility).

In any case, local systems and their economic actors have to deal with the demand and the preferences of consumers and investors in the national space, European and even global. The revitalization of inland areas is necessarily a relaunch of local systems as areas of production and this requires a steady demand for goods and services produced locally.

The incidence of inland areas in the Italian national settlement system

In this broad portion of the country - which is more than three-fifths of the total area - are concentrated more than half of the municipalities and about 23% of the total population. If only for this data, the incidence of the inland areas is far from marginal, so as to ensure that this matter has become a major national issue.

The geography of "inland areas" in Italy

While presenting deeply different conditions, these areas have important resources both environmental (water resources, agricultural systems, forests, natural and human landscapes) and cultural (archaeological and historical settlements, abbeys, museums, craft centers). They may be described in terms of "potential for economic development". Furthermore, because of their physical proximity to the industrial districts grid, they may become the focus of an integrated development policy to achieve smart, inclusive and sustainable growth in the framework of a territorial cohesion.

The centrality of knowledge

Somehow, the smart specialization strategy is able to provide a strategic approach to economic development that could encourage the involvement of marginal areas through targeted support for research and innovation. It involves a process of fostering a vision, identifying the areas of greatest potential, developing multi-stakeholder governance mechanisms and setting strategic priorities. But above all it implies the use of smart policies to maximize the knowledge-based development potential of a region.

Over the past several decades, a number of scholars have argued that the leading edge of the economy in developed countries has become driven by technologies based on knowledge and information production and dissemination. These new technologies have a strong potential toward the re-making of nature of work and the economy. To the point that the knowledge itself can acquire in some case the character of specific element, and in others the nature of "common good". In particular it becomes a common good when it is conveyed without costs for economic agents, along with appropriate social networks.

USA: a selection of high-tech trade

The problems concerning the creation and transfer of knowledge occupy the first place when a comparison is made between the main forms of the aggregation of economic activities such as industrial districts and trade clusters. The districts are basically self-organized; the knowledge that is the basis of local production processes arises largely from existing expertise on site and from educational and cultural processes of endogenous nature. On the contrary, the strong "trade clusters", at least to a certain extent, tend to attract organizational pulses coming from the outside. It follow that very often the knowledge that is the basis of production processes come in large part from the outside and often from very far away.

This less cohesion is offset by a greater length of the networks of productive relations, in the sense that the clusters are part of the necessary skills outside of the local reality, contrary to what happens in the districts.

The spatial consequences of innovation process

From this different point of view it should be reminded that the scholars who are most interested in the making of industrial clusters - in Italy, but not exclusively - have often turned the spotlight on the phenomenon of urbanization. And that is because the cities form real aggregations of sectorial economic activities, in which they manifest transformation processes related to the growth of technology and to the increase of knowledge. According to Krugman, the city is a diversified cluster of activities, or otherwise the result of self-organization processes that feed just the diversity of the activities which are placed. The starting point is represented by the close link between the city and innovation, also pointing the specific role of brownfields in metropolitan areas regarding the incubating of new, innovative companies.

It should be stressed that it is the same concept of locality to take on new aspects from an economic point of view: in fact the space is the dimension in which agents and artifacts interact to produce new ideas (invention) and new market systems (innovation).

The differences between industrial districts and trade clusters

Finally, the new approach to questions of regional development, centred on concepts of networks, local production systems, districts and so on, opens up a deep split in the organisation of traditional theories. This has clear effects on the scaffolding of regional policies.

View from an italian observatory, the geography of large trade clusters designed by Porter - on which our young researchers are training in this exciting period of stay in Boston - makes us think about how it could have been our national reality if Italy had followed a different trajectory. Or it makes us think about how will be our future, but we do not know well at the cost of such changes and sacrifices.

The ambivalent nature of clusters

The current structure of the Italian business system is the result of the policies undertaken in recent decades, in support of a network of small and medium-sized enterprises, which in turn overlaps on a dense grid of urban realities characterized by a small size and by a glorious past. The affirmation of this paradigm - which was labeled "Third Italy" from Arnaldo Bagnasco - has attracted the interest of scholars and policy-makers from all over the world. The success of italian local small business systems is so obvious that it has led to a genuine fashion of the local labour system or cluster capable of endogenous development, not only in Italy but also in other countries. A host of researchers, development agency executives and policy-makers are still busy in a dual process of analysis and concrete intervention.

The study of these spatial organisations, which we call “productive or industrial districts”, has shown that local development occurs independently because productivity here relies on cognitive work and on widespread knowledge rather than on the simple learning of regulations and standard paths defined by the centre. A local development project does not necessarily have to become a ‘model’ for others, but must primarily show that it is autonomous and can meet the needs and ambitions of its constituent community.

Two types of cluster

From this point of view, it seems convenient to distinguish between at least two different meanings of industrial cluster. As to the first, it refers to the cluster in his most complete and radical dimension, which is made up of companies settled without particular localization benefits than those offered by the metropolitan milieu. In such situations the cost of membership is simply made up from renting and the bulk of knowledge which one can gain is explicit and codified, available to any actor and organisation that may prove competitive.

The second meaning is instead related to an industrial cluster that is arranged according to a social network model in which the trust relations are marked by a variety of features, such as joint lobbying, joint ventures, informal alliances, and reciprocal arrangements regarding trading relationships. Whereas the former is easily applied to environments characterized by the presence of large companies, by high levels of financialization and by the dominance exercised by global networks, the second is at ease when it can rely on a fairly high degree of geographical proximity. So that it is possible to assume that the ability to overcome the transaction spatial costs involved in knowledge acquisition is the primary rationale underlying the existence of modern cities.

The opportunities of Smart Specialization Strategy

In the context of relations between the different forms of knowledge and spatial aggregation patterns of economic activities - very narrow in the case of industrial districts and far more ephemeral in clusters - the smart specialization strategy developed by the European Union appears to be able to promote a recomposition between theoretical approaches and applied results that point to potentially conflicting models.

The ideas around the smart specialization are perfectly consistent with the global growth strategy of the European Commission and with its response to the economic crisis, past and ongoing. These include an emphasis on identifying areas of competitive strength, the resolution of the main social problems, the promotion of innovation partnerships and the demand for greater coordination among the social actors for aligning resources and strategies between private and public actors of different governance levels. In addition, there has been a too strong focus on providing technology and R & D, which has led to a lack of recognition of other important areas for innovation, such as stimulation of demand, market access, social innovation and service.

Smart Specialisation is a strategic approach to economic development through targeted support for research and innovation. It involves a process of developing a vision, identifying the place-based areas of greatest strategic potential, developing multi-stakeholder governance mechanisms, setting strategic priorities and using smart policies to maximize the knowledge-based development potential of a region.

Forgetting the value of experience in the industrial districts, many scholars have recently suggested that the "smart specialization strategy" are difficult to design and build, because it is based on a new and complex academic framework that must now be translated into practical politics. According to this criticism, it would be better to collect the lessons learned from the rich history of cluster policies and make concrete contributions to the development of smart specialization strategies. This criticism fails to remember the value of italian experience in industrial districts, where the encounter between demand and supply of new technologies has made easy the use of bottom-up approaches and testing of place-based policies.

Trying to summarize the discussions conducted by up to this point, it is possible to argue that the special features of the new technology are the basis of a complex redefinition of innovative processes and their spatial organization. Despite the doubts that have been raised in this paper on the role of clusters in the definition of public policies in support of the innovation, you can not help but notice the need to ensure the existence of a close association between this way of defining the concentration of interconnected companies and the presence of any forms of spatial agglomeration in which the immaterial networks between businesses can not be dissociated from the urban framework.

Conclusions

At the end of this short report I would like to emphasize that the cluster theory, if it is a very useful tool to describe and understand the behavior of enterprise networks and innovative processes at the regional scale and large metropolitan areas, it proves less effective at the urban scale especially when the interpretation of settlement structures is directly aimed to the assessment of public policies. Next to it I think it is useful to remember that the imitation by transfer of already tried and tested models should be carefully avoided, not only because it is conflicting with an evolutive conception of the economic system, but also because it is based on the hypothesis of the permanent ‘productive’ subordination of some areas and cities to others.

Quoting Dominique Foray we can assume that smart specialisation strategy is not the same thing as a cluster policy. Of course generating a vibrant innovative cluster is a classic outcome of a smart specialisation policy which is “good for my region”. But regional cluster policies do not change the problem of strongly mimetic national programmes resulting in knowledge base uniformisation, wasteful duplication of R&D efforts and dissipation of the potential agglomeration economies at system level. Smart specialisation, on the other hand, generates a greater diversity of areas of knowledge expertise at system level and makes the whole system more capable of reaping the benefits of the agglomeration economies arising from the development of distinctive and original sets of capabilities in each region.

Towards implementing RIS3. Current dynamics and obstacles in the Lazio Region

Annalaura Palazzo

The three industrial revolutions of the past were triggered by technical innovations: the introduction of water and steam-powered mechanical manufacturing at the end of the 18th Century, the division of labor at the beginning of the 20th century and introduction of programmable logic controllers for automation purposes in manufacturing in the 1970s[3].

The upcoming industrial revolution is being triggered by the Internet, undermining previous location factors, both scattering production processes and incorporating them within urban areas.

In Lazio, due to a defective modernization in the 20th Century and to specific industrial patterns - small size businesses are the majority -, such phenomena have occurred since the early Eighties. Centrifugal trends led small businesses to accommodate everywhere, avoiding areas especially designed to this purpose. Such fragmentation, which proved ineffective both for sector-specific strategies and for the territories, due to general lack in accessibility, high environmental costs, etc., is a major concern for policy makers. It is sufficient to think of soil consumption, notably in the Metropolitan area of Rome, which alone touches 71,000 hectares, increasing by 500 hectares between 2012 and 2015 at the expense of agricultural areas. Statistic data referring to the last decade point out that that same area is still seen as a huge market for goods and services rather than as an employment area, and that its inherent 'resilience' to the 2008 crisis is undoubtedly linked to public sector.

These dynamics are to be framed within their ‘host contexts’, the territories, in the long run. After a phase spurred by the central initiative of the *Cassa per il Mezzogiorno* for the locations of equipped industrial areas[4], the Region has come to the fore in the Eighties as the main ruler, addressing ‘districts’ and ‘local production systems’ characterized by different typologies of specialized production (Regional Law 36/2001).

In 2013, the Lazio Region has initiated a re-industrialization policy cycle in order to support strategic sectors according to the Europe 2020 Strategy[5]. The commitment to the RIS3 strategy (the document “Smart Specialisation Strategy” was approved by the Regional Council in July 2014) envisages 12 macro sectors as the main pivots for forthcoming regional policies. Aerospace and Safety; Agri-food; Audiovisual and Creativity; Automotive; Circular Economy; Construction; Sea Economy; ICT, Electronics and Smart Cities; Fashion Design, Italian Style Furniture; Life Sciences; Transport and Logistics; Tourism and Cultural Heritage.

Apart from deep-rooted sectors long since settled in specific areas (Aerospace, Sea Economy, Life Sciences, and somehow ICT), these ‘specialization areas’ are not to be envisaged as physical clusters, since they are often dispersed, and as such they need

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[3] Industrie 4.0 Working Group, “Recommendations for implementing the strategic initiative Industrie 4.0,” 2013.

[4] Such ‘Territorialization process’ in Central and Southern Italy was initiated by the special intervention of the Cassa per il Mezzogiorno after the IIWW. Several areas in Lazio were included, allowing multinational firms (notably pharmaceutical and aerospace major companies), along with component suppliers to settle down thanks to economic and fiscal incentives.

[5] The Lazio Region share of the European GDP is 1.4%, and 11.5% of the Italian one. Investments in the consumer goods still play a major role (almost 30%), while the production function total nearly 20% both in terms of capital and new jobs. See: Crescenzi R., Iammarino S., Rodríguez-Pose A., Multinazionali, imprese locali e Sviluppo economico nella Regione Lazio, London School of Economics, Luglio 2016.

to be better connected[6]. This is all the more true within the new structure of the international division of labor, where goods are the result of long 'global supply chains' - so-called 'new globalization' - to which firms of different countries add valuable pieces in terms of goods or business services.

As a matter of fact, industrial patterns differ according to strategies, logics and rationales underpinning sector-specific and/or process-specific location choices. In this respect, the issue is twofold: we are witnessing, on the one hand, a kind of disconnect between the 'Ideal Region' as it was planned, and the 'Real' one, on the other, persisting segmentation and lack of communication between programming and implementation at the local level.

Networks between SMEs, large holdings and multinational companies are essential both for technology-intensive sectors, such as aerospace, electronics or pharmaceuticals[7], and for others, such as tourism, fashion, design.

How does currently exchange occur within the territories, and what kind of governance can address sector-specific obstacles?

What are the implications both in terms of new production settlement patterns and of processing and marketing models on the domestic and international markets? how can networking be a major catalyst in what seems to be at all effects a 'post-economies of scale era'? what models of facilitators - startups, business incubators, consortia - are likely to envisage 'territory' as an opportunity rather than a 'cost'?

Reportedly, in Lazio some major problems are:

- Everchanging dynamics within the entrepreneurial milieu between multinational corporations, local businesses and the socio-institutional environment in terms of supply of goods and services requiring intermediate contractors, and/or large enterprises as shareholders of small companies with minority shares. Their overall strategies are differentiating, even within a same sector area, depending on their relationships to local and global contexts.
- Atomization: Industry 4.0 is far less polluting, but all-pervasive. Still, it needs to put down roots in specific living environments with previous settings and rules. Co-working practices, which allow for new vibrant and creative environments, derive from the 'tenement factories' and 'flatted factories' of the first industrial revolution, buildings originally intended for small independent production activities powered by the same energy source.

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[6] The Lazio Region is committed to invest 100 million for enabling businesses to compete more effectively on the global market; 3 million for redevelopment of brownfield sites; 28 million for Ecologically Equipped Productive Areas (APEA) and related infrastructure; 30 million for the internationalization of the production system; 20 million for supporting the transformation of creative ideas into business ventures.

[7] The pharmaceutical sector is the first export sector, accounting for 36% of the regional total (Farmindustria data, 2013).

- The 'last Mile' constraints in accessibility, hampered by poor infrastructure in all senses, obliging to rethink the interdependencies and exchanges in Lazio between the different local systems even in full autonomy from Rome, and under the perspectives of increasingly globalized markets.

All these issues, place-based and scale-dependent, are crucial. So far, despite the need to fulfill the principles of cooperation and concentration (in so-called 'technology districts' and 'parks of activities' provided by planning tools), the world of production and that of policy-makers have not been able to streamline the process. Obstacles are to be found in deep-rooted mistrust from local authorities towards selective solutions; in municipal reluctance towards inter-institutional cooperation (including common agreements); in the absence of incentives for restructuring productive activities: all these circumstances result in a scenario whose social, economic and environmental costs, are difficult to face up to.

The forthcoming policy Agenda of the Lazio Region should take into due account all these crucial issues, in order to perform a sustainable and resilient approach to 'territorial innovation' complying to the strategic objectives of Europe 2020.

Metamorphosis of Territorial Districts. Sassuolo as a Case-Study

Cristiana Mattioli

Industrial district has been defined as "*a socio-economic entity characterized by the active coexistence of a community of people and a population of firms within a delimited territorial area*" by Giacomo Becattini, probably the foremost expert on this topic.

The term identifies those territories – in Italy, mostly located in the North-Eastern and Central parts of the country – where industrialization appeared in tardive and diffused forms, delineating an alternative model of development for the Fordist one.

From a territorial standpoint, industrial districts originated from commercial and industrial towns surrounded by countryside organized in a sharecropping system; thus, these territories presented both urban and rural elements.

Industrial districts flourished and grew mostly during the 70s' and 80s', whereas they consolidated during the 90s'. Today they still represent the backbone of the Italian industrial system (in terms of GDP production, employment and innovation), even if they appeared to be often underestimated in comparison to global cities and metropolitan regions. Industrial districts have deeply changed due to several factors, among which globalization, economic crisis and knowledge economy improvement. First, they are today more open and inserted in supra-local networks thanks to internationalization process. They are more hierarchized, with some middle-sized firms controlling the whole supply chain. Also, firms have absorbed important quotes of R&D and tertiary functions, entering the knowledge economy phase.

Facing these important operational transformations, the aim of the research is to understand how spaces of production and industrial district territories are changing.

The ceramics district of Sassuolo represents an interesting case-study for analysing the evolution and transformation of Italian traditional industrial districts. It is located in the Emilia-Romagna region, between the two Provinces of Modena and Reggio Emilia. Due to strong urbanization process started during the 60s', it represents the biggest conurbation of the foothill area of the region (about 180.000 inhabitants). In productive terms, hundreds of firms of the industrial district represent 80% of Italian domestic production of ceramic tiles and employ more than 18.000 people.

Sassuolo ceramics district shows a consolidated configuration that can be described as a "system" of innovative, internationalized middle-sized firms, which result from the long-term process of acquisitions and merges. Leading companies are also linked to the peculiar evolution of the district:

1. For technical reasons, ceramics firms are historically related to big dimensions. Due to acquisitions and merges, this element is today more and more evident.
2. Ceramic tiles' supply chain has always been divided in few industrial phases, which today are likely to be re-internalized by leading firms to increase productive efficiency.
3. The strong horizontal integration continues to characterize the local industrial system, allowing the persistence of small, specialized firms.
4. Internationalization processes occurred at early stages and in an extended way. Local firms (also the smaller ones) are thus used to exportation and competition. This capacity has helped local system to get out the crisis, allowing the maintenance of worldwide qualitative leadership.
5. Even if industrial and urban growth were fast and frequently not controlled by local administrations, labour and spatial public policies played a pivotal role in supporting the technical innovation of local companies, by allowing peripheral relocations linked with land valorisation or by imposing strict environmental limitations.

All these elements have shaped the industrial and territorial configuration of the district, with its extended and scattered spaces of production that today experience two opposite, yet coexisting processes.

Leading companies guide the present evolutionary phase, integrating more general trends of industrial transformation: the innovation related to the so-called "Industry 4.0" (ICT, technological innovation, efficiency, automation, etc.) brings to internal improvements and operations of re-articulation and enlargement of industrial lots. Whereas, customization, communication and welfare services equipment require more attractive spaces and requalification interventions, in some cases extended to nearby infrastructures and areas.

The dynamism of these private investments has recently improved the quality of many industrial spaces, which however tend to remain isolated and introvert. They contrast with a territory that is generally fragmented and poor in urbanity. Episodes of abandonment and underuse of industrial areas are frequent, even if they are rapidly reused for productive or logistical purposes. As a matter of fact, the ceramics district is today not only a manufacturing pole, but also an important logistics hub serving European markets.

Demands of enlargement and contraction coexist. The Sassuolo case-study reveals how territory is today strategic but, at the same time, frequently inhospitable and inefficient for local companies, especially for the most innovative ones. In fact, the quality of the territory is far from being coherent with the quality of ceramics products and renewed plants.

In order to increase local competitiveness and attractiveness on a global scale, the ceramics district – and similarly other manufacturing territories – is thus required to be more diversified, efficient, and livable (especially for high skilled-workers required by leading firms). So, it needs to invest in its territorial capital by defining a shared, systemic and coherent territorial vision, primarily based on the requalification of existing urban materials. Nonetheless, its implementation is connected with two essential conditions.

On the one hand, it is crucial to set a supra-local governance system able to overcome local rivalry and competition and, on the contrary, to promote cooperation and complementarity. In this sense, the idea of creating a greater "city-district" by gathering the eight municipality of the ceramics system is promising, even if culturally hard to support by local administrations. On the other hand, territorial vision needs to be clarified and locally tested through different, specific projects of urban reform. When interventions are related to industrial spaces and infrastructures, it is necessary to envisage new forms of public-private partnership to tackle resource scarcity, but also to define a more incisive role played by companies in requalification projects. It is probably in this field (territory) that local competitors can maintain today relations of cooperation, thus reinventing the original integration between economy, society and territory.

3. Innovation and Knowledge for Implementing 'Smart Strategies' in the European Union. Some Lessons from the Boston Area

Bruno Monardo, Claudia Trillo, Claudia Mattogno

Innovation is gaining increasing attention in the contemporary European policy making and research arena. RIS3 (Research and Innovation Strategies for Smart Specialisations) translate into a policy the concept of entrepreneurial discovery, incorporating the process of co-creation across multiple stakeholders within the development and implementation of regional strategies for growth. Policy makers, entrepreneurs, planners, researchers and other stakeholders involved in regional and urban policies need a fresh view on the current innovation strategies at the forefront of the European debate, in particular by focussing on how RIS3 could be successfully implemented in cities. At this goal, it is useful to draw insights from paradigmatic international best practices, such as the innovative clusters in the Boston area, by assuming that intriguing relationships exist between innovative clusters and Smart Specialisation.

Spurring innovation: Smart Strategies, place-based approach and cluster policies

Innovation, stemming from the 1940s concept of *creative destruction* (Schumpeter, 1942), is at the forefront of the European debate as key element for coping with the current global crisis (Madelin & Ringrose, 2016). Indeed, overcoming the persistent Research & Innovation gap among European Regions has been a major ambition of the Cohesion Policy since it was launched. The privileged strategy for pursuing the *Smart, Sustainable and Inclusive* growth Europe 2020 vision is the integration of three drivers: 'Smart Strategies', high tech and 'place based' approach.

The origin of the European policy renowned 'Research and Innovation Strategy for Smart Specialisation' (RIS3) dates back to the work of a group of experts coordinated by Dominique Foray (EC 'Knowledge for Growth', 2009). The Smart Specialisation concept appears originally in the academic literature examining the so called '*transatlantic productivity gap*' between EU and US economies (McCann & Ortega-Argilés, 2015). The Information and Communication Technology sector (ICT) boosted the US productivity growth more than in Europe where the support of new technologies for innovation was scarce. In order to tackle the gap and launch a knowledge-intensive growth model (Camagni & Capello, 2013), the EU designed RIS3, within its Europe 2020 Agenda, which aims to promote local innovation processes in particular sectors and technological domains through a bottom-up identification of specific 'innovation patterns'.

RIS3 is based on four principles: 1) economic development is knowledge and innovation-driven; 2) history matters; 3) the perspective of economic growth embraces the bottom-up approach; 4) this policy is demand-driven, i.e. derived from local potentials and needs. Because of its focus on the specific regional assets, the RIS3 policy is embedded in the 'place-based' approach (Barca, 2009), implying *co-creation* between local actors and all levels of government. Thus, local policymakers, universities and private entrepreneurs are the key actors for promoting knowledge and innovation (Capello, 2014), whereas governments perform a strategic role in the involvement of local stakeholders and public-private coordination (Iacobucci, 2014).

On the one hand, public policies are based on the concept that regions have their own specific industrial and institutional histories, and that local stakeholders should be included in the regional development strategy implementation (Coffano and Foray, 2014). On the other hand, 'entrepreneurial discovery' needs to be pursued (Foray et al., 2011), and in the self-discovery process public and private sectors must collaborate strategically (Hausmann and Rodrik, 2003).

Looking at the US 'Smart Strategies' implicit interpretation, at least three pillars are emerging. The first one is connected to the active support policy of the central public institutions, in particular the role of Federal government in boosting the innovation, with R&D subsidies. Second, the privilege of 'Key Enabling Technologies' (KETs), providing the basis for innovation in many production sectors and helping to tackle societal challenges. Third, the widespread application of the 'Cluster theory' as it was re-conceived and innovated by the Harvard Business School of Michael Porter in the early '90s, after the original Marshall's districts (1920) and the experience of the Italian industrial districts of the '70s. According to Porter's definition, "*Clusters are geographic concentrations of interconnected companies, specialised suppliers, service producers, firms in related industries, and associated institutions (universities, standard agencies, trade associations) in particular fields that compete but also cooperate*" (Porter, 2000).

Cluster policies share much common ground with the underlying principles of RIS3 (Ketels, 2013). Foray himself acknowledges that 'vibrant innovative clusters' should be considered as a 'classic outcome' or an 'emergent priority' of a RIS3 strategy, but also warns that Smart Specialization is not the same thing as a cluster policy (Foray et al., 2011). Both clusters and RIS3 can be considered as 'systemic policies' and are considerably place-dependent, since they root in that bundle of assets and capabilities already present in the territory. Some authors highlight at least two main distinctions (Aranguren and Wilson, 2013). Firstly, cluster policies are tailored to the specific needs of cluster agents and do not deal with the broader scope of gaining competitive advantages for the regional economy as a whole; secondly the cluster competitiveness is promoted among a broad range of areas (internationalisation, quality standards, training, R&D, etc.), while RIS3 strategies specifically target the allocation of regional investments for the enhancement of the innovation processes and the valorisation of human capital.

Recent best practices in the US highlighted the evolution of cluster benefits in terms of economies of scale for urban agglomerations, stakeholder networks, increase of local exchange knowledge. Although, according to Porter's method, it is possible to recognize and study clusters only at macro-territorial level (State or County), their geography elicits application at local scale as well.

Across US the most intriguing interpretation of 'Smart Strategies' and the emerging model that embodies the idea of recreate an innovative urban ecosystem is well represented by the concept of 'Innovation District', a 'geographic area where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators' (Katz and Wagner, 2014). The city of Boston represents a paradigmatic case of successful integration between innovation and city growth, thanks to the alignment between urban development initiatives and exploitation of the potential of innovation- related growth. The following sections explores in details this case.

The 'Innovation District' experience in Boston

The Greater Boston area is one of the most innovative US contexts. Thanks to its high agglomeration of educational institutions and industries, as well as its physical and infrastructural system, the whole metropolitan region has been able to attract an increasing interest of main investors and venture capitalists. This flourishing environment has positively impacted on the economic growth of the Metropolitan area, showing the highest rate of growth across the US (Kahn et al., 2012). Moreover, in the last thirty years the cities of Boston and Cambridge implemented urban policies supporting the economic growth, followed more recently by other adjacent municipalities like Somerville and Charlestown. The physical effects are witnessed by the spread of new development and renewal projects that are changing the urban geography of the Boston area by supporting the settlement of innovation hubs within specific neighborhoods.

Boston Innovation District

The Boston Innovation District (BID) planning initiative is part of the '*Innovation Boston Strategy*', that aims to create a neighbourhood able to attract financers, resources and talent, in other words creative activities operating in a thriving urban space. The BID project was conceived to redevelop the South Boston Waterfront, a 1000 acres underutilized area that hosted industrial activities, transforming the area into a mixed-use (residential, commercial and retail) and thriving hub of innovation and entrepreneurship with more than 300 technology, life science and other companies, creating about 6000 new jobs.

The City managed the project through its public agency -the Boston Redevelopment Authority (BRA)- and provided partial funding for constructing new public spaces, building a network with private companies and using financial and planning tools within the PPP 'architecture' in order to guarantee the progressive implementation and ease the burden of the costs of the project on the City's budget. The centrepiece of BID is the District Hall, a large public space where innovators can meet, aggregate, exchange ideas, explore potential synergies, finalize their creativity, find concrete agreements. The building opened in 2013 as a result of a PPP between the BRA and private investors and offers 12,000 square feet of meeting space. The public administration initiative has been actively involved in attracting both start-ups and more established companies as Vertex Pharmaceutical and most recently General Electrics that received significant tax benefits for setting up their new headquarters within the BID boundaries. Unique assets are concentrated in the dense redevelopment area, as the world's largest start-up accelerator - 'MassChallenge' - and 'Factory 63', an interesting experiment in innovation housing, providing private micro-apartments and public areas for working, gathering and organizing events.

Launched by the Menino administration in 2010 and still in progress, the vision for the Innovation District has four main features, setting the general guidelines for how development should took shape:

- *Industry-Agnostic*: the initiative is to be open to industries of every kind; this should allow for broad inclusivity of established companies and small enterprises, providing a framework for community engagement;
- *Clusters*: the BID's motto is "Work, Live, Play" with the desire to cluster innovative entrepreneurs to increase proximity and density. Creative people in a cluster environment can share technologies and knowledge easier. Following this model, the Municipality also hopes to attract amenities that would encourage

entrepreneurs to spend more time in the district networking and socializing. The city needs to retain talent through a working and living environment favorable to creativity and exchange;

- *Experimental*: the public administration is adopting an experimental framework characterized by expedited decision making and planning flexibility. The choice of the City, confirmed by the present administration after the mayor Menino's original idea, aroused interest among the business community and created momentum for the public sector's efforts to attract developers, creative firms, company CEOs, entrepreneurs, and non-profit organizations and engage them for building a new community;
- *The City as Host*: differently from the scenario of the 'university as host', as in the case of MIT in Kendall Square (Cambridge), in the BID the City embodies the role of host institution. The identification of the Innovation District as the flagship project in Boston means that the neighborhood will be free to develop organically, create momentum and allow innovation to spread all over the city and its surroundings.

Neighbourhood Innovation District (Boston)

The *Neighbourhood Innovation District* (NID) is an ongoing public strategy launched in 2014 by the Boston Municipality. The main goal is to encourage and widespread innovation and technology within deprived, low-income neighbourhoods as necessary tools that generate a positive impact on small business and local economic development. Instead of supporting a specific industrial sector 'ex ante', the NID' strategy has chosen a 'place-based' approach able to empower the existing business activities as well as the physical features of the sites. Shift from a merely entrepreneurial-centred vision towards a more inclusive and community oriented perspective, the NID seeks to take into account the overall economic empowerment of the neighbourhood. The entire area has been considered as a whole, by tackling in advance the community displacement potentially induced by the increase in the real estate values in 'Innovation Districts'. At this goal, the 'NID Committee' - body created by the present administration for identifying policies, practices, and infrastructure improvements to support the development of Innovation Districts throughout Boston - has strongly recommended the adoption of a District Housing Plan as a tool to provide new affordable housing and business space. According to the Committee, the main actions for a successful implementation of an Innovation District into an existing distressed neighborhood should ensure adequate start-up education programs and promote a streamlined regulatory framework for new entrepreneurs, providing space for both retail activities and new affordable housing.

Following specific criteria highlighted in the Innovation District experience across US (transit access, affordable office space, arts and cultural amenities, involvement of non-profit organizations) and considering the peculiarities of the area (presence of high-educational institutions, vacant lots, transportation nodes) the mayor Walsh government has chosen *Dudley Square-Upham Corner Corridor,* a vibrant zone within the Roxbury neighborhood, as location of the first step of the initiative, an Innovation

Center. Since the Roxbury Innovation Center was only recently opened, up to now it has been mainly involved in providing vocational training programs for local residents. It will be interesting to monitor how the challenge of attracting private investments in the area, due to the lack of a thriving socio-economic ecosystem, will be achieved.

Findings and open issues

Looking at the case studies, it clearly emerges how the Boston model can represent a "virtuous hybridization" between at least two dimensions, governance and socioeconomic profile of the planning initiatives, showing how *co-creation* is key for enabling innovation in cities. Given the continuity of the 'progressive' political guide of the local administration, it is clear the emerging trend of giving more emphasis to the co-creative approach, especially in the most critical contexts, regardless whether it is public or private driven. This approach is better aligned with the rationale of RIS3 than a dirigistic one could be. The meaning of the term 'Innovation Strategies' is tightly intertwined on the specific synergy between different actors of the 'multiple helix' model. Thus, a first lesson from the US Boston model regards the flexibility in the stakeholders' organisation that is associated with an adaptive strategy, based on the entrepreneurial exploration/self-creation rather than on pre-conceived plans. A factor determining the success of the initiatives and at the same time matching the typical features of the RIS3 (entrepreneurial discovery, adaptive strategy, flexibility in the implementation) is the flexibility in the appropriate blending of 'stakeholders' from the urban region, specifically public governmental institutions and local communities, i.e. a 'flexible geometry approach' in which strategies and roles can assume from time to time different identities, where the boundaries between public and private initiatives are often blurred. By looking at the European policy scenario, instead, these 'geometries' are likely to be shaped by a dominant regional approach clashing with the RIS3 nature.

A second factor is the clear interconnection between urban scale and clusters. The case studies show a strong tie with a specific urban area, and more or less explicitly the willingness to frame policy interventions within a wider spatial strategy of overall regeneration also emerges. The physical concentrations of dense fragments and significant 'critical mass' represent authentic 'hot spots' in the urban fabric and 'topologically materialize' cluster fractals belonging to complex and extended network systems.

The BID, for instance, does not show only the concentration of a huge range of economic activities, but most of all presents new thriving patterns of integrated models with young actors naturally gravitating around the space of potentials and opportunities. In general, in the 'innovation district' phenomenon the ideal objective of the regeneration strategy is the synergy between increased creative production, associated with cross-fertilization interaction, and a high level of 'urbanity'.

Finally, innovation does not happen just because some support is provided, since it is the ecosystem as a whole that has to be successfully reorganised and reinforced, including physical and socio- economic features. This is the most difficult challenge that the present Boston administration is called to face after locating an Innovation Center in a critical distressed neighbourhood like Roxbury for turning really upside down the ongoing traditional strategies and doing something truly innovative: disrupt the patterns of inequality.

Shifting towards the European wider perspective, the major challenge for an effective RIS3 implementation is not over-emphasize the role of industrial clusters, rather than 'territorialise' the redevelopment vision. At this goal, the planning process has the potential to become a key- driver for embedded innovation. The conscience of places is still crucial. The 'place-based' approach allows to build virtuous regeneration projects including the potential of territorial 'DNA' related to the local communities for identifying, recovering and increasing the values of local cultural specificities.

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4. Urban innovation-oriented policies and knowledge dynamics

Carmelina Bevilacqua, Pasquale Pizzimenti

The cluster mapping methodology (cfr WP1 "Research and Innovation strategies in cluster policies") highlighted the significant role of cluster emerged in terms of proxy of innovation concentration at city level. The case studies carried out in specific urban areas of Cambridge and Boston municipalities has led to define two directions for innovation issues at city level:

1. The relevance of urban planning tools with evident support for innovation spaces - planned development area (PDA), planned urban development (PUD);
2. The role of innovation space (innovation districts, thereby).

The process of investigation of the space-innovation link acquires in this stage of research a peculiar aspect in defining a new concept of urban dimension inside the S3 implementation as part of the entrepreneurial discovery process in building innovation ecosystem-.

The urban dimension of the innovation policy

Knowledge and Innovation, introduced in the Europe 2020 strategy as drivers to overcome the limited or declining economic growth and development affecting regions and cities, have arisen as new development paradigm with the aim to boost competitiveness of firms and territories and contribute to social cohesion.

Regions and Cities are experiencing this paradigmatic shift put in place by the EU focusing on Smart Specialisation Strategies (S3) as main driver in stimulating a smart, inclusive and sustainable growth through the Innovation Union (IU) flagship. According with European Commission (2010) on "Regional Policy contributing to smart growth in Europe 2020", the development of S3 is crucial "to maximize the impact of Regional Policy in combination with other Union policies …. they should be integrated into regional development strategies in order to ensure an effective partnership between civil society, businesses and public authorities at regional, national and European levels".

Cities acquired an important role within the reform process of cohesion policy that took place in order to build up operational programme for 2007-2013 period (EC, 2009). The need of an integrated and multilevel approach in urban policy stemmed from Lisbon strategy (Parysek, 2000) and created the condition to reinforce the link between urban policy and regional innovation system through the S3 approach.

The main impulse of this interaction came from the change in structuring development strategies at European level culminated in the publication of Barca report (2009) with the concept of place-based innovation strategies (Foray, 2015; Barca et al 2012). Even though the Lisbon strategy has stirred *innovation* at the core of development, "the way in which Structural Funds were used to support innovation was not very effective" (Foray, 2015). Europe still presents deep differences: regions more competitive and able to compete in the globalised market (Borras, 2011) and regions with unsolved structural weaknesses, highlighting an "innovation gap". The principal cause/effect relationship of the different regional responses to European innovation policy during the last decades seems to lie on the existence of a market asymmetry because of a chronic mismatch of supply-demand for innovation (Koschatzky et al., 2001). This is partly due to a persistent lack of investigation of local characteristics about territorial capital, innovation networks and their level of carrying capacity to foster innovation (EC, 2011).

The awareness of the development of an innovation system at regional level, under the impulse of the S3 approach, becomes stronger in the horizontal process of the entrepreneurial discovery that in turn "require the integration of divided and dispersed knowledge" (Foray, 2015).

The urban dimension of S3 usually is grounded on the concept of smart city. The second stage of MAPS-LED project introduces another aspect of urban dimension within S3, which becomes part of the entrepreneurial discovery process in building innovation spaces. It is possible to group under the innovation-oriented urban policy's concept the increasing phenomena of innovation districts (in a broadly sense) to refine a different perspective of the role of the city in the creation of an innovation ecosystem.

The observed shift of innovation away from out-of-town science parks and back into city centres (McBryde, 2016) could be considered as an emerging demand for innovation that recall the EDP requirement of integrating divided and dispersed knowledge. Following this perspective, it is possible to argue that the innovation-oriented urban policy act as engine of EDP, especially in defining spaces and conditions to integrate entrepreneurial knowledge, generally fragmented and dispersed.

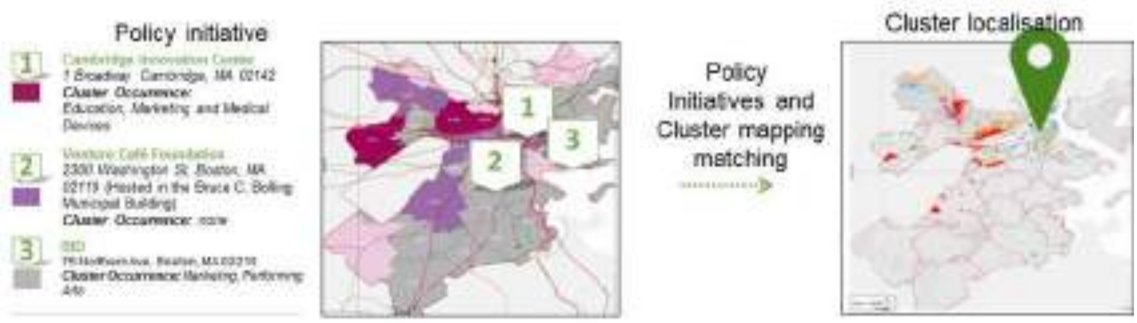
The insights of the functional connection of urban policy and S3, through the concept of innovation-driven urban policy, come from the study of the interactions among innovation, cluster, knowledge dynamics and spaces in two US cities, Boston and Cambridge, in order to identify the success factors of the cluster mapped.

In the previous chapters, the mapping cluster methodology allowed at identifying at city level a physical configuration of eight clusters - Business services, Education, Fishing, Insurance, Financial, Marketing, Medical device, Performing Art – (Figure 18).

The research focused on the occurrence of "innovation spaces" in the places characterized by the presence of Cluster, in order to identify specific urban areas (target areas) in which analysing the interaction of cluster with the urban fabric (Figure 21).

The innovation spaces has been considered as policy initiatives, in terms of interaction between urban policy and cluster organisation/cluster initiatives promotions, but also as an emerging factor of new demand of innovation-oriented physical transformation. Boston and Cambridge are cities where Cluster, innovation policy and urban planning act in a complementary way for supporting both knowledge dynamics and regeneration of local economy.

Figure 21 Policy Initiatives and Cluster mapping matching



The findings of the case studies analysis of Boston and Cambridge target areas allowed identifying the link between city and S3 by introducing the innovation-driven urban policy as an important phase of the EDP process.

Cities as catalysts of innovation: Knowledge concentration vs knowledge dispersion

The efforts in boosting economic competitiveness have been dealing with the need to balance economic interests with a more balanced social and physical development. The S3 introduced the Entrepreneurial Discovery Process (EDP) as crucial to activate the clustering phase that, in turn, is based on geographic concentration, spatial agglomeration and networking as drivers of innovation (OECD, 2012). Clusters provide a conceptual framework to describe and analyse important aspects of modern economies and constitute « the breeding ground for innovation» (Ketels et al. 2012). The place where Research and Innovation policies (S3) and clusters trigger the so called "good atmosphere" is the city for several reasons. Cities can be considered as nodes of an international complex network that autonomously can exploit ideas and diffuse to the other regions (Simmie, 2005). Innovation, indeed, is understood as the driving force of long-term competitiveness, growth, and employment in present day Europe (Das & Finne, 2008: 1) and cities are the centre of economic activity and the focal point of innovation (Tong Soo, 2015). As Foray stated (2015), «the notion of smart specialisation describes the capacity of an economic system (a region for example) to generate new specialities through the discovery of new domains of opportunity and the local concentration and agglomeration of resources and competences in these domains». These characteristics are provided by cities and can be considered the key for the activation of the EDP, intended as learning process in discovering new promising areas for future specialisation (Foray, David, Hall, 2009: 20). Knowledge fragmentation or dispersion needs a policy action in order to favour concentration, which is part of S3 implementation. Hence, 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 and (spatial/urban) planning in terms of factors suitable to be mapped in physical terms (Table 5)

Table 5 Cluster Policy and Spatial Planning key factors for S3 implementation.

Cluster Policy key Factors	Spatial Planning key Factors
Institutional networks	Proximity and Accessibility (to gateway cities, infrastructural nodes, HEI centres, broadband facilities etc.)
Entrepreneurial networks	Spatial Pattern (boundary of the cluster, network of connections, localisation of place of production and distribution etc.)
Global-local nexus between local areas and global systems	Size (dimensional data of the cluster
Organisation of local value chains	Critical Mass (number of enterprises, size of urban centers involved, number of jobs created etc.)
Stakeholders	

Source: MAPS-LED Project

The geography of innovation as well the economy of innovation privileged the regional dimension (Shearmur, 2012) perspective and focused on regions as main spatial units to analyse. However, it is also widely recognised from combining Schumpeter (1934) and Jacobs (1969) that this connection (cluster policies and spatial planning) starts at city level where finds the conditions to launch real change in regenerating local economic areas and subsequently valorises the local assets (material and immaterial) reinforcing the existing domains and identifying the new ones. In synthesis, the good atmosphere for knowledge dynamics. 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.

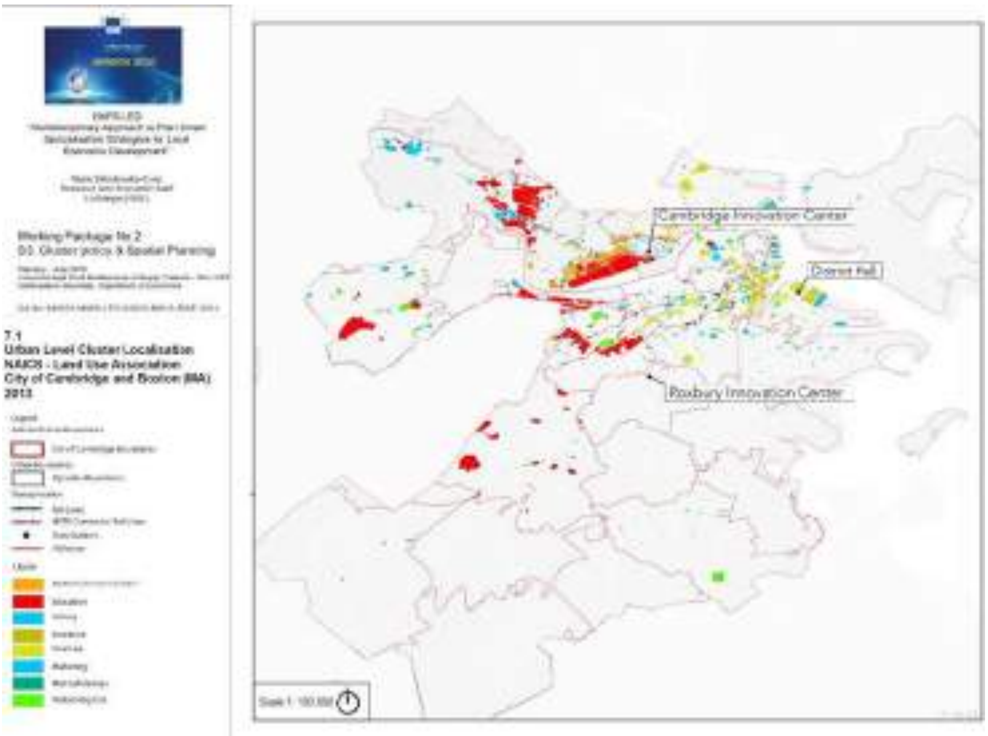
The case studies analysis remarks this linkage that in Boston and Cambridge is evident thanks to the rooted involvement of communities and the private sectors in policy implementation. Nevertheless, they can show the important factors that can be included in a public policy to foster S3 in lagging regions where the creation of an urban ecosystem acting on innovation can trigger the EDP.

The cities of Boston and Cambridge (US) present different characteristics that make difficult the comparison in terms of key socio-economic indicators, but they offer 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.

Starting from the spatial configuration of clusters (based on Porter's definition) at city level, the analysis moved to the interpretation of the role played by those spaces (innovation spaces) expression of knowledge dynamics' source, which can act as EDP engines.

The city of Cambridge (Figure 22) presents two strongest Clusters: Education and Knowledge Creation and Business Services. 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 sector, cluster organisations, innovation stakeholders (such as start-ups, small-medium enterprises) and community.

Figure 22 Clusters spatial distribution in Cambridge and Boston (MA).



The city of Boston (Figure 22) shows a different pattern. Following the same methodology, the strongest clusters are Financial, Marketing and Insurance. Nevertheless, they are more dispersed and fragmented, with some exceptions. This distribution scheme could be due to the different size of cities and other factors such as proximity and accessibility to other services or transportation facilities, all factors that the literature highlights as crucial for the location of an economic activity. Cluster-oriented initiatives linked to development and diffusion of innovation, which can be the result of cluster and planning policies adopted in targeted areas by the two cities show interesting insights. Cluster-oriented initiatives can be defined as «organised efforts to support the development of the cluster, with a person, organisation, or consortium leading the actions» (OECD, 2010). with the main aim to spread innovation and an increase competitiveness among firms. Even when the initiative is privately-driven the public sector plays a crucial role especially trough specific innovation-oriented policies.

The role of Innovation Spaces in Boston and Cambridge

The inclusion of innovation in development and urban planning policies is becoming an emerging trend in US as well as in European cities, which are experiencing a new complementary urban development paradigm characterised by the presence of Innovation Districts. The use of innovation, as main economic development driver after the economic downturn, came to the light in several US cities with the aims to revitalise urban distressed areas or to boost up innovation in areas where the presence of anchor institutions, the proximity to infrastructure and the possibility to increase liveability conditions constitutes those preconditions for the creation of the so called “nnovation ecosystem”.

Innovation Districts are defined as “geographic areas where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators. They are also physically compact, transit-accessible, and technically-wired and offer mixed-use housing, office, and retail” (Katz and Wagner, 2014:1). Innovation to be effective needs a fertile context which in some case occur thanks to the existing conditions, in some other need a push from the public or private sector for the creation of the innovation ecosystem.

The city of Boston and Cambridge followed this trend thanks the presence of a high number of anchor institutions and a context with a high potential demand for innovation. In the first case, two different areas have been taken into account: the Boston Innovation District located in the South Boston Waterfront area, and the neighbourhood of Roxbury where it is located the Roxbury Innovation Center.

Conversely, for the city of Cambridge the Kendall Square areas that is located nearby several anchor institutions has been selected. The combination of the public action with universities and other anchor institutions and the private sectors needs a policy framework to create an innovation ecosystem. Such policies are the combination of economic development measure and urban policy. The first stimulate the creation of precondition for innovation, the second drive and manage the demand of physical transformation of the cities.

The table below shows the heterogeneity of the actor typology that promotes or manages the so-called innovation spaces located in innovation districts: Public Sector (District Hall - BID), PPP (Roxbury Innovation Center), Private sector (Cambridge Innovation Center). The presence of Innovation Spaces as specific objectives in the urban planning tools highlight the will to put innovation at the core of cities’ transformation. Both Cities provided master plans in which the innovation-oriented use of spaces is clearly defined in terms of strategic objectives (boost economic growth and development of deprived areas) or in physical terms (development of new spaces or regeneration/renewal) (Table 6).

Table 6 - Innovation-oriented policy initiatives and Innovation Spaces as strategic objective in urban policies

Policy Initiative	Initiative typology	Zoning Area	Master Plan	Year	Innovation Space Objective in Urban Planning Tools
Boston Innovation District	Public	PDA[8]	Seaport Sq Master Plan	2010	"The Project will include built floor area of Innovation Uses in a minimum amount of twenty percent (20%) of the Total Gross Area of the Project's non-Residential Uses to support the South Boston Waterfront Innovation District (the Innovation Use Requirement).
Roxbuty Innovation Center	PPP	EDA[9]	Roxbury Strategic Master Plan	2004-2011	"The BRA may approve a Development Plan proposing diversification and expansion of Boston's economy. to or supportive of uses such as, but not limited to, the following: scientific Research and Development Uses"
Cambridge Innovation Center	Private	PUD[10]	K2C2 Planning study	2011-2012	"Innovation Office Space for small companies and start-ups would be required as a component of all new office development"

Source: MAPS-LED project elaboration on desk analysis

The Boston innovation District

In 2010, the Boston Innovation District has been selected by the past Mayor as the main area for businesses and companies' attraction and drive the economic regeneration of the city. In this area economic development measures have been put in place together with planning initiatives in order to create a good atmosphere accordingly with the motto of the initiative: 'Work, Live and Play'. Together with the localisation of companies, start-ups and small businesses (especially in the Boston Marine Industrial park area), innovation spaces have been localised in the seaport area (fig. 2). Thanks to the activities of initiatives such as the District Hall (public), the area is attracting new innovation-related businesses and retaining the existing ones.

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[8] PDA (Planned Development Area). According with the Boston Zoning Code a PDA is A Planned Development Area (PDA) is an overlay-zoning district that establishes special zoning controls for large or complex projects.

[9] EDA (Economic Development Area). According with the Boston Zoning Code EDAs are established to encourage economic growth and commercial activity in a manner which is sensitive to the needs and interests of the community and to provide for economic development that is of a quality and scale appropriate to the surrounding neighborhood.

[10] PUD (Planned Unit Development). According with the City of Cambridge Zoning Ordinance a PUD is a land development project comprehensively planned by the developer with a single site plan for a parcel of a size eligible for PUD designation. A PUD is designed to permit flexibility in building siting, mixtures of housing types and land uses, private open spaces, and the preservation of significant natural features.

Figure 23 Seaport Square Master Plan Source: Boston Global Investors – Boston Redevelopment Authority,

Source: http://www.bostonredevelopmentauthority.org

The District Hall, which is one of the few public innovation center in the country, represents the space of contact where community and entrepreneurs work together in creating a new public anchor institution stimulating social innovation. The Boston Redevelopment Authority (BRA) included the project within the 23-acre waterfront development master plan drawn by Boston Global Investors[11]. Managed by a Public Private Partnership, it makes available spaces for events, which help in building and strengthening an inclusive innovation community. «In 2014, District Hall hosted a total of 562 events ranging from hackathons and training sessions to start-up networking meetings and brainstorming sessions. More than 70 percent of District Hall's space rental value has been donated for community use – a $1 million investment in the local start-up community»[12].

The Roxbury Innovation Center

The Roxbury Innovation Center is a civic innovation center that supports local economic development by encouraging innovation and entrepreneurship[13]. It is localised in Dudley Square in Roxbury, a neighbourhood of the city of Boston characterised for a high level of socio-economic weakness. Dudley Square has been interested by several development projects in the last decades aiming at revitalise and renew the entire area. Particularly, the center is located in a historical building included in a Landmark Project of the city of Boston (fig. 3). Although Roxbury is an economically challenged neighbourhood, this area, is located nearby the city center, with its access to public transit and highway systems, and proximity to many of Boston's educational institutions, life-science centers and convention centers. Physical assets are energized by the neighbourhood's strong community organizations and relatively young population. Here, several activities involving start-ups, tech companies and local

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[11] Boston Global Investors http://bginvestors.com/projects/district-hall/ [accessed August/September 2016] http://bginvestors.com/master-plan/seaport-square/ [accessed August/September 2016].

[12] The Intersector Project Report, http://intersector.com/wp-content/uploads/2015/10/The-Development-of-Bostons-Innovation-District.pdf [Accessed June 2016].

[13] Roxbuty Innovation Center , http://roxburyinnovationcenter.org/about/ [accessed September 2016].

community are organised monthly, in order to allow interaction, networking among all participants and provide exposure to the emerging local entrepreneurs.

Figure 24Dudley Square Planned Development Projects Source: Dudley Square Vision – Boston Redevelopment Authority, available at http://www.bostonredevelopmentauthority.org/

The Cambridge Innovation Center

The city of Cambridge presents different context conditions with respect the city of Boston, especially for the production of innovation thanks to the presence of two of the most important Research Institutions of the world (Harvard and MIT) and their capability to transfer research outputs into the market thanks the high demand of innovation pushed both by the public and private sectors. With respect to the City of Boston, the private sector in Cambridge is pushing for the creation of innovation spaces. This is the case of the Cambridge Innovation Center (CIC) located in Kendall Square (Figure 25). Businesses, start-ups, companies, venture capitalists act together in order to capitalise the research activities conducted by public and private research institutions and, in this way, produce innovation and create economic growth.

The increasing need of innovation spaces, which demands for physical transformations, is supported by the Urban Policies of the City of Cambridge. The stakeholders involved in the initiative are also proactively involved in the K2C2 Planning Study, which will transform the area in the next ten years paying particular attention to public, transportation and innovation-related facilities.

Figure 25- Kendall Square Development Projects

Source: Reinventing Kendall Square for the 21st Century Vision and Framework 2012

The K2C2 (Kendall Square – Central Square) planning study, which is articulated in master-plan including also Central Square, has in its main economic development goals that one to ensure affordability for the increasing demand of innovation spaces for start-ups together with the community participation.

Insights for the case study analysis of target areas in Boston and Cambridge

The synthesis, here reported, of the case studies conducted in two US cities Boston and Cambridge highlighted the core of the whole framework of the target areas analysis (explained in the next chapters), which was built to understand if and how cluster-oriented policy initiatives, aimed at the achievement of economic development goals, are linked with urban policy. Particularly, it is interesting to observe if the urban policy, in supporting these initiatives, can be considered the input of the Knowledge concentration/fragmentation process or it is just a consequence of exogenous dynamics acting on these territories. Master-Plans of the areas show an increasing interest in providing office and retail spaces which in the selected cases are partially addressed to innovation spaces (Table 7).

Table 7 - Case studies and expected transformations. Sources: Various Reports from the Boston redevelopment authority and the City of Cambridge Community Development Department

Innovation Spaces	Percentage (%) of Innovation Space provided by urban planning tools
District Hall (BID)*	20% of Retail or Office Gross (Ground) floor area
Roxbury Innovation Center	9%[14] of Retail or Office the Gross floor area
Cambridge Innovation Center	5-10% of Retail or Office Gross (Ground) floor area

Elaboration MAPS-LED project from PUU and PDA in Cambridge and Boston

From a functional approach perspective, it seems that the City of Cambridge is experiencing a different characterization of the connection between urban policy and innovation, more oriented to the production of innovation aiming at boosting competitiveness and attract exogenous resources. The city of Boston appears to be more oriented to the use of innovation finalised at regeneration of local economic target areas. This is the case for example of the District Hall locate in the Boston Innovation District that was a former industrial area and that actually is considered a catalyst for innovation and the Roxbury Innovation Center, located in a neighbourhood characterised by social, economic and physical weaknesses. Nevertheless, the case studies show how the concentration of cluster organizations can be considered an indicator of the entrepreneurial discovery stage in supporting or creating the conditions for the innovation ecosystem.

The higher the level of Knowledge convergence, the higher the level of cluster organization, innovation spaces (which creation is supported by urban policies) at city level are conceived to stimulate the creation of knowledge convergence by endorsing cluster organizations.

The analysis of innovation ecosystems opens the discussion on relevant emerging topic such as the possibility that innovation could generate possible side effects. Negative consequences, such as gentrification or side effects linked to the sharing economy diffusion can arise and public policies should take into account appropriate solutions in balancing the innovation-related approach per se with social needs. 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. The complexity of S3 policies and the unknown effects/impacts it can generate make this policy area very risky and uncertain due to the continuous experimentation of an on-going policy implementation that can vary from place to place, from city to city, from region to region. This variability, linked obviously to the different contexts

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[14] This percentage was not established in advance by the City of Boston Zoning Code or the urban planning tools but has been calculated on the current status of the initiative which interested the Ferdinand Building in Dudley Square, a municipal civic center in which the Roxbury Innovation Center plays the role of connectors between the innovators and local community spreading out innovation.

characteristics, is the base in developing real “tailor-made” policy at local level in response to the local needs in exploiting local resources (human, social, relational, territorial capital). The EDP based on urban innovation-oriented policy is proposed as a trigger for the coordination of the efforts – public administrations, research institutions, entrepreneurs, communities – at city level in boosting the local knowledge convergence and generating the expected change.

PART II

Knowledge-based urban area case studies: the construction of target areas

1. Innovation-oriented Policy Initiatives and innovation ecosystem

Carmelina Bevilacqua, Pasquale Pizzimenti, Carla Maione

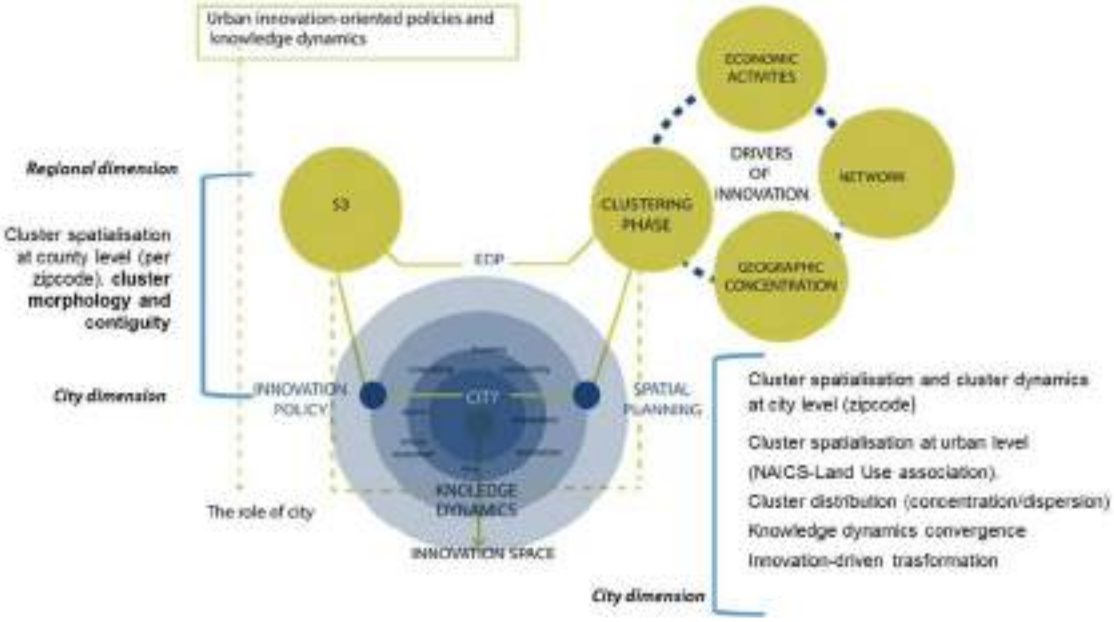
Building an innovation ecosystem: the methodological approach for case study analysis

The Europe Union have established in 1994 the European Committee of the Regions (CoR) with the aim to bring citizens closer to the European Union. The Lisbon Treaty in 2009 recognised the important role of CoR in knowledge-based economy transition. The last report on Regional Innovation ecosystem, edited by CoR in 2016, emphasizes the role of the city in the building innovation ecosystem as a condition to boost economic development in globalization era.

> *Cities and regions have become the new powerhouses for progress and societal innovation: they can and must benefit greatly from open innovation ecosystems and they need to take a new orchestrator role in this field. (…) Innovation eco-systems are very much comparable: it takes human ingenuity, a pioneer's spirit and a real long term vision to fully exploit their potential. The shift towards a knowledge-based economy requires taking risks, connecting the actors of the quadruple helix – citizens, businesses, administrations and academia, and being constantly on the cutting edge of innovation. These innovation eco-systems are self-organising systems but evolve through an interaction between top-down policy choices and bottom-up creative forces. The role of public policies is to facilitate the ongoing process of discovery of new opportunities. Be it through the provision of resources, such as education or infrastructures, or through the articulation of demand, such as public procurement. But more strategic: by promoting the interfaces between innovation actors. An important instrument in setting-up a balanced innovation eco-system is the Integrated Territorial Investment, which allows targeting investments on the basis of a specific regional development strategy. A strong instrument to support experimentation in urban settings.*

Starting by the consideration that innovation ecosystem is "self-organising system" in which top-down policy and bottom-up creative forces interacts, the cluster spatialization at city level allowed at investigating these interactions. The main objective is to understand which factors, for policy practitioners, can be considered significant in facilitating the "ongoing process of discovery of new opportunity" (Figure 26).

Figure 26 – The analysis of innovation ecosystem – from region to city



Based on cluster spatialization process, aiming at spatializing innovation, the analysis have been concentrated on the surrounding conditions (socioeconomic performance, urban facilities, innovation spaces, urban planning initiatives) that characterize the occurrence of innovation concentration (cluster, thereby).

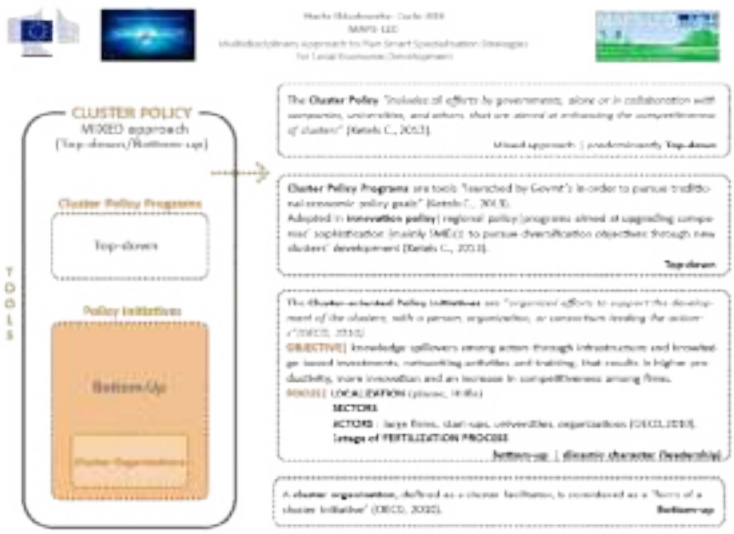
The identification of cluster policy initiatives

Pasquale Pizzimenti with Giada Anversa, Virginia Borrello, Luana Parisi

The policy initiatives' analysis aimed at investigating the relationship between cluster policy and spatial planning, according with the main objective of the WP No. 2 of the MAPS-LED project about building a methodology to approach clusters with a spatial planning-led and governance-oriented approach. It allowed understanding the policy initiatives Clusters and Innovation oriented, their target areas and their weight on the specific clusters that will be analysed afterwards. It has been set a table structured into three main parts: the first one about policy initiatives, the second one about policy actions and the last one about a deepening on spatial data. Regarding the policy initiatives, the analysis specifies involved clusters, objective, keywords, typology (Public, Private, Non-profit, PPP) and geographic level of interest. In several cases, there was a univocal correspondence between policies and clusters, thus, the connection was automatic; in all the other cases, the relative clusters have been deducted from the description of the policy initiatives.

The policy initiatives are considered as the main tools for strengthening a particular regional economy by supporting clusters, assumed to be geographic concentrations of inter-connected firms and related actors. They're promoted by several Organizations and Agencies heading the policy actions, which are the main organized practical efforts to support cluster development.

Figure 27 MAPS-LED. Cluster Policy, Programs and Initiatives



Source: elaboration (MAPS-LED Project)

The policy initiatives may be activated by either public, or private actors. Even when the initiative is privately-driven, the public sector plays a crucial role and the cooperation between them, which often occurs, ensure that the effect can always be considered as a policy.

Leadership (both public and private) is important to support effective cluster linkages and triggering innovation.

.Figure 28 Cluster-oriented policies: from innovation to competitiveness

Source: 1 PAU Unit elaboration (MAPS-LED Project)

The policy initiatives invest on the production and diffusion of innovation, while clusters indicate where pockets of specialization are located, thus it's worthwhile to invest there.

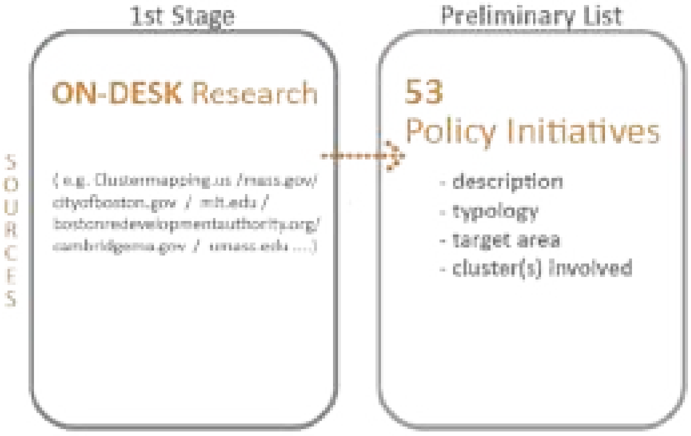
After some essential readings about cluster policies' definition, target and practice, such as the document from OECD (http://www.oecd.org/innovation/policyplatform/48137710.pdf), the first stage was the on-desk research, consisted in gathering data already available on-line on several websites, including the ClusterMapping.us one, within the "organizations" registry section.

The preliminary analysis has involved different geographical level (State, County, City) in order to acquire a broader understanding of cluster-oriented policy initiatives framework across US.

The first rough list contained around 53 policy initiatives, with relative description and geographical scope. Within the workflow, it followed a two-stages process of filtering. The first filter applied was the geographical one, since the two studied areas, turned on during the first phase of the research, have been Boston and Cambridge, considered the economic engines of the Region. The second skimming applied relates to the most performing clusters, totally 10 according to the research, which are:

- Cambridge (Middlesex County) - Biopharma, Business services, Education, IT, Marketing, Medical Devices;
- Boston (Suffolk County) - Biopharma, Education, Financial, Fishing, Insurance Services, Marketing, Performing Arts.

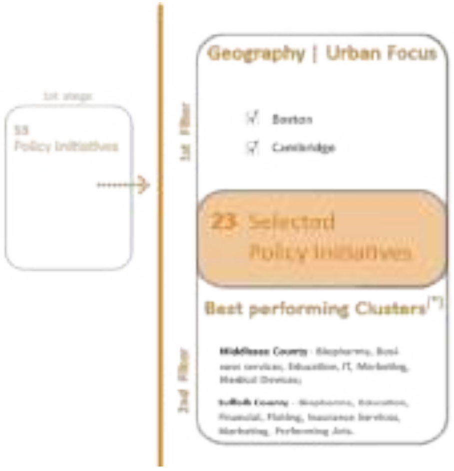
Figure 29 . First Stage of Cluster Policy Initiatives



Source: MAPS-LED Project elaboration

The number of the Initiatives clearly decreased sensibly at this point and even more after the further check about the presence of the target areas for each Initiative. The policy actions have then been grouped under the relative policy initiative and this allowed to realize that there were analysed 23 main Initiatives and 31 Actions insisting to the selected Clusters and areas, considering a margin of error.

Figure 30 Cluster Policy Initiative Analysis. Second Stage



Source: elaboration (MAPS-LED Project)

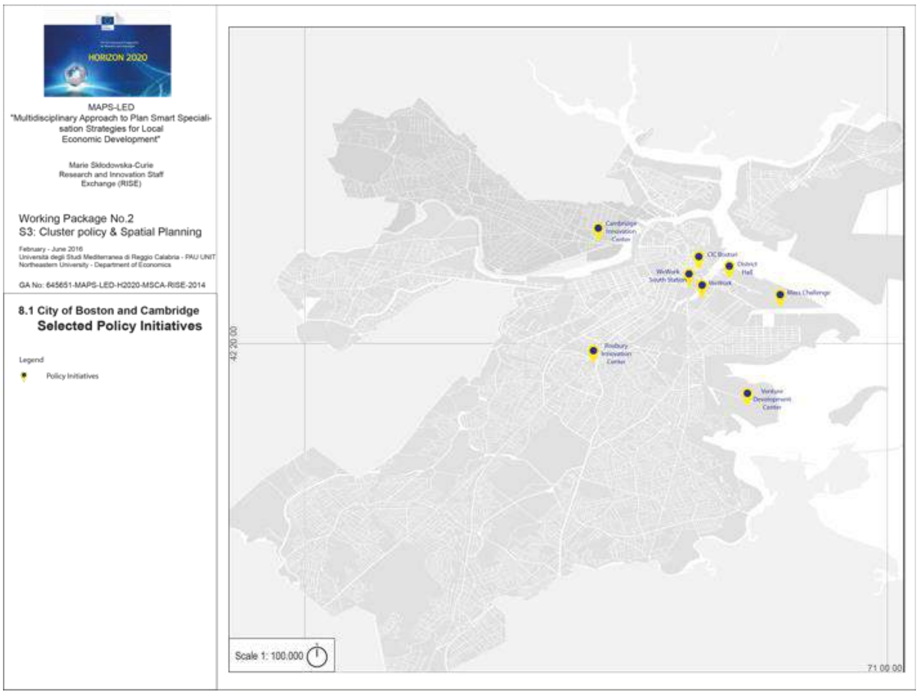
The 23 Policy initiatives have been analyses with respect to their geographical location using the zipcode as spatial unit of reference. The spatialized clusters at urban level for the city of Cambridge and Boston that have been selected on the basis of the MAPS-LED methodology have been matched with the policy initiatives (Table 9).

Table 8 - Selected Cluster-oriented Policy Initiatives

Policy Initiative	***Related Cluster***
Boston Innovation District (BID)	Performing Arts
Cambridge Innovation Center (CIC)	Financial Services
Greentown Labs	Education and Knowledge Creation
Venture Café Foundation	Marketing, Design and Publishing
WeWork	Performing Arts
VDC - Venture development Center	Insurance Services
Initiative for a Competitive Inner City (ICIC)	Business Services, Financial Services
LifeTech Boston	Biopharma
Greentown Labs	Business Services

The results have been mapped using a GIS software (fig.13) and used for the next step: the association with urban regeneration initiatives in order to find and operative linkage at urban level between cluster-oriented policies and spatial planning.

Figure 31Selected Cluster-orietend Policy Initiative



Source: (MAPS-LED Project Elaboration

This complex activity has brought to a preliminary conclusion: the majority of the initiatives are characterised by a private-driven process focused on innovation on which the role of space (physical) emerged as crucial. In this sense is emblematic the increasing occurrence of co-working spaces, incubators, accelerators, acting as innovation-hub for the attraction of private (venture-capital) and public investments.

Urban Regeneration Initiatives

Carmelina Bevilacqua

The integration of "Urban regeneration initiatives" within "cluster oriented policy initiatives" lies in the inference that Including and supporting knowledge dynamics within regeneration process spur the creation of cluster initiatives and cluster organisations (Ketels, Lindqvist & Sölvell, 2013), through urban regeneration mechanisms.

Cities acquired an important role within the reform process of cohesion policy that took place in order to build up operational programme for 2007-2013 period (Hubner, 2000), and for the future programming period their role is strictly connected with smart specialization strategies. (Europe 2020)

Urban regeneration acquired a powerful role in the shaping the future role of the cities in the globalizations era. Urban regeneration can be considered a public action in a market governed by different powers, namely the new powers of globalization era, and has introduced an innovative strategic approach in the contemporary urban planning theory and practice. This kind of new approach has produced a strong political impact within urban affairs, both in Europe and US.

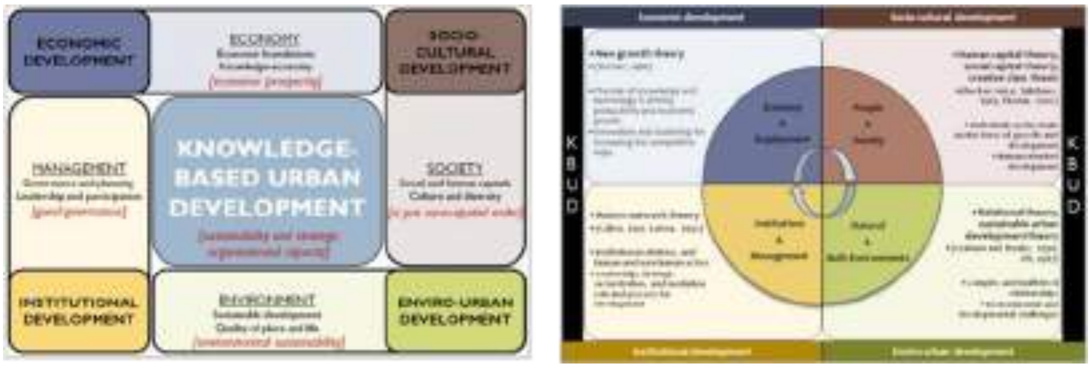
The main features of urban regeneration regard: area-based approach, strong awareness of what are local needs/urban problems, strategic approach and effects/impacts of initiatives. Since integration can be considered one of the main objective to get through urban regeneration, and the complexity as well as the peculiarity of urban dynamics are very much related to the context they belong to, we might see the community involvement as crucial toward sustainable urban regeneration initiatives. The shift of urban regeneration processes toward an increase of the community importance generates different urban management tools based on the typology of partnership set up.

In the emerging role of intensive-knowledge economy, cities produce various development strategies. Such strategising is an important development mechanism for cities to complete their transformation into knowledge cities (Yigitcanlar, 2011).

The urban regeneration, as mechanism to intervene under a public-private partnership in re-shaping urban areas towards economic, social and environment sustainability, has been acquiring a new connotation in the era of knowledge economy. It is clearly explained with the concept of knowledge-based urban development (KBUD) by Yigitcanlar (2011) "*the economic future of cities and city-regions increasingly depends on the capacity to attract, generate, retain and foster creativity, knowledge and innovation This paradigm, namely knowledge-based urban development (KBUD), has first been introduced during the last years of the 20th century considering the impacts of the global knowledge economy on urban localities and societies (Yigitcanlar et al., 2008a; 2008b). In 1995, Richard Knight published his illuminating article, 'knowledge-based development: policy and planning implications for cities', arguing the need and emergence of a new approach to city development focusing on knowledge based development (Knight, 1995). He defined "knowledge-based [urban] development [as] the transformation of knowledge resources into local development [which] could provide a basis for sustainable development" (Knight, 1995, pp.225-226).*"

If we compare the logical frameworks of KBUD (Figure 32) and Urban Regeneration mechanism (Figure 33), it may be appropriate to associate the knowledge-based urban development (KBUD) as an evolution of urban regeneration practices in displaying the KBDU strategy into innovation spaces/places.

Figure 32 The conceptual framework of KBUD



Source: Yigitcanlar (2011)

Figure 33 The Urban Regeneration Mechanism

Source: http://urban-regeneration.worldbank.org/

Consequently, under the label "Urban regeneration initiatives" are grouped the projects of urban transformation, envisaged by the municipalities of Boston and Cambridge, which support innovation-led initiative to attract companies, research institution, startups, accelerators in creating a dense community of innovators, in other words to contribute in building an innovation ecosystem. Alongside the emerging rise of innovation districts across US and EU with a specific and recognizable connotation, the urban regeneration initiatives encompasses also those planning activities that include innovation as a characterization of the area under zoning rules.

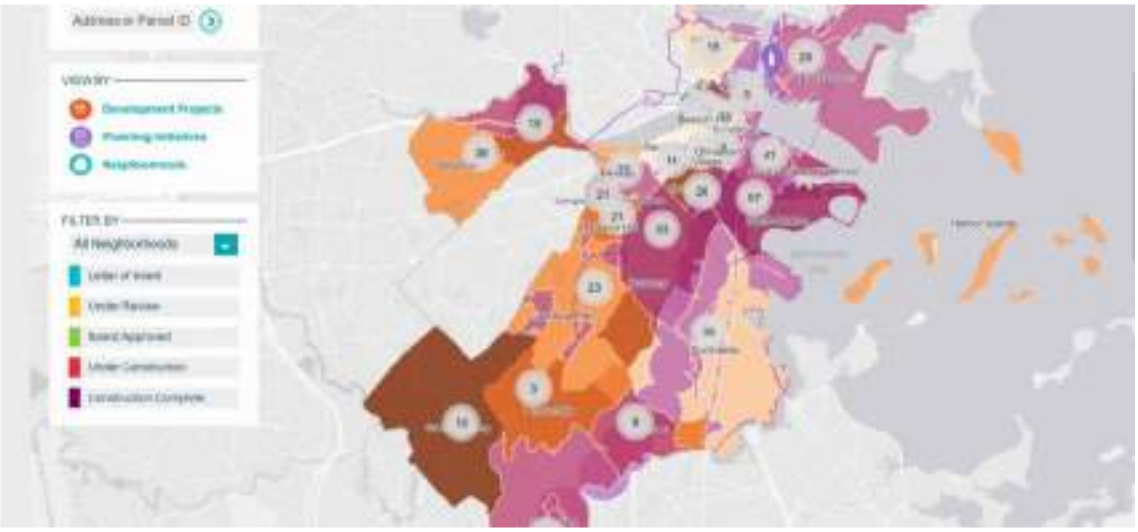
The analysis of urban transformation initiatives in Boston and Cambridge revealed that the space for innovation is becoming a requirement in ordinary planning activities, beside the exceptionality that innovation district can mean in a context of urban policy.

The space of innovation acquires a sort of "service" implication, becoming a requirement, rule of zoning, like the space for commerce, residential areas, education, etc.

The analysis of urban regeneration initiatives have been carried out through on desk activities and interviews to selected public actors in management urban planning in Boston and Cambridge.

The Boston Redevelopment Authority (BRA), also named BDPA Boston Development & Planning Authority after the 1993 when the two divisions Planning and Economic Development were merged, manages the urban planning and development project in Boston. The Figure 34 shows the whole initiatives (planning and economic development) just completed or under construction in Boston.

Figure 34 Development projects and Planning initiatives in Boston



Source: http://www.bostonplans.org/

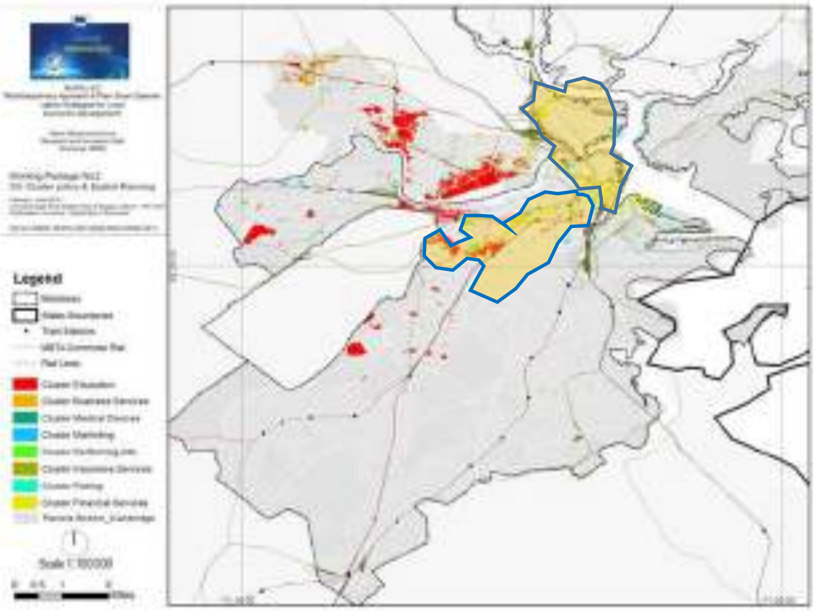
The projects related to urban regeneration mechanism as shown in the Figure 35.

Figure 35 Urban regeneration initiatives in Boston

Source: http://maps.bostonredevelopmentauthority.org/zoningviewer/

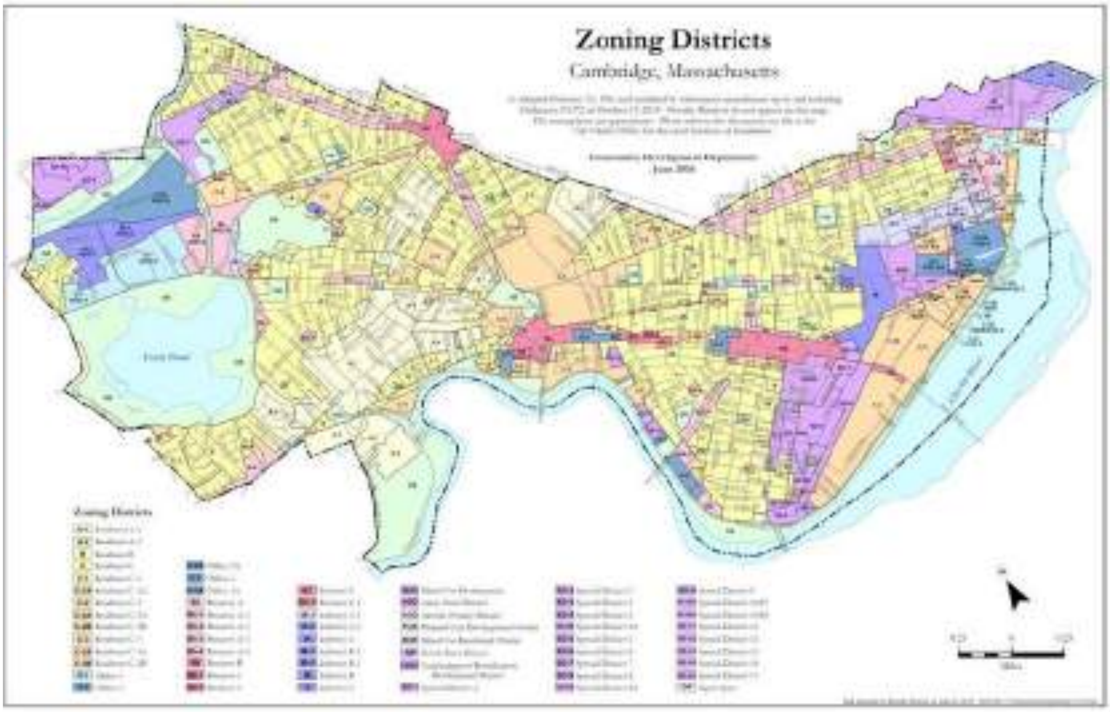
The overlay mapping between urban regeneration and cluster spatialization map at city level in Boston reveals the concentration of urban regeneration initiatives inside the influence area of clusters (Figure 36).

Figure 36 - Overlay mapping Cluster and Urban regeneration in Boston



Source MAPS-LED project elaboration

The Cambridge Redevelopment Authority (CRA) plays the same role of the BRA for the city of Cambridge. The figure 29 displays the zoning districts as expression of the organization of urban fabric according to specific objectives.



The map of the zoning districts in Cambridge reveals a concentration of mixed used development districts, revitalization development districts, business districts and special districts (purple, blue and red in the map) in the influence area of clusters mapped in Cambridge.

Beside the major projects related to urban areas, under the label of urban renewal, development initiatives, economic development projects, both the Municipalities of Boston and Cambridge have introduced in particular district zonings a space required for innovation.

These particular district zonings are ruled by the notion of overlay district. The council of Vermont (US) gives a definition of overlay district as following:

An overlay district is a common tool for establishing development restrictions, or extending development incentives, on land within a defined geographic area or characterized by specific physical features or site conditions. Adopted as part of a zoning bylaw, overlay districts are superimposed over one or more underlying conventional zoning districts in order to address areas of community interest that warrant special consideration such as historic preservation, or protection of a particular natural resource like shorelands or wildlife travel corridors. Common types of overlay districts include:

- Natural Resource – often utilized to protect hillside development, farmland, watershed protection and stream and wildlife corridors.
- Historic Preservation – examples include historic district design standards.
- Design Review – utilized to ensure new development fits into the existing community character. Examples include highway corridors and central business districts.
- Public Safety – often associated with airport hazard zones, fire safety zones and geologic hazard zones.

- Development Incentives – examples include parking districts, that reduce parking requirements in compact, mixed use areas, or Transit Oriented Development (TOD) Overlay Districts that grant incentives for compact, mixed use development within walking distance of transit stops.

The overlay districts in Boston and Cambridge that assume innovation as a required space in the physical transformation are appointed, respectively, PDA (Planned Development Area) and PUD (Planned Unit Development).

The Boston Redevelopment Authority defines PDA as: "An overlay zoning district which may be established under Article 80 where a development that is well-suited to its location cannot be accommodated by the general zoning for the area. For example, a PDA may be appropriate where a development involves a large building, a cluster of buildings, or a mix of uses. No project may be built in a PDA unless it is described in detail in an approved PDA Development Plan. A PDA Development Plan must specify the proposed location, dimensions, and appearance of all buildings in the PDA, as well as all proposed uses, parking, and landscaping. PDAs may also detail public benefits".

The overlay district PUD is a tool common used in planning activities in US since the '70s. Robert W. Burchell and James W. Hughes explained in details the origin and the use of this innovative technique of land use that introduced the community participation in the transformation of the city driving the rise of urban regeneration projects. The definition of Planned Unit Development does not differ from that of the PDA, also because the PDA belongs to the category of the instrument PDU.

The term Planned Unit Development (PUD) is used to describe a type of development and the regulatory process that permits a developer to meet overall community density and land use goals without being bound by existing zoning requirements. PUD is a special type of floating overlay district which generally does not appear on the municipal zoning map until a designation is requested. This is applied at the time a project is approved and may include provisions to encourage clustering of buildings, designation of common open space, and incorporation of a variety of building types and mixed land uses. A PUD is planned and built as a unit thus fixing the type and location of uses and buildings over the entire project. Potential benefits of a PUD include more efficient site design, preservation of amenities such as open space, lower costs for street construction and utility extension for the developer and lower maintenance costs for the municipality. (www.uwsp.edu/cnr/landcenter/).

In the figure below the overlay districts are mapped in the city of Cambridge.

The PDA map (Figure 37) in Boston and the PDU map (Figure 38) in Cambridge provide the configuration of urban transformation initiatives that reveals an innovation-led approach in requirement of innovation spaces, confirming how the concept of knowledge-based urban development is embedded inside the contemporary urban regeneration mechanism.

Figure 37 - Planned Development Area (PDA) in Boston

Source: http://maps.bostonredevelopmentauthority.org/zoningviewer/

Figure 38 - Planned Unit Development in Cambridge

Source http://www.cambridgeredevelopment.org/

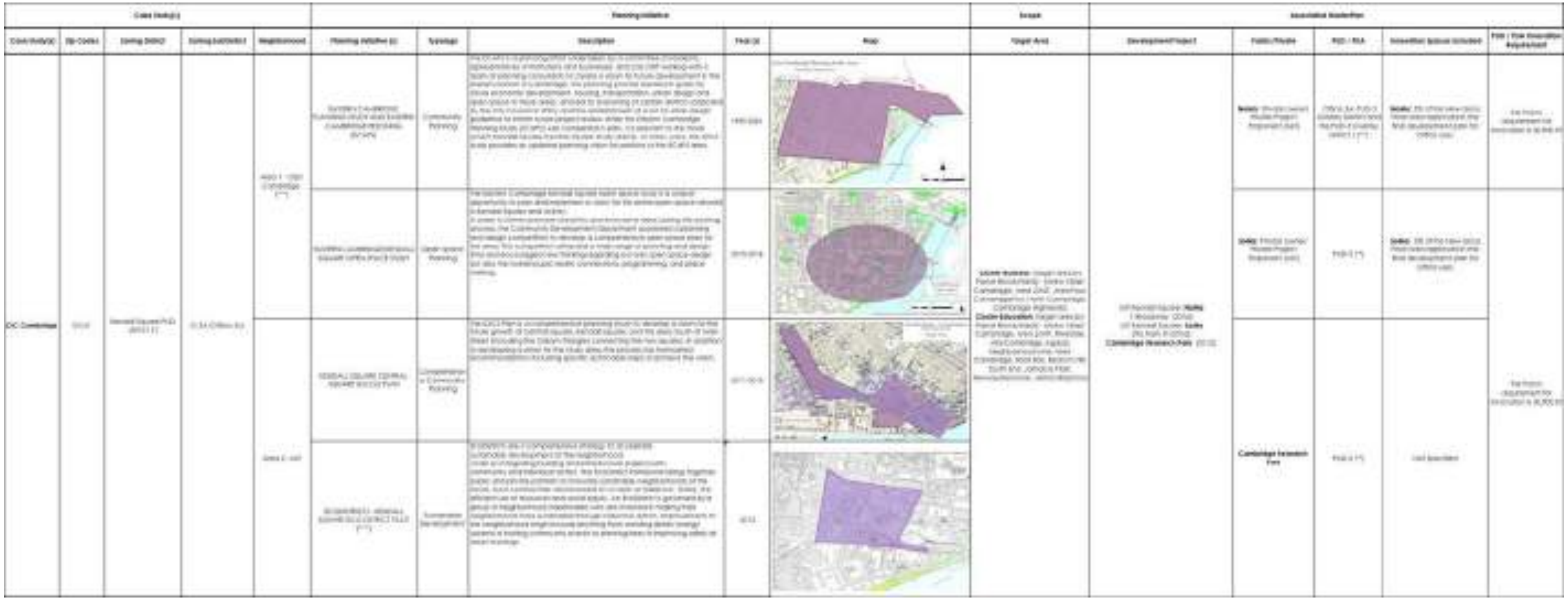
The Synoptic frame of Cluster-oriented policy initiatives

The Table 9 combine the cluster policy initiatives with the urban regeneration initiatives. The information are collected according to three main categories:

1. Cluster-oriented policy initiative localisation characteristics:
    a. Case Study;
    b. Zip code;
    c. Zoning District;
    d. Zoning Sub-District;
    e. Neighbourhood.
2. Planning Initiatives details (Example associated to the above case study:
    a. Planning Initiative;
    b. Typology;
    c. Year;
    d. Map.
3. Associated Master Plan:
    a. Development Project;
    b. Public/Private;
    c. PUD/PDA;
    d. Innovation Spaces included in the objective;
    e. PUD/PDA innovation space requirement.

The analysis of the connection between urban planning and cluster spatialization allows at defining those urban areas in which is possible to investigate the relationship of physical transformation with innovation occurred because of clusters. In particular, analysing in these urban areas the behaviour of urban phenomena: socioeconomic structure, housing and real estate, reveals insights on how the urban dimension can play an important role in structuring knowledge for the entrepreneurial discovery process, in building innovation ecosystem.

Table 9 - Synoptic frame of Cluster policy initiatives in Cambridge

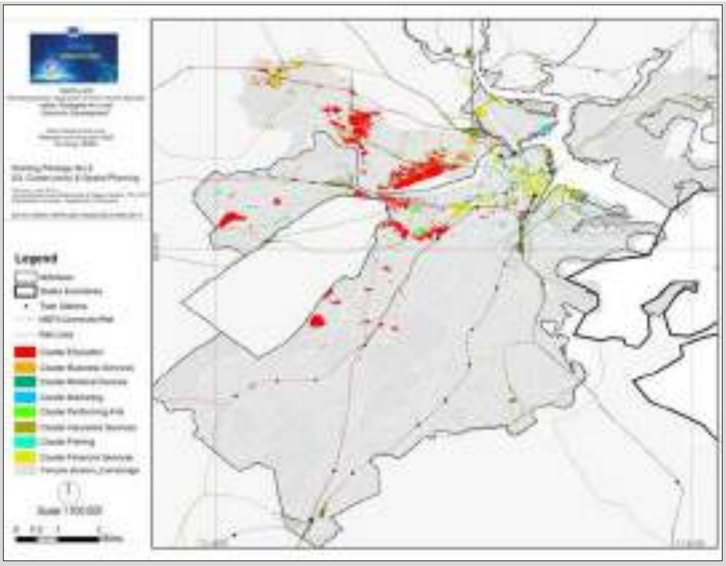


2. Target Areas Identification Process

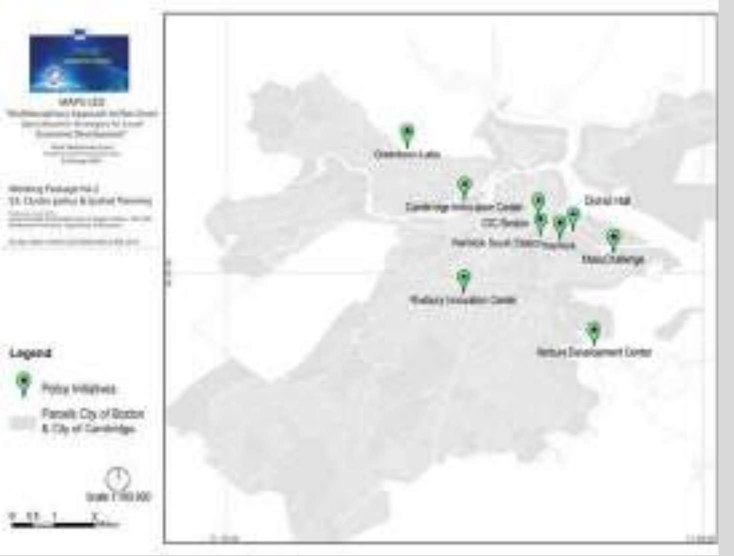
Carla Maione with Giuseppe Cantafio

The Target Area identification process started from the cluster spatialisation at urban level, which allowed identifying a spatial distribution pattern of clusters in the urban environment (step 1). Cluster-oriented policies identified through the methodology explained in the previous chapter, have been mapped too (step 2). At this point, it was possible to highlight the relationship between cluster-oriented policies and spatial planning through the mapping of the urban regeneration initiatives, identified by the PDA and PUD areas for the city of Cambridge and the city of Boston (step 3). The boundaries of the Target Areas to analyse have been set thanks to the joint between us census tracts and city parcel block/ward of the two cities (Step 4). Finally, it has been possible to identify the six target areas through overlapping technique that allowed to operate a match between the cluster occurrence at urban level and the elements above mentioned (Step 5).

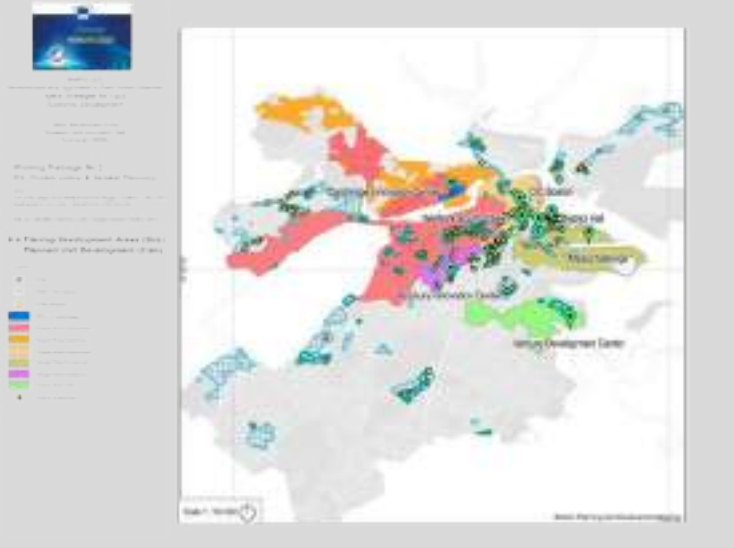
1.
Cluster
Spatialisation
at urban level



2. Cluster-oriented policies localisation

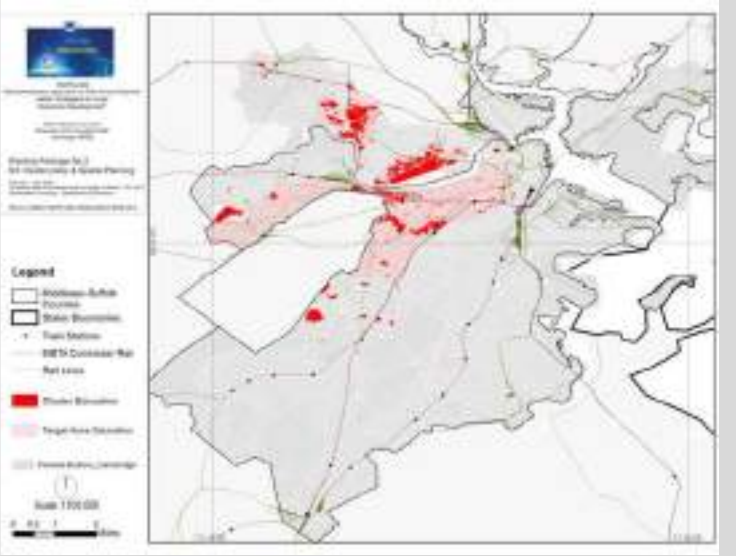


3. Urban Regeneration Initiatives



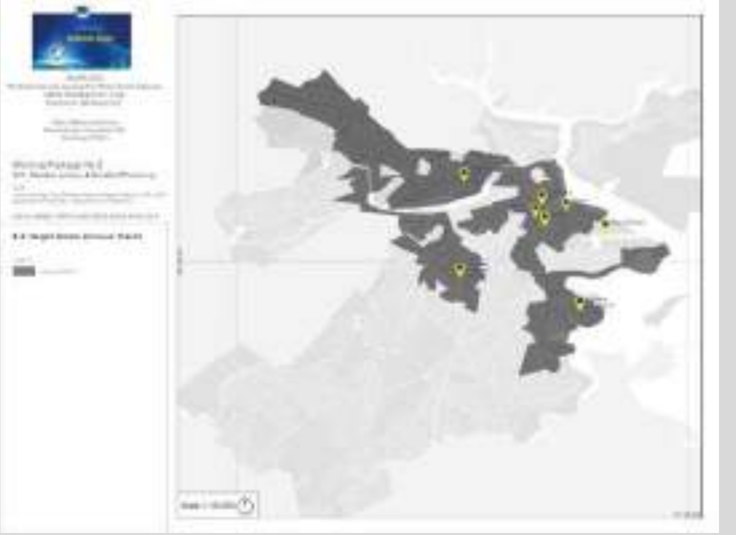
4a.

Target Areas Boundaries: parcel block identification

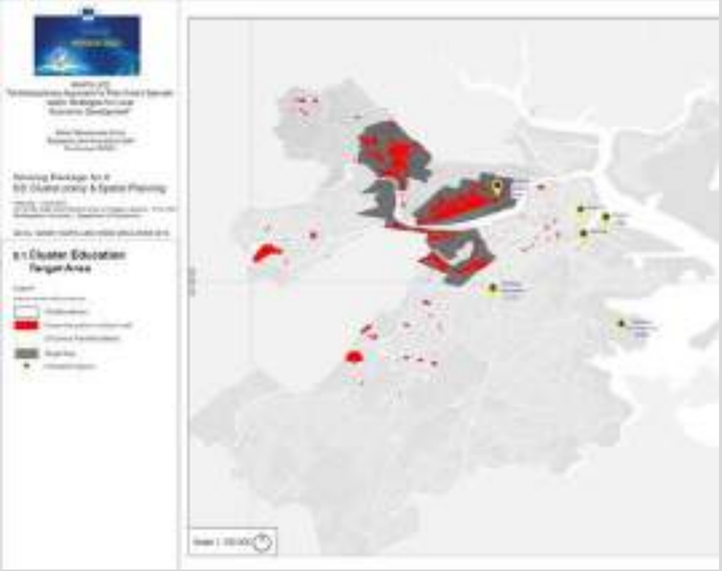


4b.

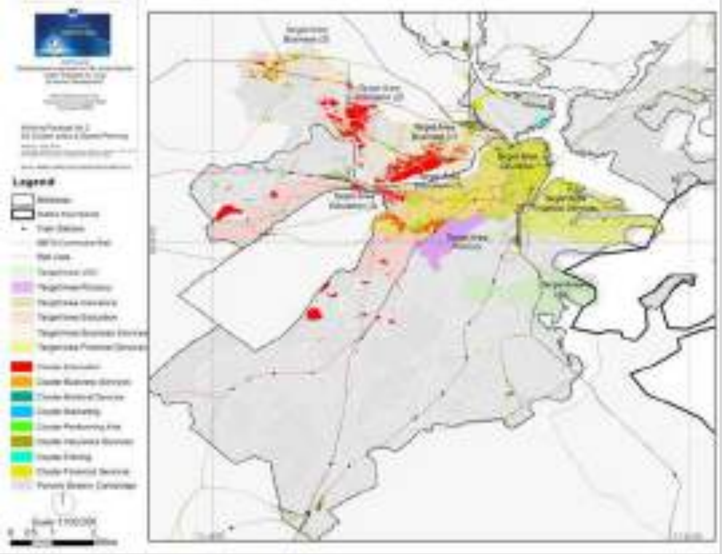
Target Areas Boundaries: census tracts identification



5.
Target Area
Identification



6.
List of Target Areas:
TA_1_Education
(Cambridge)
TA_2 Business
(Cambridge)
TA_3 Financial (Boston)
TA_4 Insurance (Boston)
TA_5 Roxbury Innovation
Center (Boston)
TA_6 VDC (Boston)

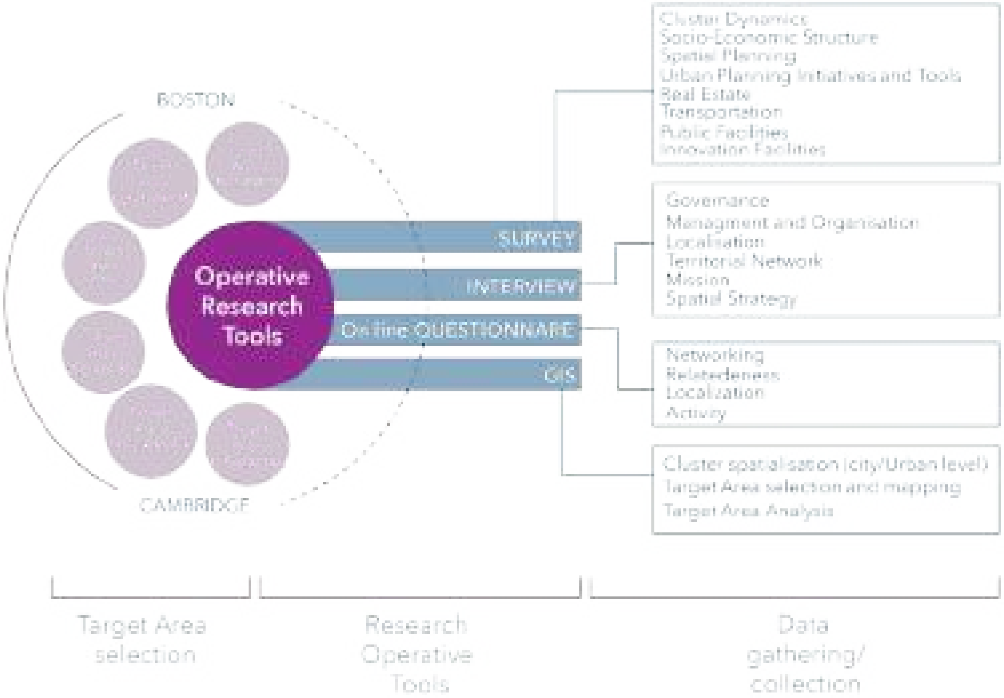


Target Areas Analytical tools

Carla Maione, Pasquale Pizzimenti with Virginia Borrello

In order to analyse the selected Target areas a set of both qualitative and quantitative analytical tools have been used (fig. 17). A specific survey form has been developed to investigate in depth the social, economic and physical dimensions of the target areas. Further, in order to capture all the possible inter-linkages and innovation-related capabilities of start-ups, small firms and companies, has been set an online questionnaire that has been delivered to the members of the innovation hub occurring in the target areas. These elements together with the interview forms, already described in chapter 5, have been mapped using GIS techniques.

Figure 39 MAPS-LED - Target Areas Analytical Tools



Source: 2 PAU Unit elaboration (MAPS-LED Project)

Target Areas Survey Form

The Target Area survey form is structured similarly to the survey form illustrated in the chapter 5 about clusters at city level. In addition, it investigated in depth the relationship between clusters and the urban environment in terms of infrastructures, services, public general facilities and innovation-related facilities.

The survey for the Target Areas has been structured as follows:

1. ***Socio Demographic***

Population	Population by Sex and Race Origin Educational Attainment by Sex and Degree
Labour Market	Employed by Age, Sex and Race Origin Unemployed by Age, Sex and Race Origin Labour Force by Age, Sex and Race Origin Not In Labour Force by Age, Sex and Race Origin
Housing Stock	Housing Occupancy Occupied Housing Tenure Vacant Housing Units

2. Real Estate

Property Typology (Units;Surface)	*Residential* *Commercial* *Industrial* *Office* *Other*
Property Value	*Lot Area;* *Land Assessed Value;* *Total Building Surface; Building Assessed Value;* *Total Assessed Value;* *Markte Value;* *Average Total Assessed Value per Parcel Block/ward;* *Average Market Value per parcel block/ward*

3. Transportation and Infrastructure

Infrastructure	*Numbers of Station(s)/Bus Stop(s)/Bike Hotspot(s) within the study area;* *Change of Number of Station(s) within the study area in last 10 Years [%]* *No. Of Bus Stops [No.]* *No. Of T Stops* *No. Of Bike Hotspots [No.]*
Services	*Total Number of line(s) stopping per station(s) within the study area;* *Ratio of station(s) accessible for wheelchair within the study area [%];*
Accessibility	*Residential Units close to any station (200 mt) [No.];* *Commercial Units close to any station [No.];* *Office Units close to any station [No.];* *Retail Units close to any station [No.]*
Parking	*Public [No.];* *Private [No.];* *Average cost per hour of parking [$]*
Distance form the main infrastructure	*Distances to the closest International Airport [Km];* *Distances to the closest Port [Km]* *Distances to the closest Highway [Km]*

4. Public Facilities

Facilities	*Open Spaces;* *Parks;* *Community Centers;* *Public Libraries;* *School;* *School Yards;* *Religious;* *Social Services Centers;* *Governmental Facilities;* *Clinic;* *Commercial Recreation;* *Hospitals;* *Museums;*

	Fire and Emergency; *Police Station*
Innovation Facilities *Innovation Facilities*	*Colleges/Universities;* *Start-up located in the areas;* *Research Centers (public and private)* *Innovation Centers hub* *Research Labs (public and private)*

On-line questionnaires

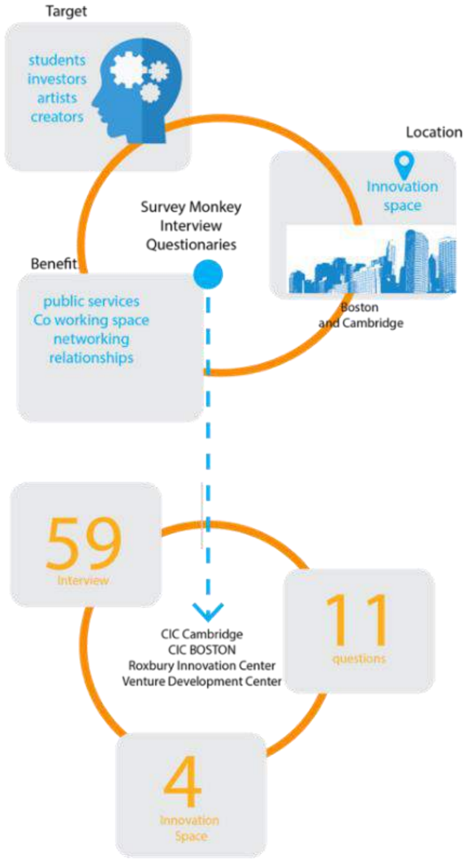
The on-line questionnaire has been developed by the PAU and SOBE unit and delivered to the major innovation hubs localised in the selected Target Areas. The primary goal of this survey is to understand the impact of Innovation Hubs on the urban and economic environment. For each innovation hub has been set a questionnaire responding to different logic.

The Survey-Monkey on-line software has been used in order to prepare and deliver the on-line survey to the potential participants. The targets of the survey activity were the members and visitors of the innovation spaces located in the Cluster-oriented policies' areas analysed.

The specific objectives were the following:

1. Innovation Spaces benefit: advantages related to location and services offered;
2. The relationship between Innovation Space and the City: commuting, urban and other services provided by innovation spaces;
3. Networking: interactions among members and visitors of innovation spaces (entrepreneurs, students, innovators).

Figure 40 On-line questionnaires synthesis



The web link of the questionnaire has been advertised through posters, flyers and other materials to the participants of networking events.

The timeframe to fill out the questionnaire started in April 2016 and closed in December 2016.

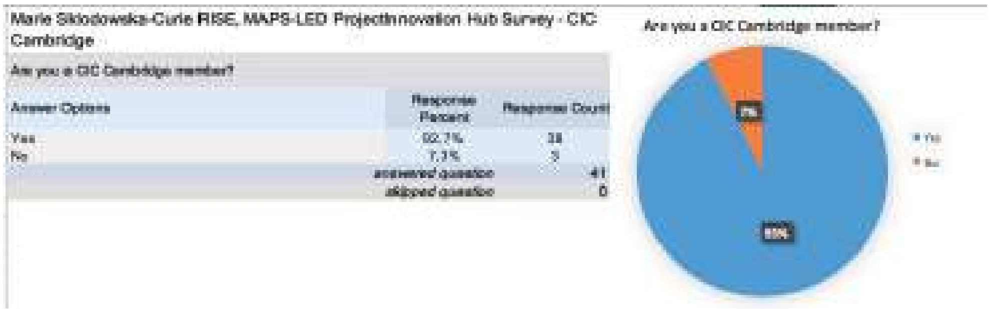
Filters have been applied in order to diversify the questions according to the different categories taken into account: members and visitors of the innovation spaces.

Questions change dynamically on the base of the responses filled out, and are grouped in 4 main groups. Here is reported an example of the questions which participants were requested to respond (all the typology of questionnaires are available as annex of this report) and relative results for the Cambridge Innovation Center

Innovation Hub Survey – CIC Cambridge

General information

1. Are you a CIC Cambridge Member? (Y/N) (Firs Filter apply)



Marie Sklodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

Are you a CIC Cambridge member?

Answer Options	Response Percent	Response Count
Yes	92.7%	38
No	7.3%	3
	answered question	41
	skipped question	0

2. If No: In what type of company do you work?

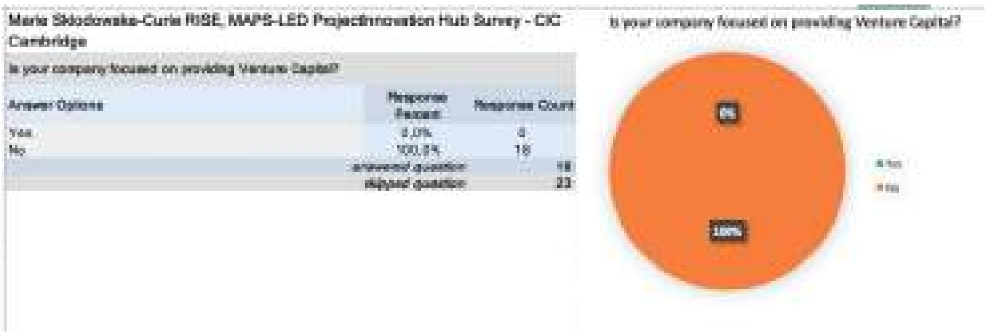
Marie Sklodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

In what type of company do you work?

Answer Options	Response Percent	Response Count
Startup	50.0%	19
Small or medium enterprise	26.3%	10
Big company	2.6%	1
Individual consultant	15.8%	6
Other (please specify)	5.3%	2
	answered question	38
	skipped question	3

Number	Response Date	Other (please specify)	Categories
1	ul 19, 2016 4:38 PM	non profit supporting entrepreneurs	
2	ug 31, 2016 7:26 PM	Author, one person company	

3. Is your company focused on providing Venture Capital?

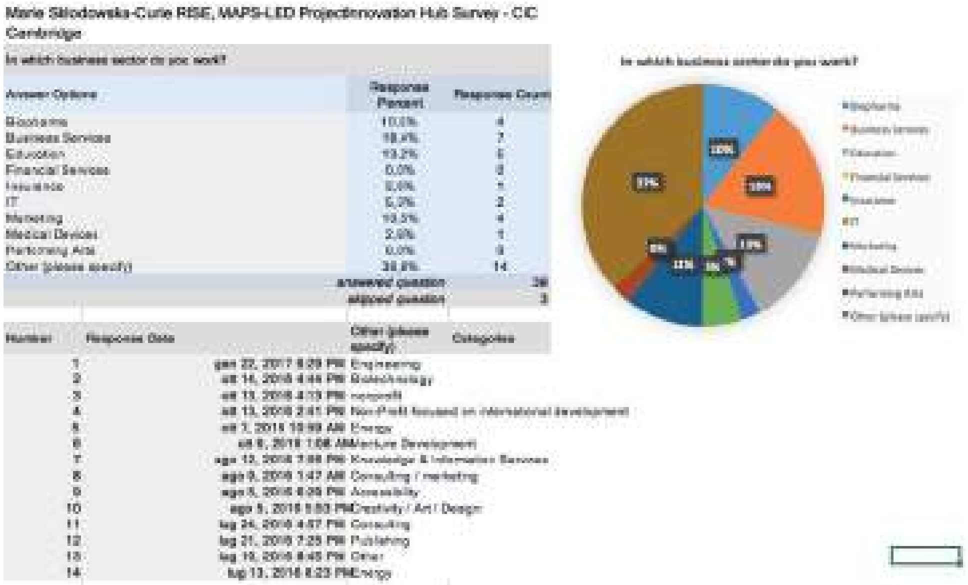


Marie Sklodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

Is your company focused on providing Venture Capital?

Answer Options	Response Percent	Response Count
Yes	0.0%	0
No	100.0%	18
	answered question	18
	skipped question	23

4. In which business sector do you work?

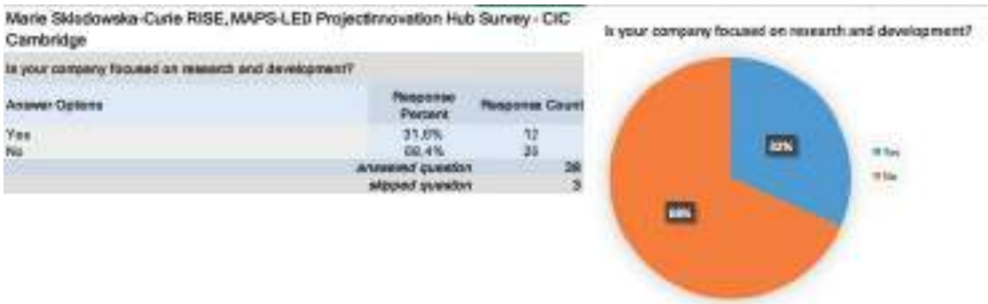

Marie Sklodowska-Curie RISE, MAPS-LED Projectinnovation Hub Survey - CIC Cambridge

In which business sector do you work?

Answer Options	Response Percent	Response Count
Biopharma	10.5%	4
Business Services	18.4%	7
Education	13.2%	5
Financial Services	0.0%	0
Insurance	2.6%	1
IT	5.3%	2
Marketing	10.5%	4
Medical Devices	2.6%	1
Performing Arts	0.0%	0
Other (please specify)	36.8%	14
	answered question	38
	skipped question	3

Number	Response Date	Other (please specify)	Categories
1	gen 22, 2017 6:29 PM	Engineering	
2	ott 14, 2016 4:46 PM	Biotechnology	
3	ott 13, 2016 4:13 PM	nonprofit	
4	ott 13, 2016 2:41 PM	Non-Profit focused on international development	
5	ott 7, 2016 10:59 AM	Energy	
6	ott 6, 2016 1:08 AM	Venture Development	
7	ago 13, 2016 7:08 PM	Knowledge & Information Services	
8	ago 9, 2016 1:47 AM	Consulting / marketing	
9	ago 5, 2016 6:29 PM	Accessibility	
10	ago 5, 2016 5:53 PM	Creativity / Art / Design	
11	lug 24, 2016 4:07 PM	Consulting	
12	lug 21, 2016 7:25 PM	Publishing	
13	lug 19, 2016 8:45 PM	Other	
14	lug 13, 2016 6:23 PM	Energy	

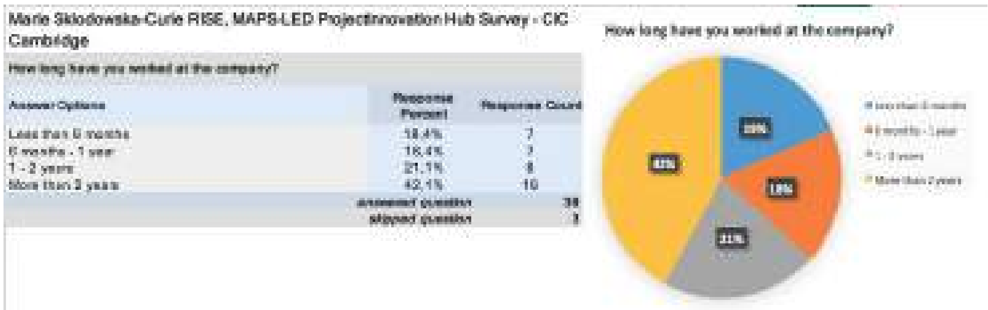
5. Is your company focused on research and development?


Marie Sklodowska-Curie RISE, MAPS-LED Projectinnovation Hub Survey - CIC Cambridge

Is your company focused on research and development?

Answer Options	Response Percent	Response Count
Yes	31.6%	12
No	68.4%	26
	answered question	38
	skipped question	3

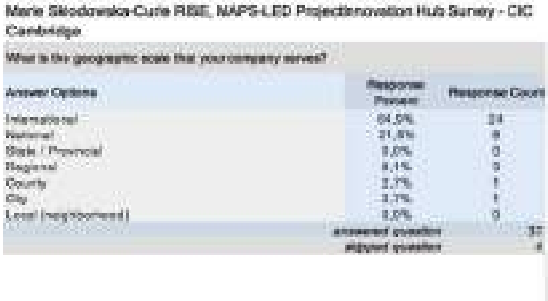
6. How long have you worked at the company?


Marie Sklodowska-Curie RISE, MAPS-LED Projectinnovation Hub Survey - CIC Cambridge

How long have you worked at the company?

Answer Options	Response Percent	Response Count
Less than 6 months	18.4%	7
6 months - 1 year	18.4%	7
1 - 2 years	21.1%	8
More than 2 years	42.1%	16
	answered question	38
	skipped question	3

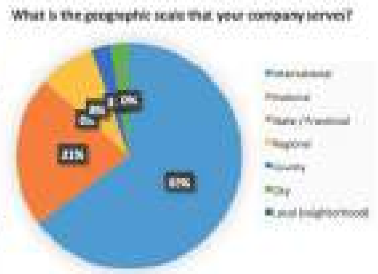
7. What is the geographic scale that your company serves?



Marie Skłodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

What is the geographic scale that your company serves?

Answer Options	Response Percent	Response Count
International	64,9%	24
National	21,6%	8
State / Provincial	0,0%	0
Regional	8,1%	3
County	2,7%	1
City	2,7%	1
Local (neighborhood)	0,0%	0
	answered question	37
	skipped question	4

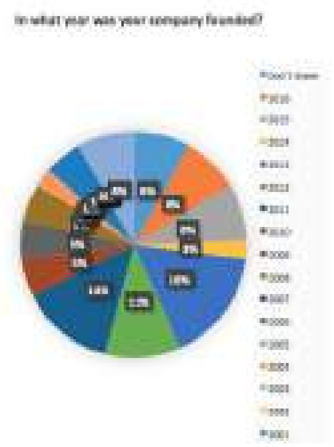


8. In what year was your company founded?

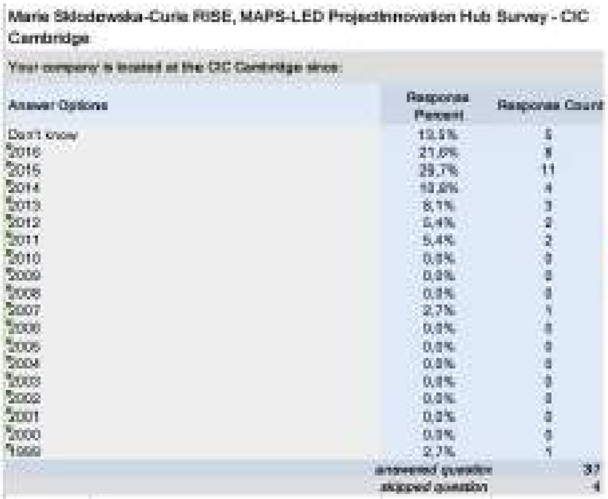
Marie Skłodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

In what year was your company founded?

Answer Options	Response Percent	Response Count
Don't know	8,1%	3
2016	8,1%	3
2015	8,1%	3
2014	2,7%	1
2013	16,2%	6
2012	10,8%	4
2011	13,5%	5
2010	5,4%	2
2009	5,4%	2
2008	5,4%	2
2007	0,0%	0
2006	0,0%	0
2005	0,0%	0
2004	2,7%	1
2003	0,0%	0
2002	0,0%	0
2001	0,0%	0
2000	0,0%	0
1999	5,4%	2
1998	0,0%	0
1997	0,0%	0
1996	0,0%	0
1995	0,0%	0
1994	0,0%	0
1993	0,0%	0
1992	0,0%	0
1991	0,0%	0
1990	0,0%	0
before 1990	8,1%	3
	answered question	37
	skipped question	4



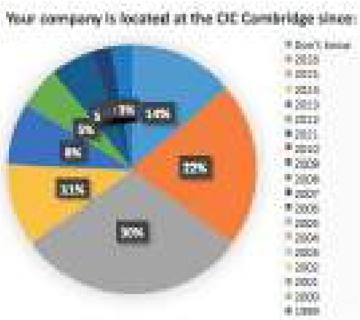
9. Your Company is located at the CIC Cambridge since?



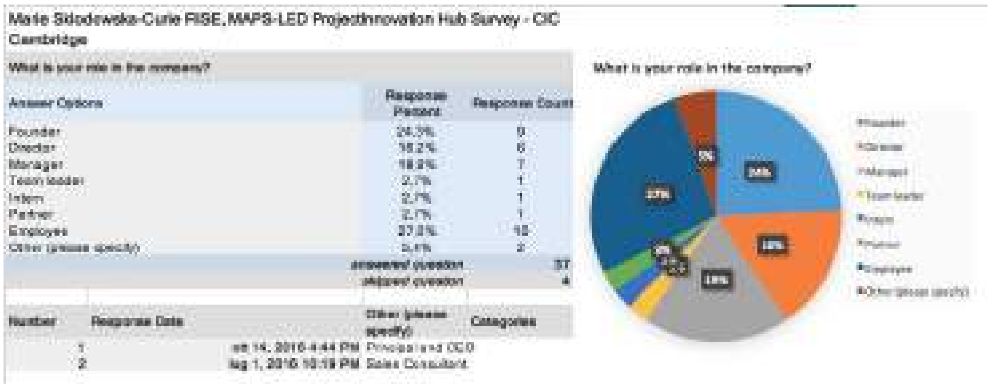
Marie Skłodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

Your company is located at the CIC Cambridge since:

Answer Options	Response Percent	Response Count
Don't know	13,5%	5
2016	21,6%	8
2015	29,7%	11
2014	10,8%	4
2013	8,1%	3
2012	5,4%	2
2011	5,4%	2
2010	0,0%	0
2009	0,0%	0
2008	0,0%	0
2007	2,7%	1
2006	0,0%	0
2005	0,0%	0
2004	0,0%	0
2003	0,0%	0
2002	0,0%	0
2001	0,0%	0
2000	0,0%	0
1999	2,7%	1
	answered question	37
	skipped question	4



10. What is your role in the company?



Marie Sklodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

What is your role in the company?

Answer Options	Response Percent	Response Count
Founder	24.3%	9
Director	16.2%	6
Manager	18.9%	7
Team leader	2.7%	1
Intern	2.7%	1
Partner	2.7%	1
Employee	27.0%	10
Other (please specify)	5.4%	2
	answered question	37
	skipped question	4

Number	Response Date	Other (please specify)	Categories
1	ot 14, 2016 4:44 PM	Principal and CEO	
2	ug 1, 2016 10:19 PM	Sales Consultant	

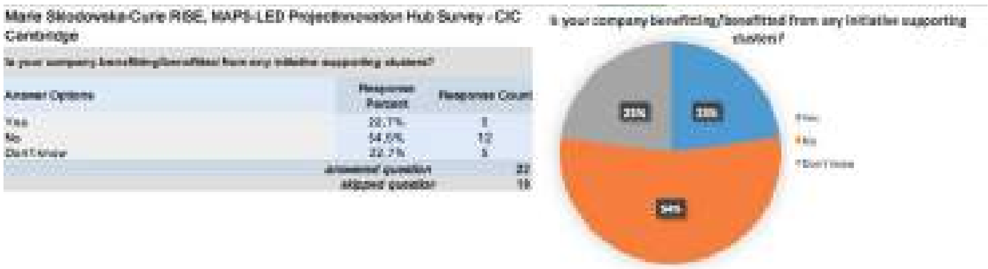
Benefits of being in this Hub

11. (What are the 3 main reasons for which your company decided to locate in the CIC Cambridge?

Unique CIC Factorr

Unique environmental factors, proximity to:

12. Is your company benefiting/benefited from any initiative supporting cluster?

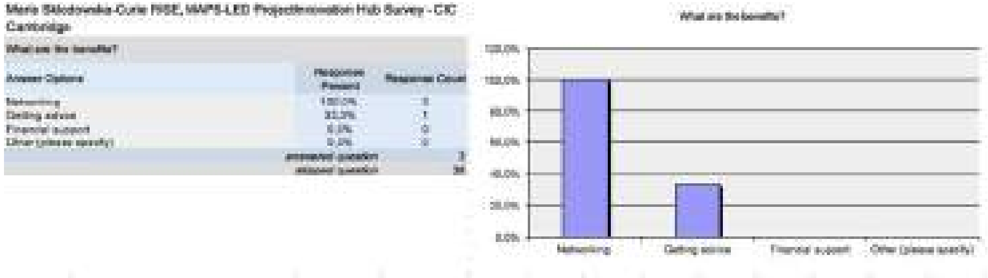


Marie Sklodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

Is your company benefiting/benefited from any initiative supporting clusters?

Answer Options	Response Percent	Response Count
Yes	22.7%	5
No	54.5%	12
Don't know	22.7%	5
	answered question	22
	skipped question	19

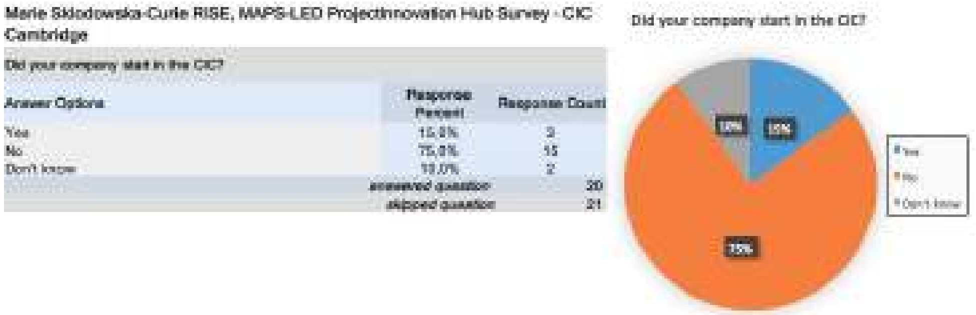
13. If Yes, What initiative?
14. What are the benefits?



Marie Sklodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

What are the benefits?		
Answer Options	Response Percent	Response Count
Networking	100.0%	3
Getting advice	33.3%	1
Financial support	0.0%	0
Other (please specify)	0.0%	0
	answered question	3
	skipped question	38

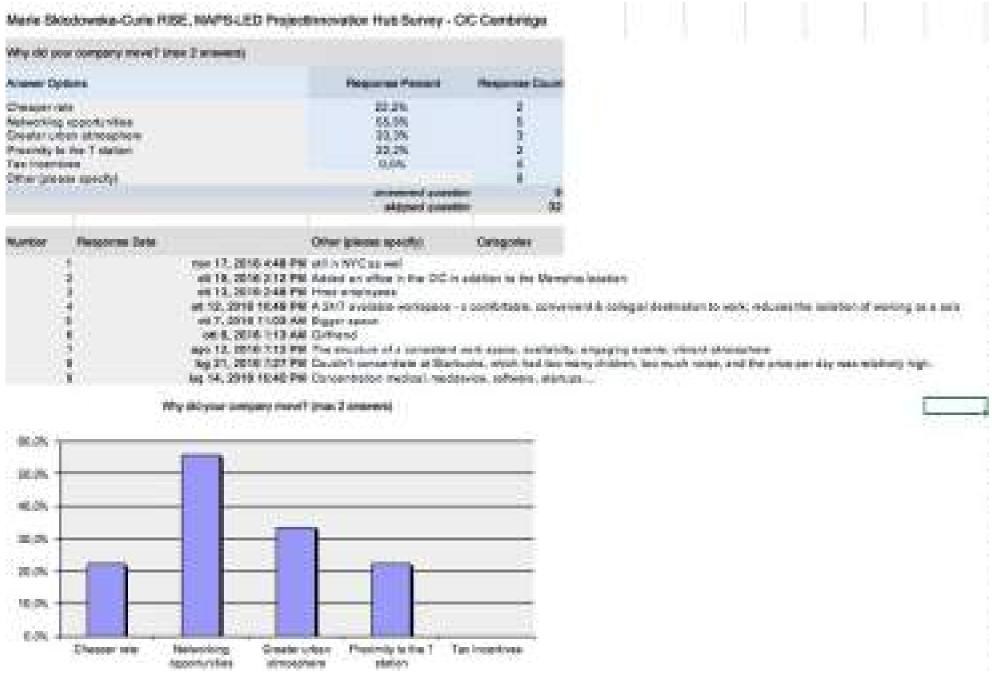
15. Did your company start in the CIC?



Marie Sklodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

Did your company start in the CIC?		
Answer Options	Response Percent	Response Count
Yes	15.0%	3
No	75.0%	15
Don't know	10.0%	2
	answered question	20
	skipped question	21

16. Where was it located before?
17. Why did your company move?

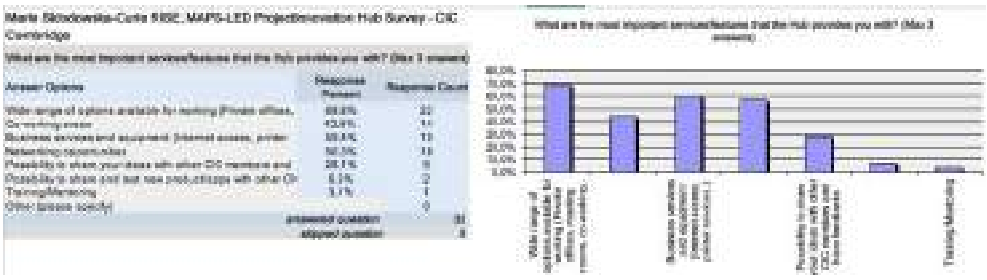


Marie Sklodowska-Curie RISE, MAPS-LED ProjectInnovation Hub Survey - CIC Cambridge

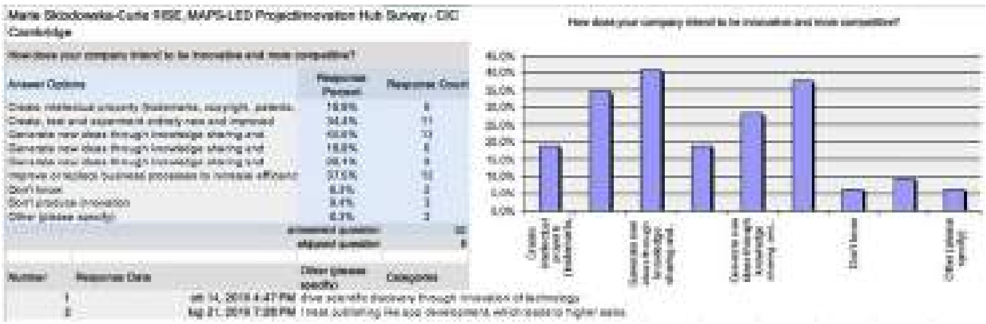
Why did your company move? (max 2 answers)		
Answer Options	Response Percent	Response Count
Cheaper rate	22.2%	2
Networking opportunities	55.6%	5
Greater urban atmosphere	33.3%	3
Proximity to the T station	22.2%	2
Tax incentives	0.0%	0
Other (please specify)		9
	answered question	9
	skipped question	32

Number	Response Date	Other (please specify)	Categories

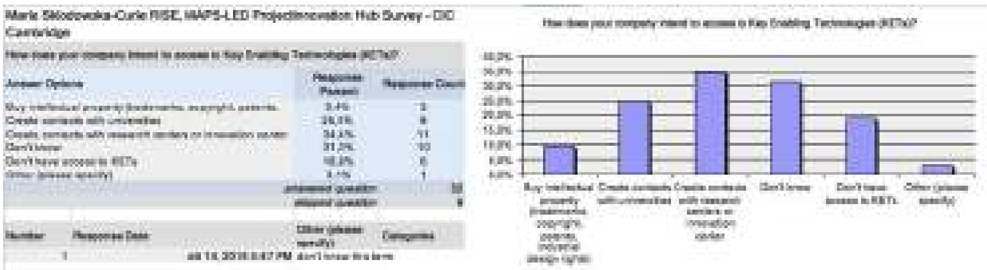
18. What are the most important services/features that the Hub provides you with?



19. How does your company intend to be innovative and more competitive?

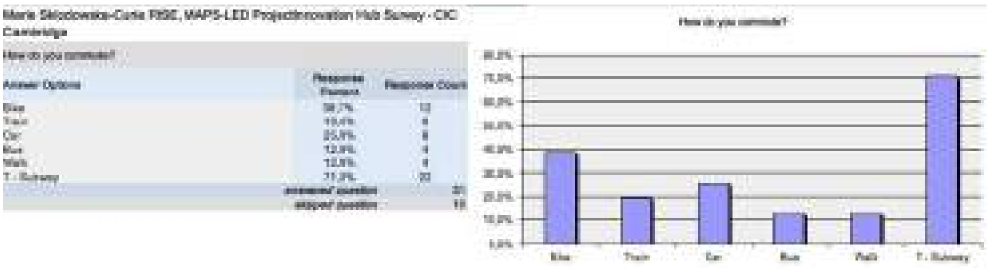


20. How does your company intend to access to Key Enabling Technologies (KETs)?



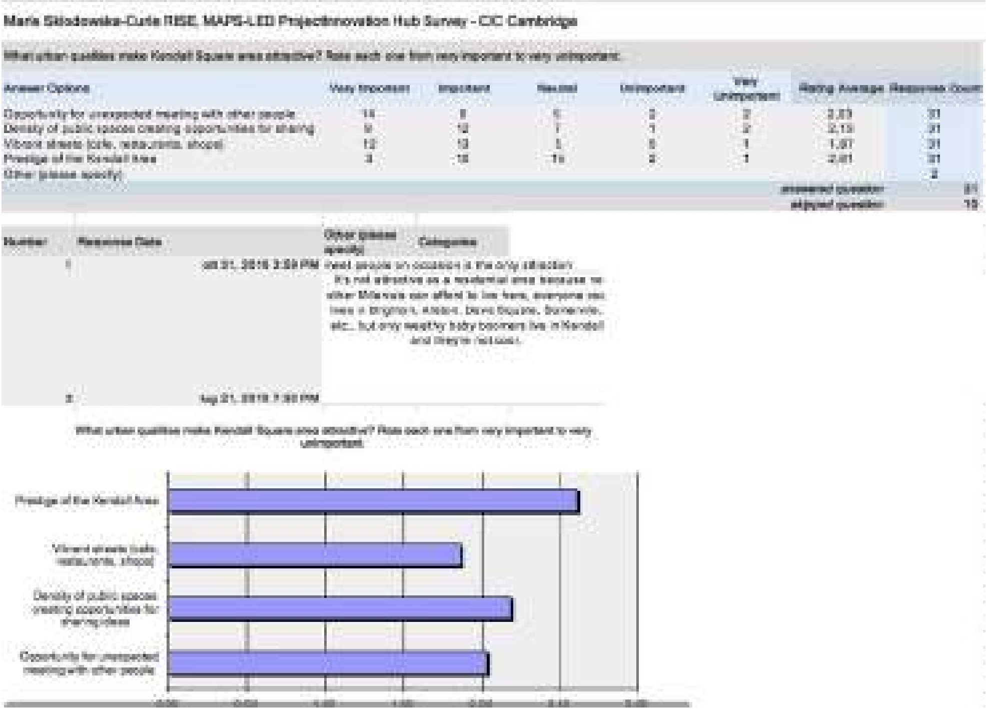
Hub-City Linkage

21. Where do you live?
22. How do you commute?



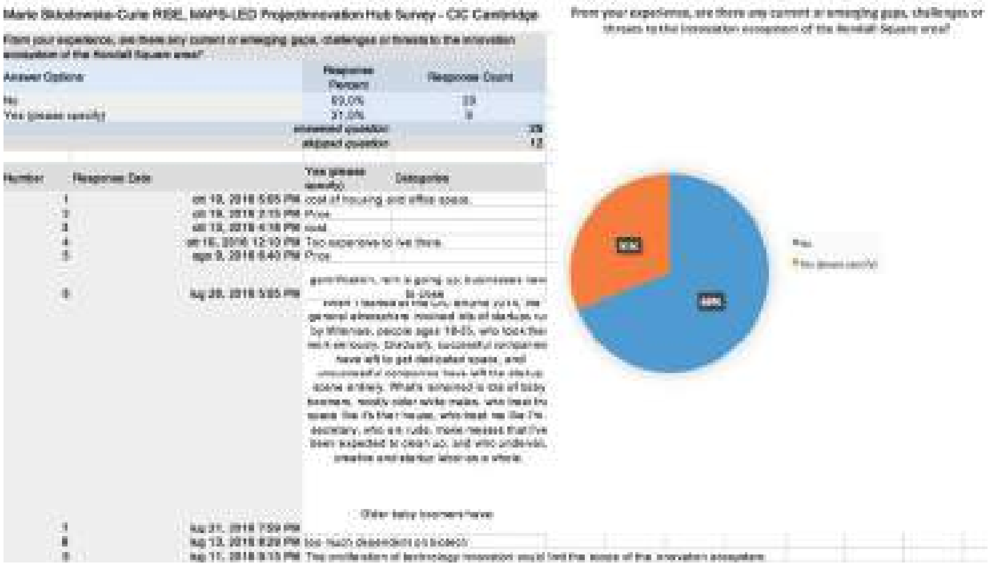
23. What urban services make Kendall Square area attractive?

24. What urban qualities make Kendall Square area attractive?



Maria Sklodowska-Curie RISE, MAPS-LED Projectinnovation Hub Survey - CIC Cambridge

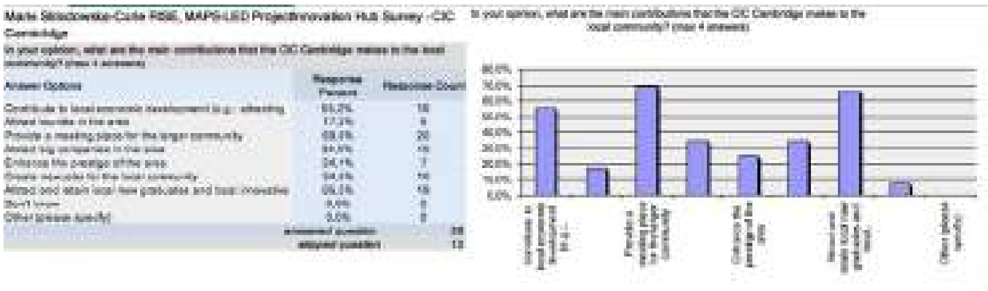
25. From your experience, are there any current or emerging gaps, challenges or threats to the innovation ecosystem of the Kendall Square area?



Marie Skłodowska-Curie RISE, MAPS-LED Project/Innovation Hub Survey - CIC Cambridge

Answer Options	Response Percent	Response Count
No	69.0%	20
Yes (please specify)	31.0%	9
	answered question	29
	skipped question	12

26. In your opinion, what are the main contributions that the CIC Cambridge makes to the local community?

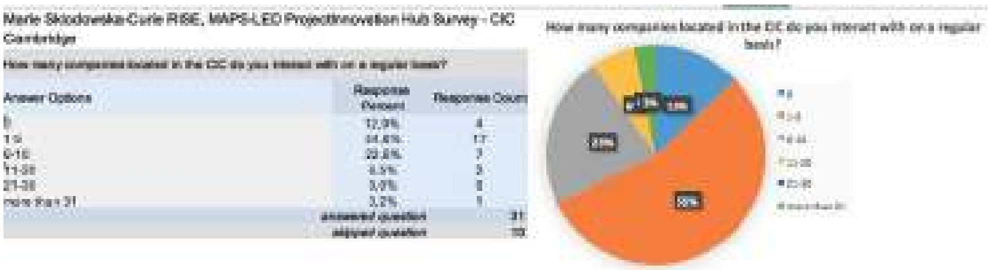


Marie Skłodowska-Curie RISE, MAPS-LED Project/Innovation Hub Survey - CIC Cambridge

Answer Options	Response Percent	Response Count
Contribute to local economic development (e.g.: attracting	55.2%	16
Attract tourists in the area	17.2%	5
Provide a meeting place for the larger community	69.0%	20
Attract big companies in the area	34.5%	10
Enhance the prestige of the area	24.1%	7
Create new jobs for the local community	34.5%	10
Attract and retain local new graduates and local innovative	65.5%	19
Don't know	6.9%	2
Other (please specify)	0.0%	0
	answered question	29
	skipped question	12

Interaction with other companies

27. How many companies located in the CIC do you * interact with on ar egular basis?

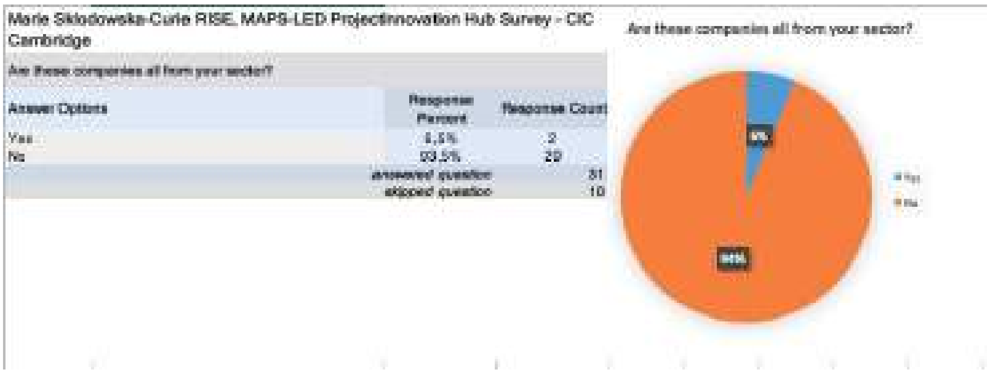


Marie Skłodowska-Curie RISE, MAPS-LED Project/Innovation Hub Survey - CIC Cambridge

How many companies located in the CIC do you interact with on a regular basis?

Answer Options	Response Percent	Response Count
0	12.9%	4
1-5	54.8%	17
6-10	22.6%	7
11-20	6.5%	2
21-30	0.0%	0
more than 31	3.2%	1
	answered question	31
	skipped question	10

28. Are these companies all from your sector?

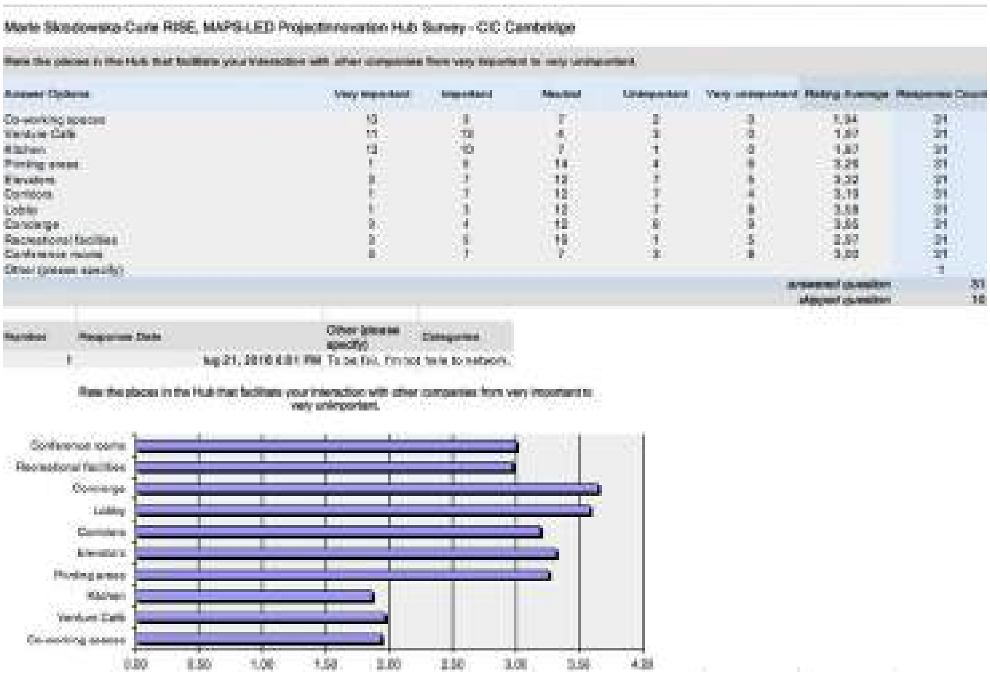


Marie Sklodowska-Curie RISE, MAPS-LED Projectinnovation Hub Survey - CIC Cambridge

Are these companies all from your sector?

Answer Options	Response Percent	Response Count
Yes	6,5%	2
No	93,5%	29
	answered question	31
	skipped question	10

29. Rate the places in the Hub that facilitate your interaction with other companies from very important to very unimportant



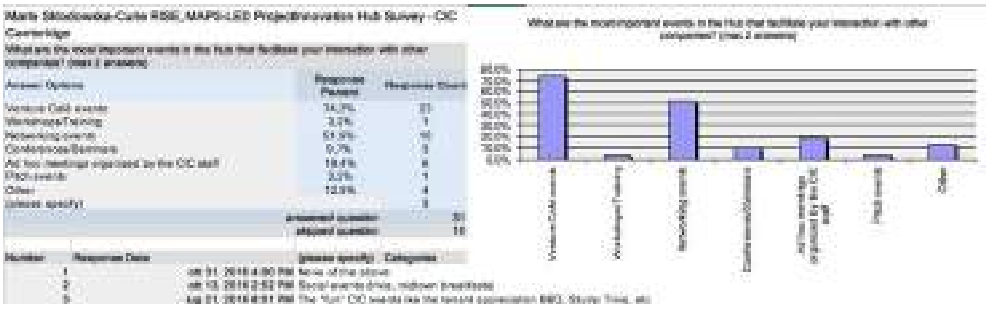
Marie Sklodowska-Curie RISE, MAPS-LED Projectinnovation Hub Survey - CIC Cambridge

Rate the places in the Hub that facilitate your interaction with other companies from very important to very unimportant.

Answer Options	Very important	Important	Neutral	Unimportant	Very unimportant	Rating Average	Response Count
Co-working spaces	13	9	7	2	0	1,94	31
Venture Café	11	13	4	3	0	1,97	31
Kitchen	13	10	7	1	0	1,87	31
Printing areas	1	6	14	4	6	3,26	31
Elevators	0	7	12	7	5	3,32	31
Corridors	1	7	12	7	4	3,19	31
Lobby	1	3	12	7	8	3,58	31
Concierge	0	4	12	6	9	3,65	31
Recreational facilities	2	5	18	1	5	2,97	31
Conference rooms	6	7	7	3	8	3,00	31
Other (please specify)							1
						answered question	31
						skipped question	10

Number	Response Date	Other (please specify)	Categories
1	lug 21, 2016 4:01 PM	To be fair, I'm not here to network.	

30. What are the most important events in the Hub that facilitate your interaction with other companies?



Marie Sklodowska-Curie RISE, MAPS-LED Projectinnovation Hub Survey - CIC Cambridge

What are the most important events in the Hub that facilitate your interaction with other companies? (max 2 answers)

Answer Options	Response Percent	Response Count
Venture Café events	74,2%	23
Workshops/Training	3,2%	1
Networking events	51,6%	16
Conferences/Seminars	9,7%	3
Ad hoc meetings organised by the CIC staff	19,4%	6
Pitch events	3,2%	1
Other	12,9%	4
(please specify)		4
	answered question	31
	skipped question	10

Number	Response Date	(please specify)	Categories
1	ott 31, 2016 4:00 PM	None of the above	
2	ott 13, 2016 2:52 PM	Social events drinks, midtown breakfasts	
3	lug 21, 2016 4:01 PM	The "fun" CIC events like the tenant appreciation BBQ, Stump Trivia, etc.	

3. Target Area Analysis

Carla Maione, Pasquale Pizzimenti with Laura Biancuzzo, Cesare Cascella, Claudio Massimo Colombo, Andrea Porelli, Giuseppe Pronestì

The structure of case study analysis of the target areas is articulated as following:

PART 1: Urban Regeneration

1. Target Area identification
    1.1. Target Area description
    1.2. Cluster structure:
    1.3. Related cluster

PART 2: Sociodemographic

2. Target Area Analysis-Socio-Demographic
    2.1. Population By Sex and Race
    2.2. Educational Attainment by Sex and Degree
    2.3. Labor Market
    2.4. Housing Stock

PART 3: Real Estate

3. Real Estate
    3.1. Property Type
    3.2. Average-Market Value per Parcel Block/ward
    3.3. Residential market Value

PART 4: Services

4. Transportation and Infrastracture
    4.1. Target area map with centroid spatial identification
    4.2. Target Area distance from the main Infrastructures

PART 5: Innovation Facilities

5. Innovation Facilities
    5.1. Public Facilities
    5.2. Innovation facilities

In the next parargraph is higlithed the syntesis of the 6 target areas. The Annex 1 contains the analysis for each target analysis.

Comparaed analysis of Target areas – Boston and Cambridge

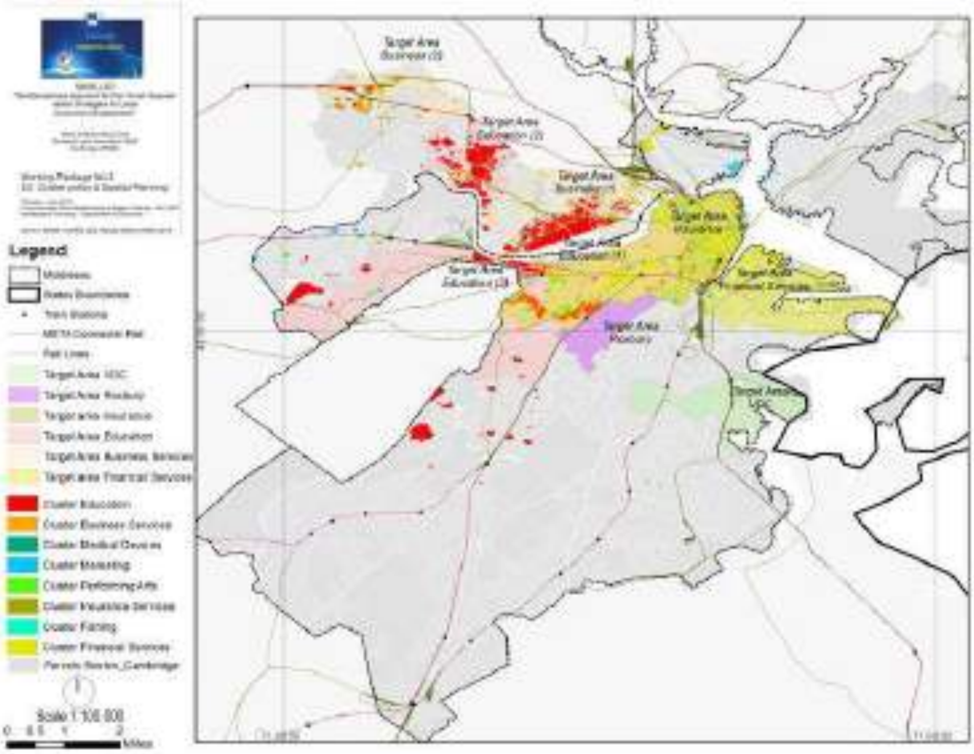
The table 10 contains the criteria used to develop a compared analysis of the 6 target areas. The criteria are based on the main pillars of the KBUD (Knowledge Base Urban Development, in order to define the main factors affecting the innovation ecosystem and, consequently, the entrepreneurial knowledge.

Table 10 Knowledge-based urban development assessment framework: the target area analysis

4 pillars of KBUD	Indicator Category	Indicator set	Description
Socio-cultural development	1. Socio Demographic	Population	Population growth rate(2010-2013) by Sex and Race Origin Educational Attainment growth rate (2010-2013)by Sex and Degree
Economic Development Economic structure, knowledge economy performance	2. Economic	Labour Market	Employed growth rate(2010-2013) by Age, Sex and Race Origin Unemployed growth rate(2010-2013by Age, Sex and Race Origin Labour Force growth rate(2010-2013) by Age, Sex and Race Origin Not In Labour Force growth rate(2010-2013 by Age, Sex and Race Origin
		Housing Stock	Housing Occupancy ; Occupied Housing Tenure ; Vacant Housing Units;
	3. Real Estate	Property Typology (Units;Surface)	Residential ; Commercial; Industrial; Office; Other
		Property Value	Lot Area; Land Assessed Value; TotalBuilding Surface; Building Assessed Value; Total Assessed Value; Markte Value; Average Total Assessed Value per Parcel Block/ward; Average Market Value per parcel block/ward.
Enviro-Urban Development Sustainable development Quality of place and life	4.Transportation and Infrastructure	Infrastructure	Numbers of Station(s)/Bus Stop(s)/Bike Hotspot(s) within the study area; Change of Number of Station(s) within the

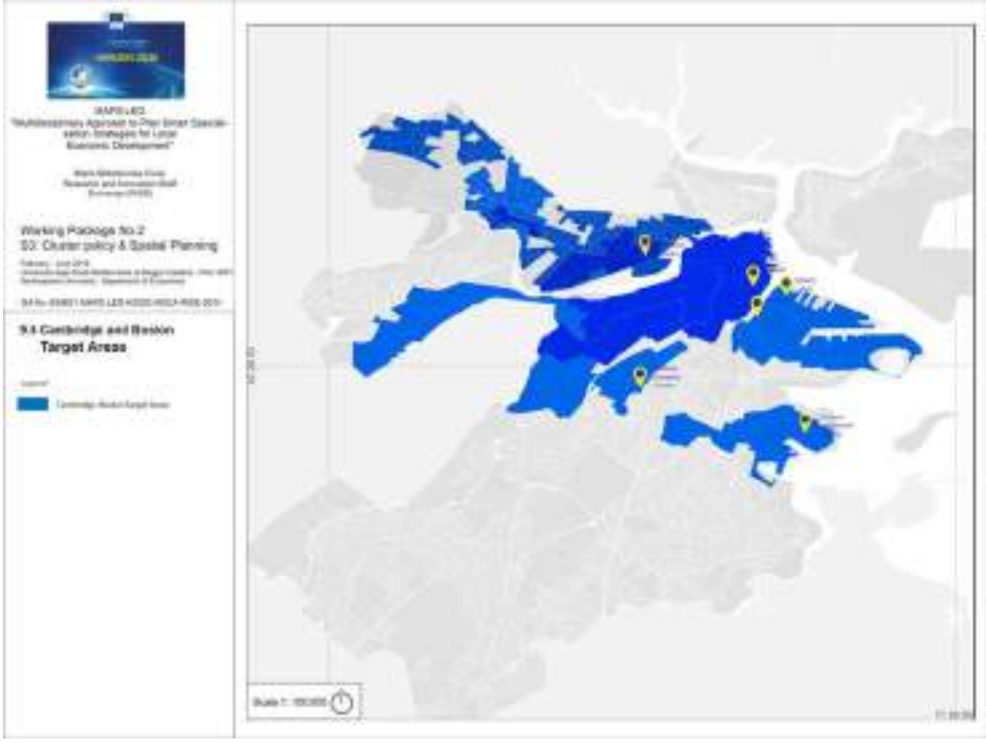
			study area in last 10 Years [%] No. Of Bus Stops [No.] No. Of T Stops No. Of Bike Hotspots [No.]
		Services	Total Number of line(s) stopping per station(s) within the study area; Ratio of station(s) accessible for wheelchair within the study area [%];
		Accessibility	Residential Units close to any station (200 mt) [No.]; Commercial Units close to any station [No.]; Office Units close to any station [No.]; Retail Units close to any station [No.]
		Parking	Public [No.]; Private [No.]; Average cost per hour of parking [$]
		Distance form the main infrastructure	Distances to the closest International Airport [Km]; Distances to the closest Port [Km] Distances to the closest Highway [Km]
	5. Public Facilities	Public Facilities	Open Spaces; Parks; Community Centers; Public Libraries; School; School Yards; Religious; Social Services Centers; Governmental Facilities; Clinic; Commercial Recreation; Hospitals; Museums; Fire and Emergency; Police Station
		Innovation Facilities	Colleges/Universities; Start-up located in the areas; Research Centers (public and private) Innovation Centers hub Research Labs (public and private)
Institutional Development	6. Governance and planning leadership and community	Urban regeneration Tools Plan and mapping	Innotive oriented tools: Planned Development area in BOSTON Planned urban development in Cambridge

Target Areas' Localisation



City(ies)	Boston and Cambridge	
Target Area Cluster-oriented Policy Initiatives linkages	TA1_Education	CIC Cambridge
	TA2_business	CIC Boston
	TA3_financial	District Hall We Work Boston Innovation District
	TA4_Insurance	Masschallange
	TA5_Roxbury	Roxbury Innovation Center
	TA6_VDC	Venture development Center

Target Areas' description



Target area	Population	Area (kmq)	Density (ab/sqf)
TA1_Education	84962	17,24	4928,190255
TA2_business	73174	6,97	10498,42181
TA3_financial	34417	14,92	2306,769437
TA4_Insurance	11003	3,62	3039,502762
TA5_Roxbury	20767	1,73	12004,04624
TA6_VDC	18144	3,67	4943,86921

In order to explore and evaluate the KBUD performance potentials of the 6 Target Areas in Boston and Cambridge, the research focuses on 4 main pillars of KBUD and 6 key indicators. The target area are comparable not only for localisation but for high level of Education.

This empirical study's key comparison factors and the indicator group have been selected by the literature on knowledge-based development.

The methodology includes literature review, review, survey and statistical analyses of the fundamental data collected that provide a comparison between the target knowledge areas of the city. The indicators are selected on the basis of measurability, analytical soundness, comparability, geographic coverage, data availability, and relevance. The Goal is to provide more accurate comparison, the use of proxy data for indicator values is permitted. All of the indicators are selected from a large indicator pool by using a multivariate analysis to determine the most suitable ones for each of the KBUD pillars. Multivariate analysis is also employed to see the correlations between indicators, look for causal relationships, and identify the dominance of any indicators.

Socio-cultural Development

Socio-cultural development indicates the intention to increase the skills and knowledge of residents as a mean for individual and community development (Gonzalez et. al., 2005). Social and human capitals of a society are seen highly interrelated with its high level achievements in socio-cultural development (Frane et al., 2005).

The first domain or pillar of Knowledge Based Urban Development (KBUD) and in line with literature findings, the key indicators are grouped under the "social" and "cultural" indicator sets(World Bank, 1996; OECD, 1998; Stone, 2001). The major indicator in this step are the Population Growth Rate (2010-2013)and Education Attainment(2010-2013).

Table 11 Population Growth Rate By Sex and Race 2010-2013 (%)

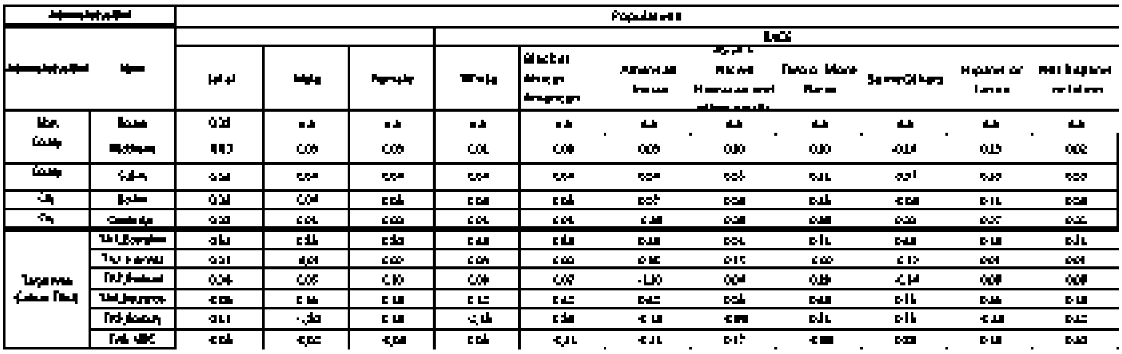


Figure 41 Total Population Growth Rate 2010-2013(%)

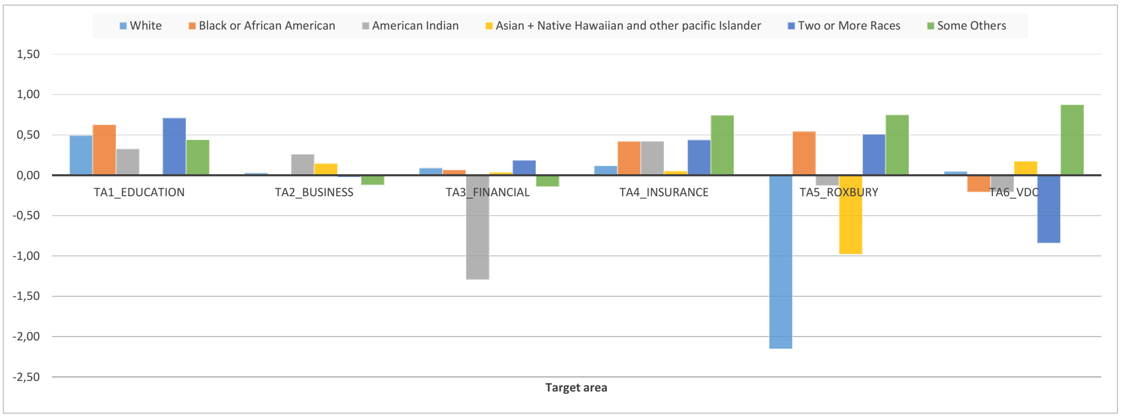


Figure 42 Total Population Growth Rate 2010-2013(%)

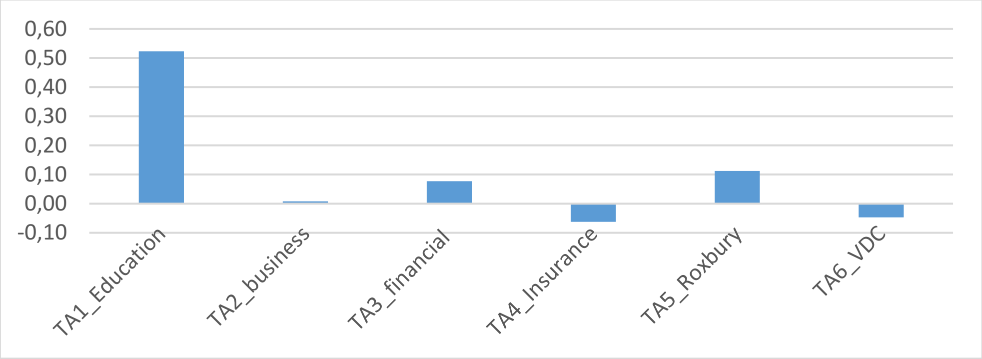
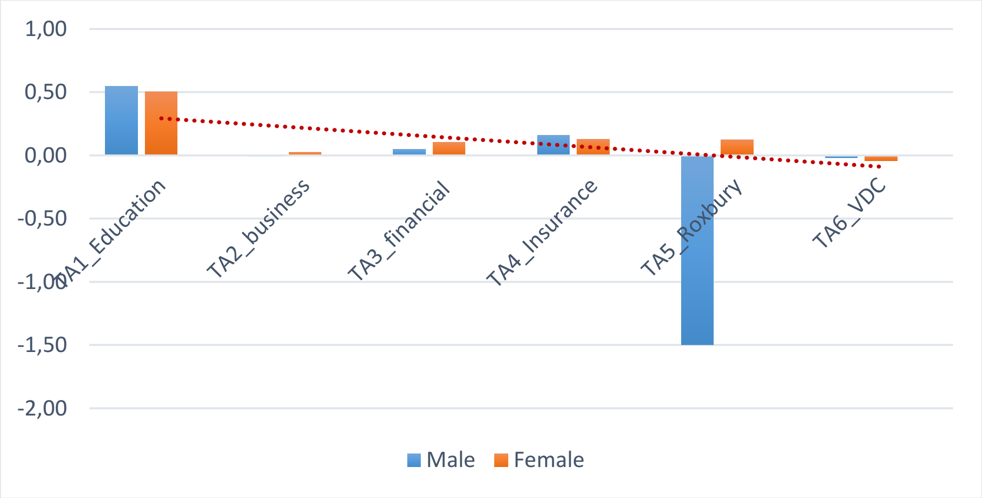


Figure 43 Population growth rate by Sex 2010-2013(%)



The first part measures socio-cultural development at the local level by focusing on the critical social and cultural development aspects of the target areas. The first indicator set of the socio-cultural development pillar of KBUD are the population growth rate and the other indicator is the Education Attainnent.

In particular, from graphs is evident as Boston's growing at its fastest rate in decades. the Target area Education shows a high percentage of growth rate 2010-2013 with respect to the other target area. In the figure 3, the target area education show a clear dominancy of white in the target area education, financial, busness, venture development center, insurance, furthermore in target area roxbury the percentage of white is decreasing rapidly but is growing the percentage of black or african America and some other race. The multiethnic groups, intended as a mixite of identity and tradition, in the target area rapresents the potential to develop of a regions, for the particular reasons that the ethnic group are usually territorially concentrated.

Table 12 Educational Attainment By Sex And Degree Growth Rate (2010-2013) (%)

Population

	Total population	High school graduate, equivalent	Some college, no degree	Associate's degree	Bachelor's degree	Graduate or professional degree
TA1_Education	4%	-15%	21%	-41%	-3%	-2%
TA2_business	4%	1%	23%	-13%	-3%	3%
TA3_financial	7%	-4%	15%	1%	8%	10%
TA4_Insurance	15%	19%	3%	13%	10%	17%
TA5_Roxbury	14%	13%	31%	-1%	2%	9%
TA6_VDC	-3%	5%	15%	10%	19%	11%

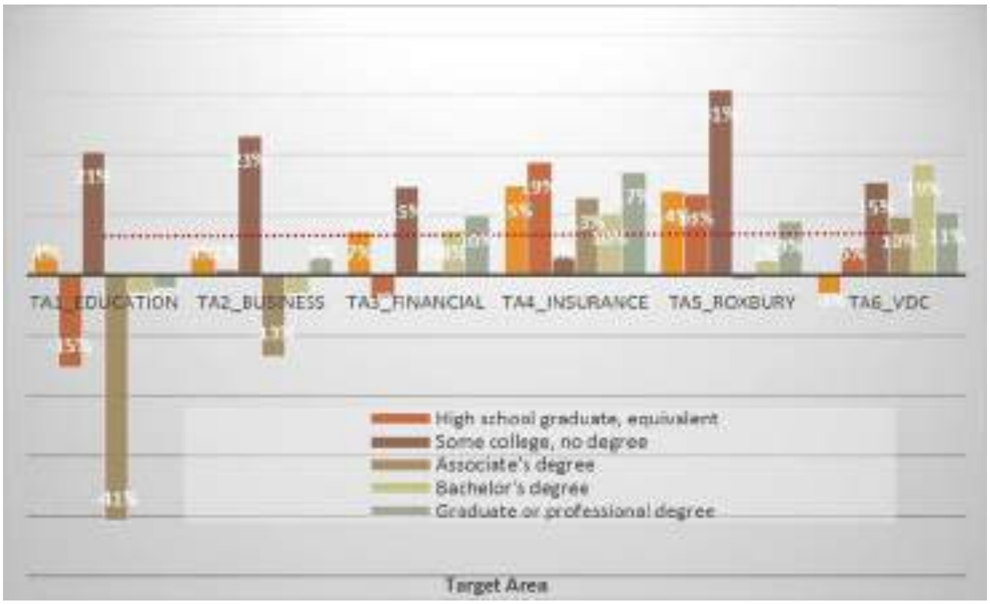
Male

	Total population Male	High school graduate, equivalent	Some college, no degree	Associate's degree	Bachelor's degree	Graduate or professional degree
TA1_Education	4%	-23%	24%	-82%	0%	-3%
TA2_business	3%	-2%	21%	-9%	-7%	6%
TA3_financial	6%	2%	11%	12%	3%	8%
TA4_Insurance	18%	37%	19%	51%	19%	12%
TA5_Roxbury	13%	23%	38%	-60%	-13%	11%
TA6_VDC	12%	12%	17%	-14%	18%	11%

Female

	Total Population Female	High school graduate, equivalent	Some college, no degree	Associate's degree	Bachelor's degree	Graduate or professional degree
TA1_Education	4%	-10%	18%	-19%	-6%	-1%
TA2_business	5%	3%	25%	-17%	0%	0%
TA3_financial	14%	-9%	18%	-8%	12%	11%
TA4_Insurance	6%	1%	-19%	-2%	0%	22%
TA5_Roxbury	14%	6%	25%	14%	16%	6%
TA6_VDC	20%	-2%	13%	23%	19%	10%

Figure 44 Educational growth rate by Total population (2010-2013)



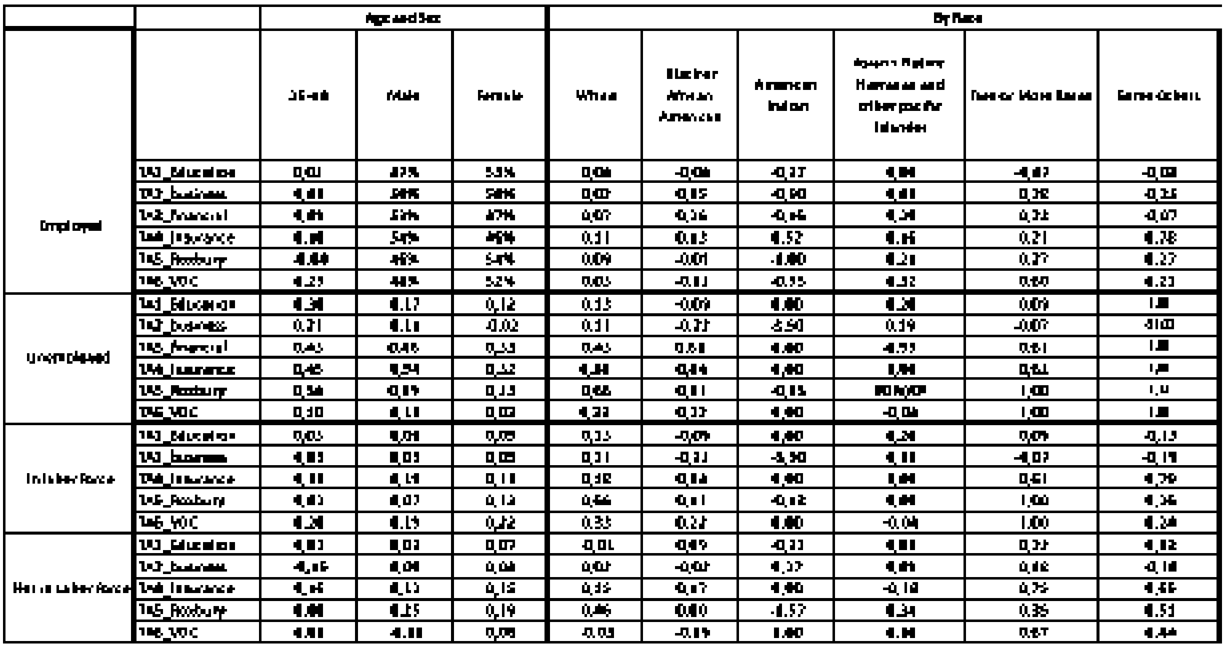
The second indicator of the socio-cultural development analysis is the Educational Attainment rate 2010-2013. According to Boston redevelopment authorities report, the target area's workforce is highly educated infact is evident as the rate for graduate or professional degree is growing in the target areas sourrounding the target area education in which are localised Harvard University and Mit in Cambridge. The presence of several colleges and universities, between Boston and Cambridge, creates the conditions that generate positive externalities for the local economy. A group of well-educated future workers will drive Boston's knowledge economy for years to come. In 2013-2014, almost 150,000 students enrolled in Boston colleges and universities, up significantly from about 118,000 in 2005-2006. Infact, From 2010 to 2013, students graduating from any degree program in Boston increased by about 10%, from approximately 50,500 to 55,500.(BRA,2017). From graphs is evident as in the target area roxbury and Venture development center the rate of resident in labor force is highly educated is growing.

Economic Development

Economic development codifies technical knowledge for the innovation of products and services, market knowledge for understanding changes in consumer choices, financial knowledge to measure the inputs and outputs of production and development processes, and human knowledge in the form of skills and creativity, within an economic model(Lever, 2002; Laszlo and Laszlo, 2007). Particularly in the era of knowledge, success in economic development is highly correlated with a city's ability to adapt in the knowledge economy (Nguyen, 2010).

The second domain or pillar of KBUD is economic development. The literature indicates that in determining the economic development level at city level, in the era of knowledge based economy, the key variables or indicators are mainly selected in relation to target area's of city and the economic structure, employment, unemployment, in labor force, not in labor force growth rate (2010-2013)(Anand and Sen, 2000; The New Zealand Government, 2007; World Bank,2008).

Table 13 Employed and Unemployed growth rate (2010-2013) (%)



		Age and Sex			By Race					
		16-64	Male	Female	White	Black or African American	American Indian	Asian, Native Hawaiian and other pacific Islander	Two or More Races	Some Others
Employed	TA1_Education	0,02	47%	53%	0,06	-0,06	-0,27	[illegible]	[illegible]	-0,03
	TA2_business	[illegible]	50%	50%	[illegible]	-0,15	-0,90	[illegible]	0,32	-0,25
	TA3_Financial	[illegible]	53%	47%	0,07	-0,36	-0,46	[illegible]	0,32	-0,07
	TA4_Insurance	[illegible]	54%	46%	0,11	-0,13	[illegible]	[illegible]	0,21	[illegible]
	TA5_Roxbury	[illegible]	46%	54%	0,09	-0,01	-1,00	[illegible]	0,27	[illegible]
	TA6_VDC	[illegible]	48%	52%	0,05	-0,11	-0,75	[illegible]	0,60	[illegible]
Unemployed	TA1_Education	[illegible]	[illegible]	0,12	0,15	-0,09	[illegible]	[illegible]	0,09	[illegible]
	TA2_business	0,21	[illegible]	-0,02	0,11	-0,21	-5,50	0,19	-0,07	[illegible]
	TA3_Financial	0,45	-0,46	0,53	0,45	0,61	[illegible]	-0,75	0,61	[illegible]
	TA4_Insurance	0,48	[illegible]	0,32	[illegible]	-0,44	[illegible]	[illegible]	0,61	[illegible]
	TA5_Roxbury	0,56	-0,19	0,13	0,66	-0,11	-0,15	#DIV/0!	1,00	[illegible]
	TA6_VDC	0,10	[illegible]	0,02	[illegible]	-0,33	[illegible]	-0,06	1,00	[illegible]
In labor Force	TA1_Education	0,05	[illegible]	0,05	0,15	-0,09	[illegible]	[illegible]	0,09	-0,13
	TA2_business	[illegible]	[illegible]	0,05	0,11	-0,21	-5,50	[illegible]	[illegible]	-0,19
	TA4_Insurance	[illegible]	[illegible]	0,11	0,32	-0,16	[illegible]	[illegible]	0,61	[illegible]
	TA5_Roxbury	[illegible]	[illegible]	0,12	0,66	-0,11	-0,12	[illegible]	1,00	[illegible]
	TA6_VDC	[illegible]	[illegible]	0,22	0,35	0,22	[illegible]	-0,04	1,00	[illegible]
Not in Labor Force	TA1_Education	[illegible]	[illegible]	0,07	-0,01	-0,49	-0,33	[illegible]	0,37	[illegible]
	TA2_business	-0,16	[illegible]	0,06	0,01	-0,01	[illegible]	[illegible]	0,12	-0,16
	TA4_Insurance	[illegible]	[illegible]	0,15	0,35	-0,17	[illegible]	-0,18	0,75	[illegible]
	TA5_Roxbury	[illegible]	[illegible]	0,19	0,46	0,00	-1,57	[illegible]	0,35	[illegible]
	TA6_VDC	[illegible]	[illegible]	0,09	-0,03	-0,19	1,00	[illegible]	0,87	[illegible]

Figure 45 Employed Growth Rate by Sex(2010-2013)(%)

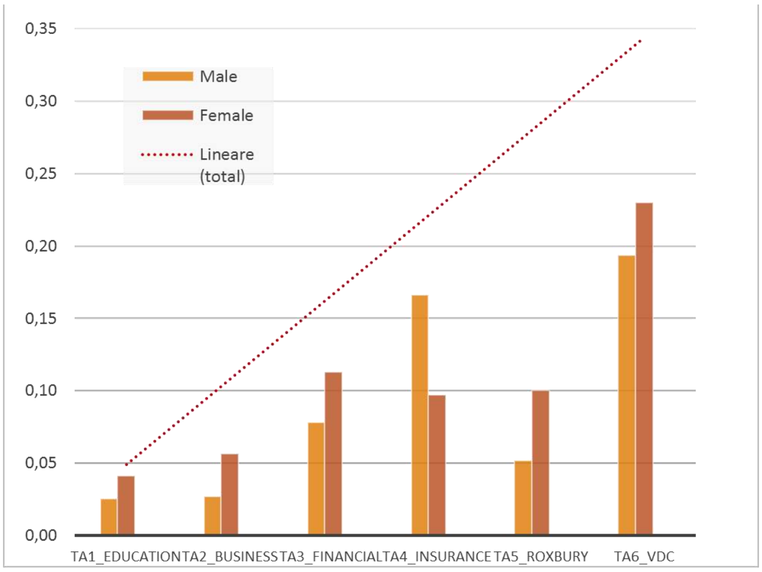
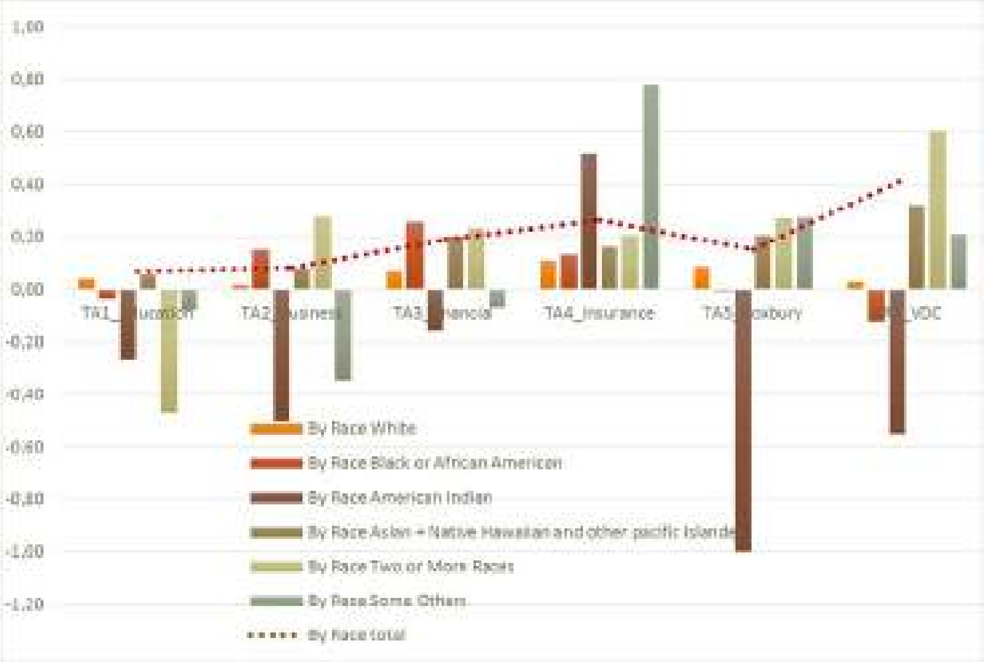


Figure 46 Employed Growth Rate by Race (2010-2013)(%)



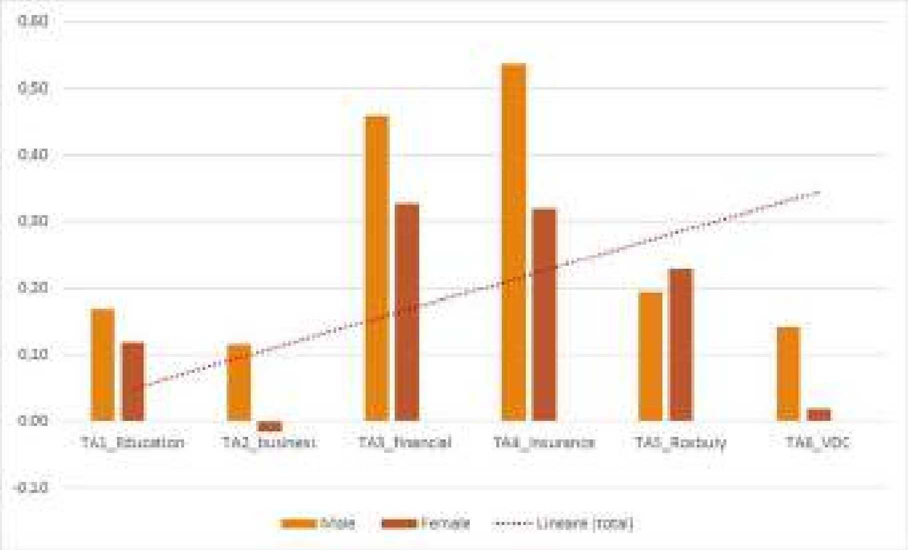
The first indicator set of the Economic development analysis rapresent the trends of labour market and are a set of indicators: Employment and Unemployment rate 2010-2013, in labour force and Not in Labour force growth rate(2010-2013).

From graphs is evident as Boston's core industries continue to be reflected in the city's largest private employers, which are all in the target area **Education, Insurance, and Financial**.

According the Boston Redevelopment Authorities by 2013, people working in Boston produced $157,152 in GDP per worker, 33% higher than the national average of $118,577. A steady percentage of Boston workers live in Boston – about 38%. The remaining 62% of jobs in Boston are filled each year by over 400,000 commuters from surrounding communities. The proportion of Boston workers who live in Boston has remained roughly steady since 2000, wavering between 35% and 39%. In addition to private workers, there were an estimated 76,150 federal, state and local government workers in the city in 2013. Is relevant in this sense the role played by principal employes in Boston and are: Massachusetts General Hospital 16,999 (Health Care)Brigham and Women's Hospital 13,303 (Health Care) Boston University(9,854 (Education) Children's Hospital 8,866 (Health Care) State Street Bank & Trust Company 7,800 (Finance) Beth Israel Deaconess Medical Center 6,781 (Health Care) Harvard University (Graduate Schools) 5,677 Education Northeastern University 5,069 Education Fidelity Investments 5,000 Finance Boston Medical Center 4,596 (Health Care):

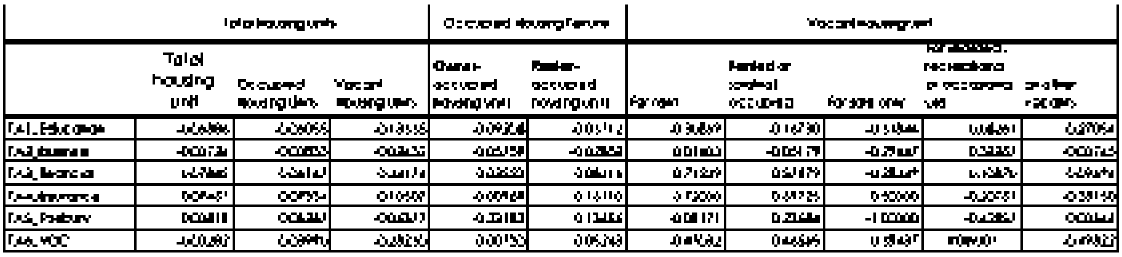
The figure of employment growth rate by sex ´2010-2013`shows the increasing role of female in the Venture Development Center Target Area and Roxbury Target Area. In particular from Boston redevelopment authorities trend market shows as Boston's resident labor force is about half White, while the labor force that commutes into Boston from other communities is about three quarters White. Residents who are Black/African-American or Hispanic consistently have higher rates of unemployment than the citywide average (set here at 1.0). A score of 1.8 means that Black/African-American residents experience unemployment rates that are 1.8 times higher than the city average.

Figure 47 Employment growth rate by sex ´2010-2013



Housing stock

Table 14 Housing occupancy 2013



	Total housing units			Occupied housing tenure		Vacant housing unit				
	Total housing unit	Occupied housing units	Vacant housing units	Owner-occupied housing unit	Renter-occupied housing unit	For rent	Rented or sold, not occupied	For sale only	For seasonal, recreational, or occasional use	All other vacants
TA1_Education	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TA2_Business	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TA3_Financial	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TA4_Insurance	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
TA5_Roxbury	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-1.00000	[illegible]	[illegible]
TA6_VDC	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	#DIV/0!	[illegible]

Figure 48 Total Housing Unit growth (2010-2013)

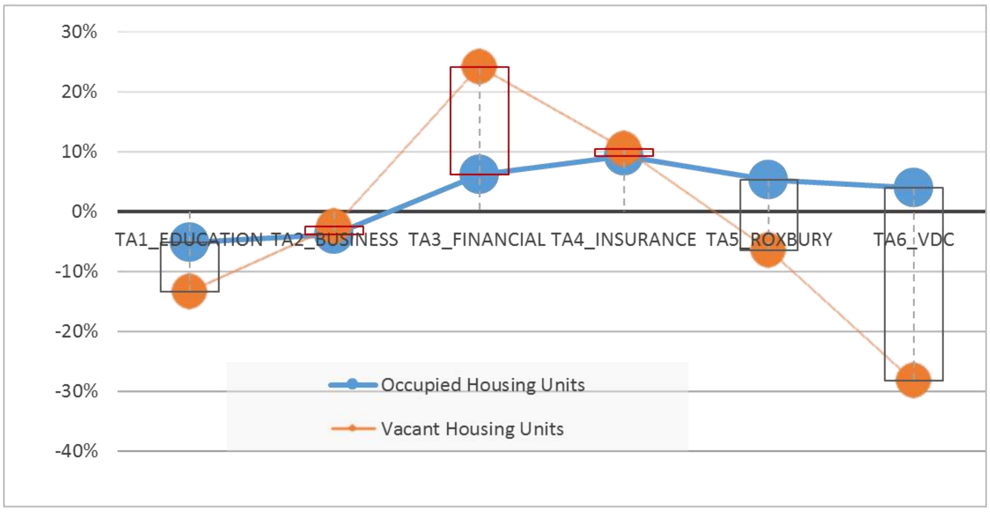


Figure 49 Occupied Housing Tenure (2010-2013)

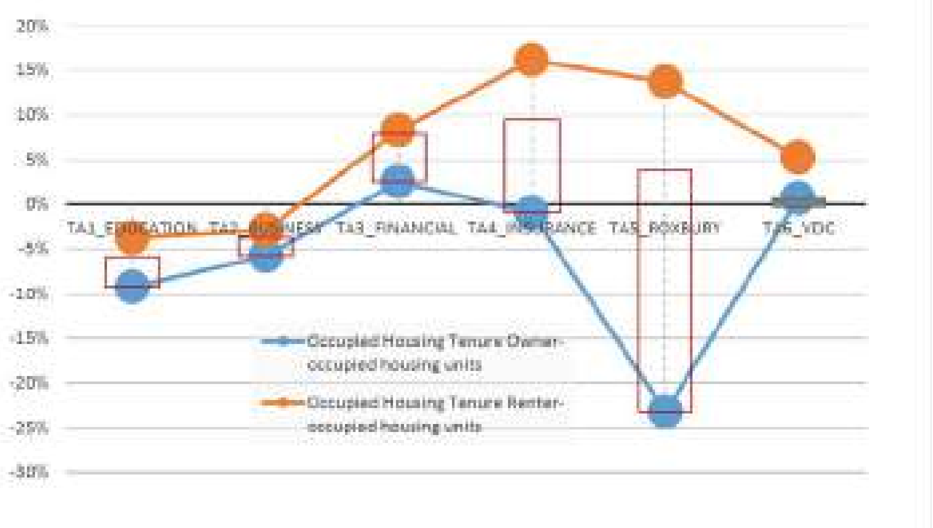
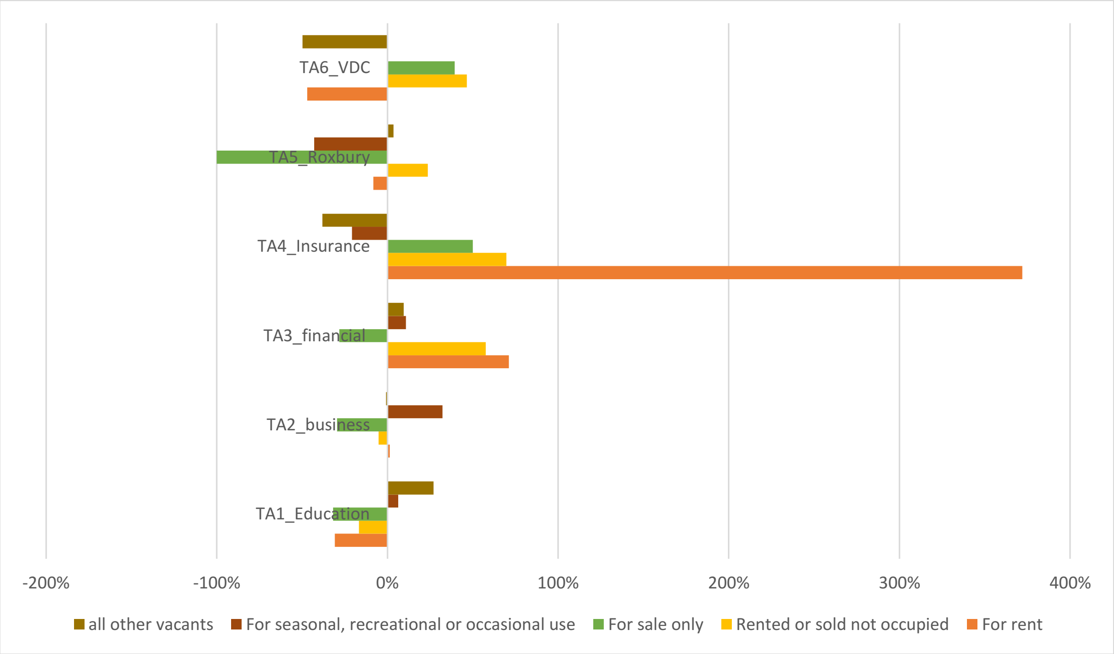
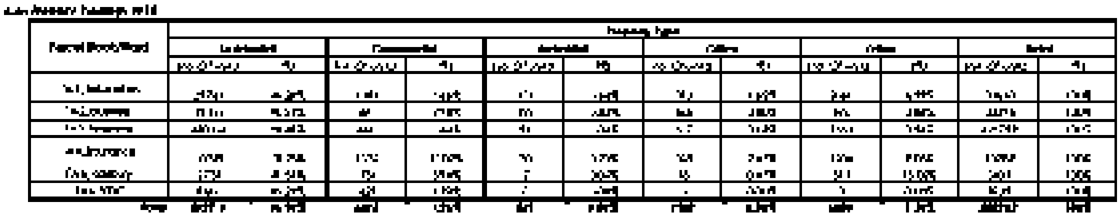


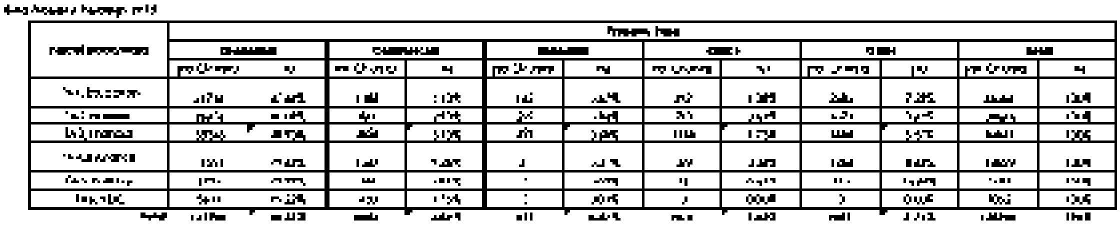
Figure 50 Vacant Housing Unit growth rate(2010-2013)



In Boston, the number of housing units is 273,113 , up 8.4% since 2000. Housing unit growth rate between 2000 and 2010 was the strongest decade since 1950: Boston added 20,546 new units of housing, for a decade-long growth rate of 8.2%. the trend highlighted by target areas, shows the level of vacant housing unit growth rate in the financial, busness and insurance area. This data is very relevant because ofthe concentration of economic forces that generates particular dynamics of gentrification. Gentrification is the results of a new demand, responding to the new patterns of demography, lifestyle and work, wich ask for new types of space.

Table 15 Property typology





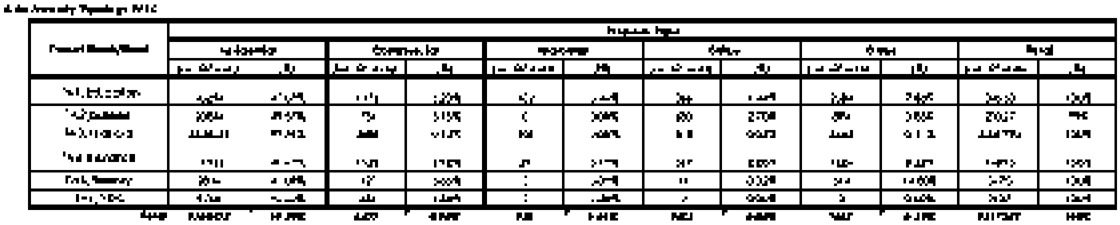


Figure 51 Property rate (2014)

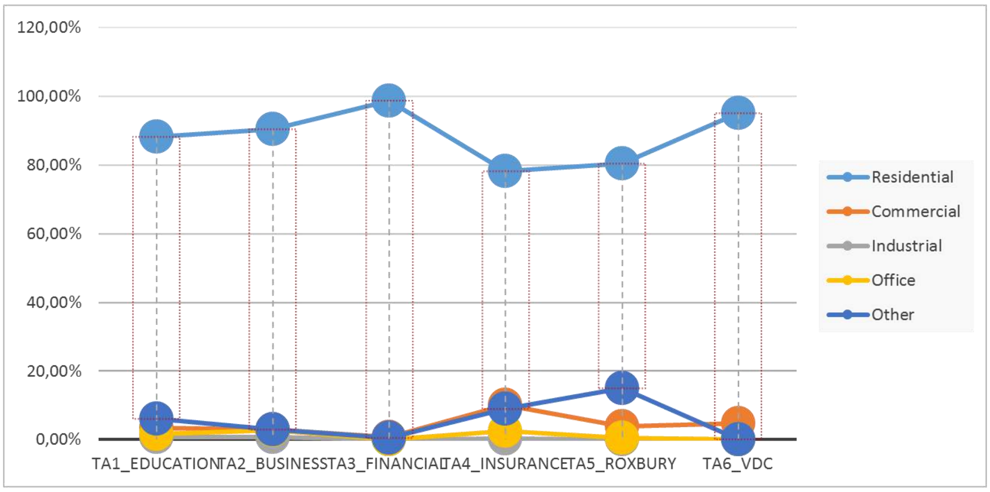


Figure 52 Property typology 2015

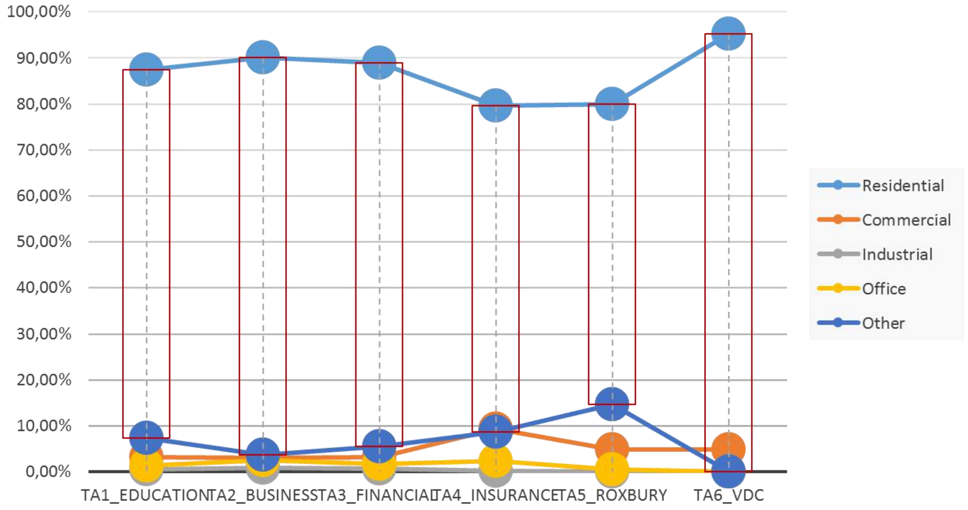


Figure 53 Property typology 2016

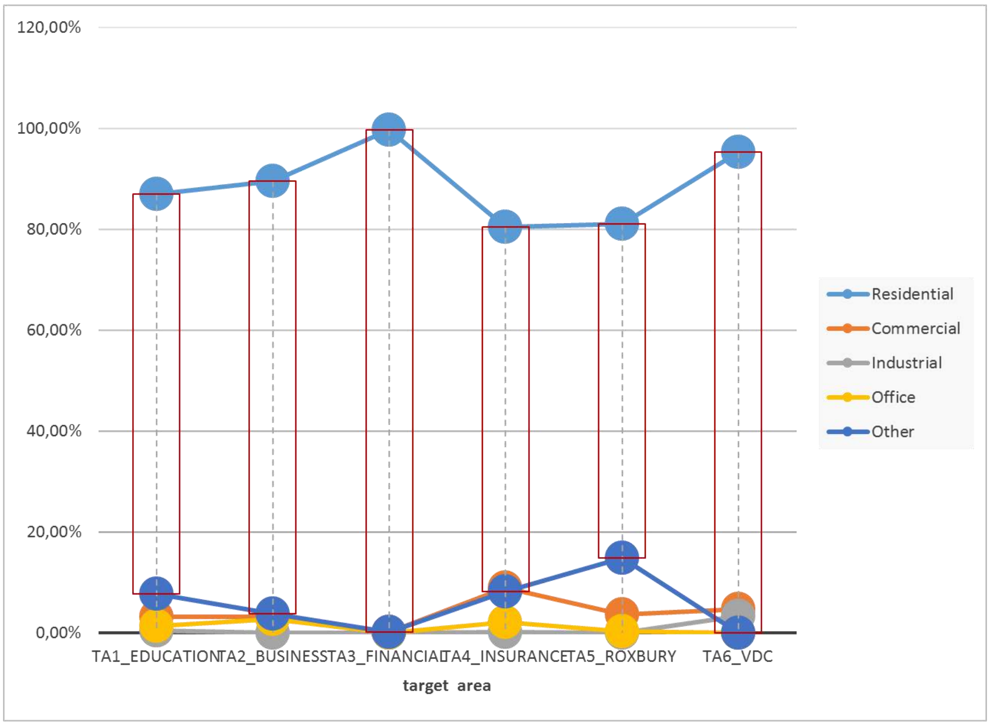


Figure 54 Property value growth rate (2014-2016)

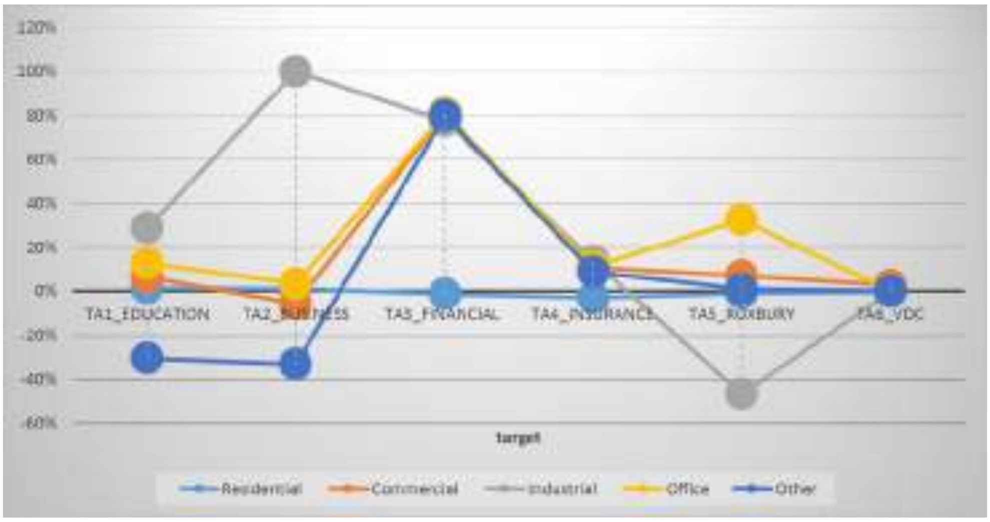
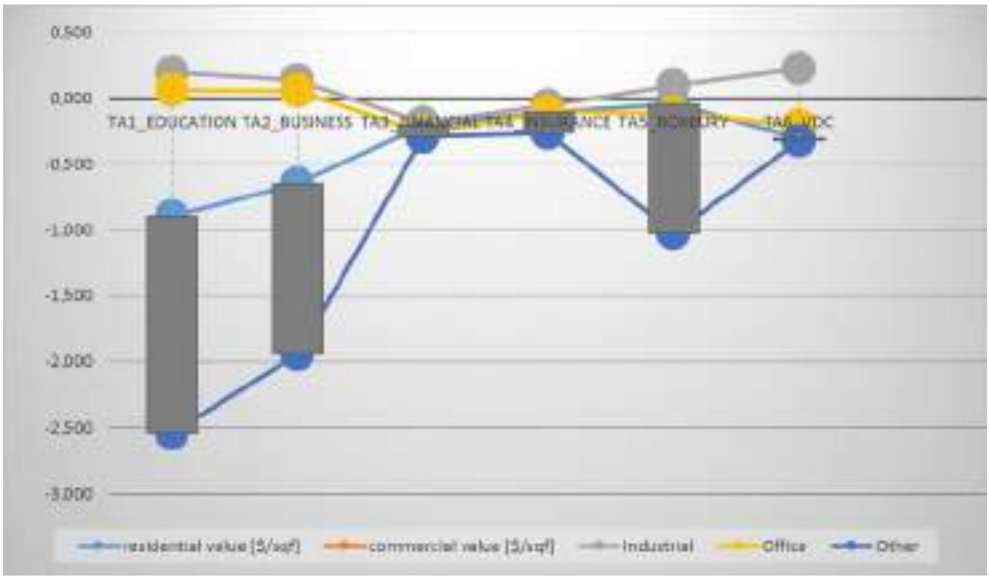


Figure 55 Average growth rate (2014-2016) Total Assessed Value per Parcel Block/ward($/sqf)



Despite the recession, the Boston housing market has remained strong. Adjusted for inflation, assessed values of both residential and commercial properties have increased and now exceed their pre-recession highs.

The assessed value of residential properties has grown faster than that of commercial properties since 2001. The total assessed value of residential properties was higher than the total assessed value of commercial properties in 2016. The graph highlight the property value per category and in particular shows the total assessed value of office was higher than the total assessed value of residential and commercial.

Enviromental urban development

Environmental urban development builds a strong spatial network relationship between urban development clusters while driving an urban development that is ecologically friendly. In this sense, sustainable urban development and quality of life, particularly in the knowledge community precincts, play a significant role in the spatial formation of the citywide sustainable KBUD strategies (Yigitcanlar et al.,2008d; Yigitcanlar, 2010c).

The third domain or pillar of KBUD is enviro-urban development. The literature indicates that in determining the enviro-urban development level at city level, in the era of knowledge based economy, the key variables or indicators are mainly selected in relation to target area's of city and the sustainable urban development and quality of place and life. (Hemphill et al., 2004; Hezri, 2005; Singh et al., 2009). More in particular the Indicators related are the public facilities and innovation facilities and transportation.

Table 16 Public facilities

	Open Spaces	Parks	Community Centers	Public Libraries	School	School yards	Religious	Social Services Centers	Government Facilities	Clinic
	(No)	(No)	(No)	(No)	(No)	(No)	(No)	(No)	(No)	(No)
TA1_Education	177	41	5	4	127	15	52	7	75	4
TA2_business	145	57	10	1	22	8	46	14	3	3
TA3_financial	153	82	5	3	114	7	[illegible]	2	252	4
TA4_Insurance	75	30	2	4	34	3	38	0	172	4
TA5_Roxbury	26	22	2	[illegible]	20	[illegible]	25	1	24	1
TA6_VDC	17	26	0	1	7	5	20	0	14	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Figure 56 Public facilities per Surface (sq/FT) and per Number

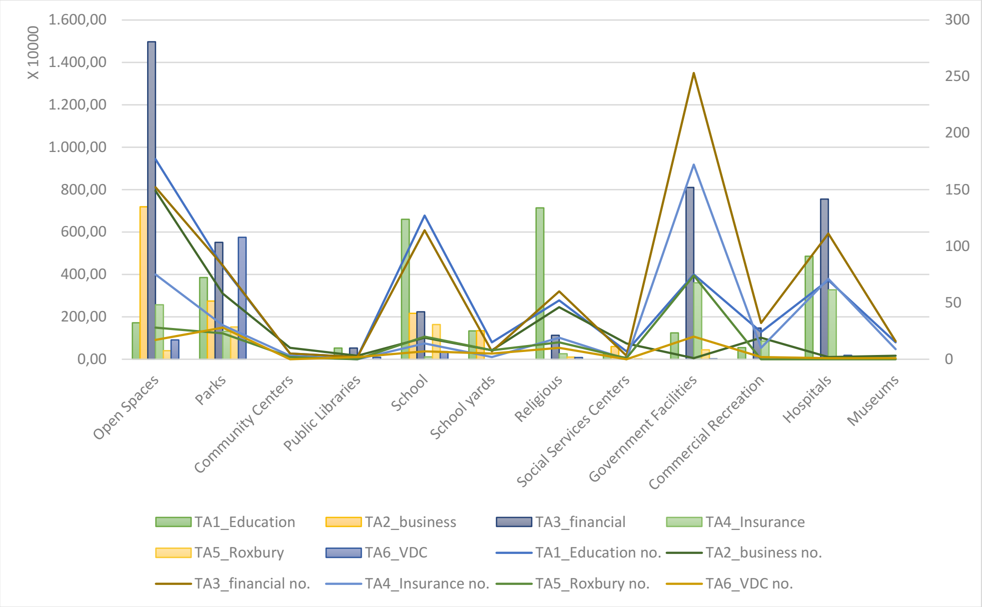
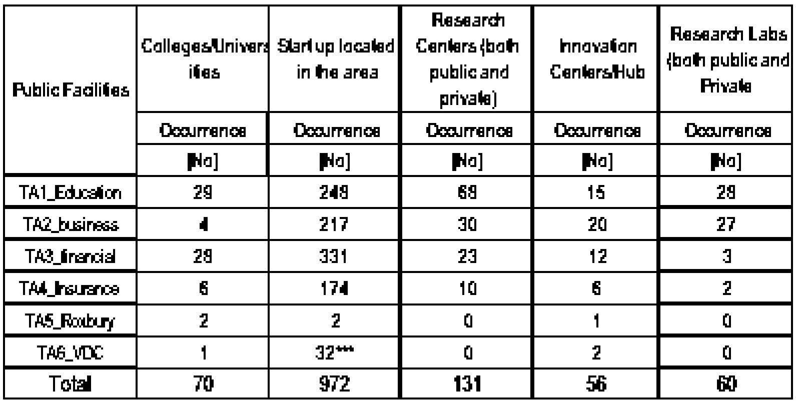
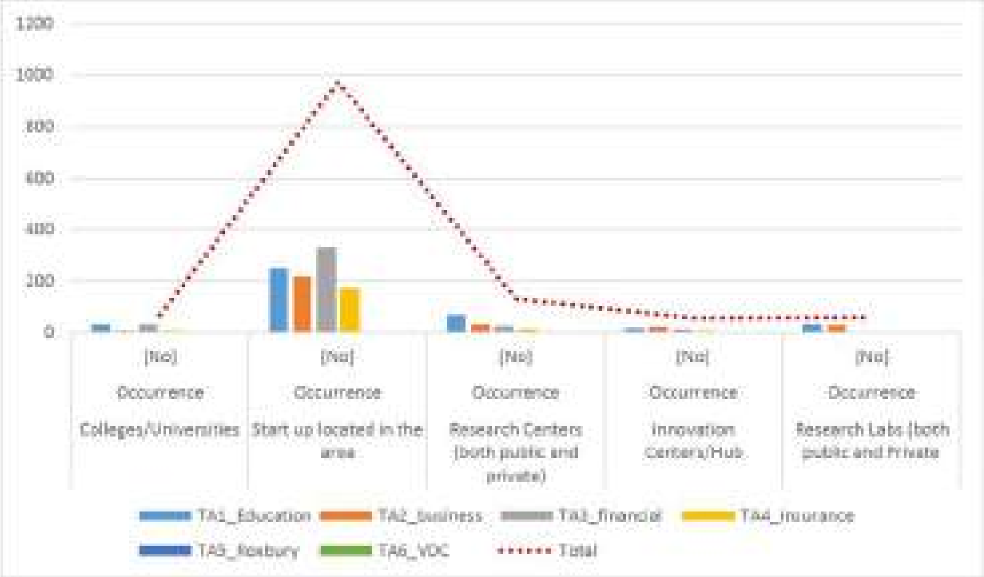


Table 17 Innovation facilities 2016



Public Facilities	Colleges/Universities	Start up located in the area	Research Centers (both public and private)	Innovation Centers/Hub	Research Labs (both public and Private
	Occurrence	Occurrence	Occurrence	Occurrence	Occurrence
	(No)	(No)	(No)	(No)	(No)
TA1_Education	29	249	68	15	28
TA2_business	4	217	30	20	27
TA3_financial	28	331	23	12	3
TA4_Insurance	6	174	10	6	2
TA5_Roxbury	2	2	0	1	0
TA6_VDC	1	32***	0	2	0
Total	70	972	131	56	60

Figure 57 Innovation facilities



Institutional development

Institutional development is key to orchestrating the KBUD and bringing together all of the main actors and sources so that they are able to organise and facilitate necessary knowledge-intensive activities and plan strategically for knowledge city formation(Yigitcanlar, 2009). The literature indicates that governing the KBUD via institutional leadership makes a big difference in achieving the knowledge city status (Baum et al.,2007).

The final pillar of KBUD is institutional development. In light of the literature findings, the key indicators in the assessment of institutional development are clustered around two main indicator sets of 'governance and planning and leadership and community (Aron, 2000; Wilson and Beaton, 2003; Brinkerhoff and Morgan, 2010).

In the case study analysis, the institutional development is represented by innovative-oriented urban management tool, in particular the Planned Development Area in Boston and the Planned Unit Development in Boston. The characterization of indicator of institutional development lays in their nature of "overlay districts" in which the innovation space becomes a zoning requirement.

Figure 58 Planned Development Area (Boston)

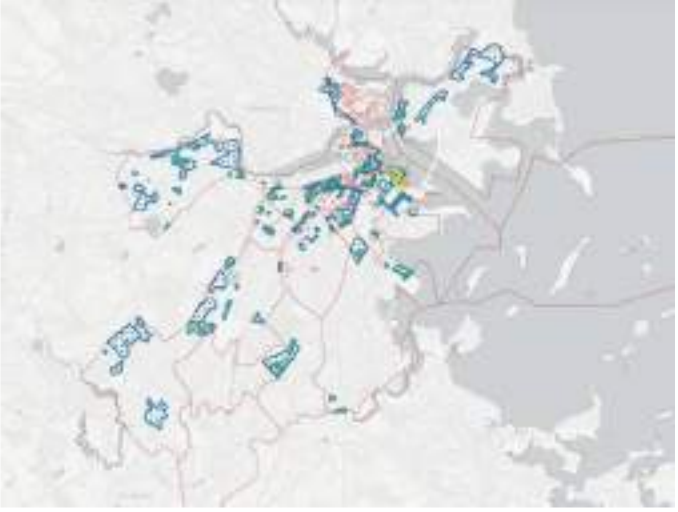
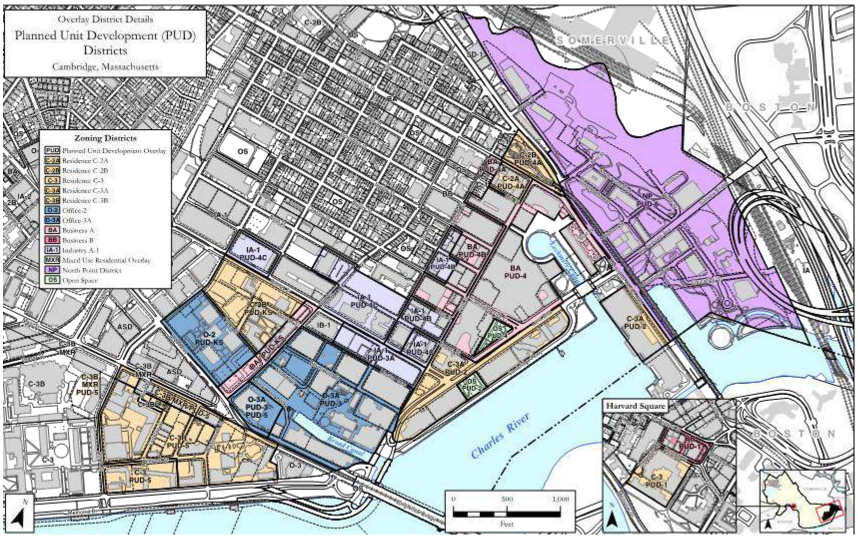


Figure 59 Planned Unit Development (Cambridge)



PART IV

The strategic role of innovation spaces

1. Introduction

Antonio Cappuccitti

These few lines will briefly introduce the case study framework in the central Boston urban area, studied by the Focus research unit, illustrating the main characters of the areas related to the actual urban transformations, and especially regarding the physical relationships with the urban context.

In the central Boston urban area, the case study framework includes some settlements in which there are relevant and different regeneration programs and master plans of different kinds.

The case studies have a number of interesting elements.

Among these, we would like to highlight the synergy between the mix of urban functions related to innovation (the core of our cluster study) and the new shape of the city.

Some areas (Longwood Medical Area, South End Cluster and Allston – Brighton) are related to LifeTech Boston Program, the Mayor Menino's program, launched in 2004, focused on fostering the growth of life sciences and high technology sectors.

The **Boston Seaport Innovation District** is the most important and large area in Boston, actually in transformation.

1,000 acres on the waterfront, principally on disused port areas and "brownsfields".

You can see, in the attached picture, the location of Seaport and the other waterfront district in Charlestown.

The target of a strong synergy of urban functions, in a complex urban cluster, joins the project of the most qualifying sector of the new waterfront, with important equipments and public spaces, for a future global image of the city.

A few numbers can explain easier. It's the fastest growing cluster.

200 new companies and over 4,000 new jobs since January 2010, including 10 new life sciences companies. Over 30 life sciences companies and growing, including giants companies like Vertex pharmaceuticals, are located in Seaport with their headquarters, served by the Silverline metro to Logan airport.

The area is the focus of urban Master Plans since nineties, and important metropolitan equipments have been built here, with a major catalyzing effect on urban development.

In the attached pictures you can see some of these equipments, including Boston Convention and Exhibition Center and the Seaport District Hall, a central space for meeting and innovation initiatives.

Charlestown new district is close to the historical settlement and the naval museum, in the northern sector of the city.

The development of a high quality city waterfront joins a mix of important urban functions, as well in this case.

The mix of urban functions and equipments is composed, in this case, by the Massachusetts General Hospital, the Spaulding Rehabilitation Hospital, New England Science and Technology Center, Incubator spaces, offices and laboratories, pharmaceutical companies, residential buildings, a tourist harbor.

The whole settlement is provided with an excellent and recent structure of public spaces, including the waterfront promenades.

In the western sector of the city, the three district directly involved in Life Tech Program, and whose location you can see in this picture, are Longwood Medical Area, South End Cluster and Allston – Brighton.

The **Longwood Medical Area**, 210 acres, contains a singular mix of research, health care, and academia. It's a real core of health care and medical training and research.

World-famous medical campus: Brigham & Women's Hospital, Children's Hospital, Dana-Farber Cancer Institute, Harvard Medical School, Harvard School of Public Health and of Dental Medicine, Merck research laboratories, and other healthcare, research, and educational institutions.

A few number. More than 43,000 scientists, researchers, and staff including more than 19,000 students. The projected growth is about 25% within the next decade.

The structure of public spaces is defined by a master plan with specific guidelines. The settlement is close to the historical and qualifying environmental system of the "Emerald Necklace Parks" designed by the landascape architect Frederic Law Olmested.

The **South End Cluster** is near the historical district of South End.

The urban surrounding context is characterized by the proximity with the compact and typical urban fabric of the historical district, and the high accessibility given by the nearby expressway.

The functional content is characterized by two important Medical centers, and by networks of alliances, partnerships, collaborations, and consultantships, especially in the medical field and in biologic research.

Key Players are: Boston University's BioSquare Research Park, Boston Medical Center, Boston University's Medical Center and Charles River Campus, BioScience Academy.

Boston University's BioSquare Research Park is a 2.5 million square foot biomedical research park featuring the National Emerging Infectious Diseases Labs, and fully built biotechnology start-up space.

Allston / Brighton is located at a side of Charles River, close to the large campus of Harvard Business school.

In this case studies, there are two principal and important structures:

- Harvard Innovation Lab: Initiative by Harvard Business School for team-based entrepreneurs activities and interactions among Harvard students, faculty, entrepreneurs and members of Allston and greater Boston. Opened November 2011.

- Genzyme corporation's main protein manufacturing facility, and one of the world's largest cell-culture manufacturing plants.

The urban context, in the area, is characterized by these important equipments.

The surrounding site is in large part to be morphologically defined yet, and this lets us understand the potentiality of the important urban functions located here.

In the case study of **Somerville**, a complex vision for the socioeconomic and physical regeneration is defined by a Comprehensive Plan, whose period of action is 2010 – 2030.

The principal stakeholder the urban regeneration action, in this context, is Greentown Labs, a Public Private Partnership initiative with the aim to become principally an important incubator for clean-tech start-ups, but also with others objectives.

The surrounding area is also characterized by disused buildings, in this moment, but an increase of urban quality is planned and expected, for this historical area of Union square, Somerville.

The **Roxbury** case study regards an "innovation district" at the neighbourhood scale, according with a strategy aimed to the socioeconomic and physical regeneration of peripherals districts, launched two years ago by Boston Municipality.

In this case, the regeneration strategy adopts an urban-based approach able to empower the existing local social resources and business activities, as well as the physical qualities of the urban spaces.

The urban and architectonical symbol of this local strategy is the Roxbury Innovation Center, opened in 2015 in Dudley Square's historical Bolling Building. The Roxbury Innovation Center, is a 3,000-square-foot business incubator to encourage collaboration, bold thinking, and new business development. The Bolling Building is also the new headquarters of the Boston Public Schools, and includes 18,000 square feet of street-level space for business or nonprofit use.

The case study framework in the central Boston urban area involves districts where the presence of powerful cluster of important urban function is decisive for the city, and where, at the same time, plans and programs aimed to a high quality urban regeneration is developing a new image for Boston global city.

2. Boston Case Study: The Neighbourhood Innovation District

Nicole del Re

Territorial and urban context before the initiative

Neighborhood development

Fig. 1

Figure 60 Neighborhood Localization within the City - Roxbury

From the foundation to the white wealthy suburb

Roxbury is one of the oldest Massachusetts Bay settlements founded in the 1600s. It was an independent community and later was annexed as part of Boston area, becoming a central site in the city. Due to its history, the area is now characterized by several historical sites such as the Eustis Street Fire Station (1859), the Chochiutate Stand Pipe (1869), and the Frankiln Park (1912), designed by the famous landscape architect F.L. Olmsted.

Along different eras Roxbury has been characterized by several phases of development. The settlement was established as a farming town in the early 1600s and until the 18th century, agriculture was the main basis of its economy. Moreover, due to its strategic location and geological characteristics, Roxbury played an important role during the Revolutionary War (1775-1783). Then, after the Civil War, Roxbury turned from a farm city to a Boston suburb. In 1820 the horsedrawn bus was established along Washington St. and the Boston-Providence railroad along the Stoney Brook Valley.

Therefore, Roxbury was affected by the residential development of houses inhabited by wealthy white families.

In the early 1900s, the area had a new transformation: Dudley Square became a vibrant place in the heart of the neighborhood, characterized by small businesses, hotels and amenities. In 1901 was built the Dudley Station, which remains one of the most important public infrastructure that links the neighborhood with the city. Moreover, in the same years were built the Ferdinand's' Building, an iconic five story building located in the heart of Square . Although, the central area was dedicated to commerce and leisure, the lower part was characterized by the presence of mills, tanneries, worker's houses; and subsequently were developed many other industries such as iron foundries, rubbers, etc, which confirm the industrial vocation of the lower part of the neighborhood.

Noteworthy, only a small percentage of African Americans lived in the area by 1920, mostly because they were attracted by the presence of churches. Therefore, after the 1920, Lower Roxbury was mostly characterized by a working class population composed by Irish, German, Scandinavian, Canadian and Jewish immigrants (Warner, 1978).

Modern Development of the area: from a white working class to a ghetto

As mentioned above, Roxbury had a thriving industrial sector starting in the early 1900s until the end of the 40s. However, the following years were marked by disinvestment and relocation policies. This affected the whole city of Boston and specifically the Roxbury area, which suffered from a serious economic decline. Thus, the businesses in Dudley Square dwindled, as well as the manufacturing sector located in the lower part and as a consequence, the white population that inhabited the area started to move out. However, this latter phenomenon was not accidental, but actively supported by the Federal Housing Administration (FHA) and private banks. In fact, bank initiatives enabled the exodus of white people from the inner area by offering them mortgages that were regularly denied to the black community. Therefore "race and ethnicity are used to determine mortgage eligibility in the community such as Roxbury … thus perpetuating housing segregation"(Bostonfairhousing.org), and determining the definitive socio-economic decline of the neighborhood as well as its *ghettoization*[15].

The flight of white working class occurred in the 60's caused the abandonment of houses and small business in the whole area. Moreover, shortly after in the neighborhood started the arson, that particularly affected the core area of the Dudley Corridor. Arson became another aspect of the neighborhood's decline leaving the neighborhood full of vacant lots, suddenly filled by trash and illegal landfills. This unhealthy situation linked with the illicit pollution continued for many years until the Boston Office of Environmental Health declared that Roxbury was home of 64% of the city's landfills (Faber, 2007). Lastly, in 1987 Roxbury was also cut off from the transportation network by the steady inefficiency of the orange line system. As a result,

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[15] This practice, implemented by government, private banks and insurances was called *redlining*, and affected Roxbury's Afro American community from 1950 to at least 1990s.

the old working class neighborhood inhabited by white immigrants, rapidly became a socio-economically depressed area populated by minorities with a large Afro Americans contingent.

Figure 61 Neighborhood Historical Photos Roxbury

Roxbury working class neighborhood, 1940s

Roxbury's arson, 1965

Roxbury' vacant lots, 1985

Source: *photos from the documentary "Holding Ground: The Rebirth of Dudley Street", New Day Film*

Roxbury today: social, economic and environmental characteristics

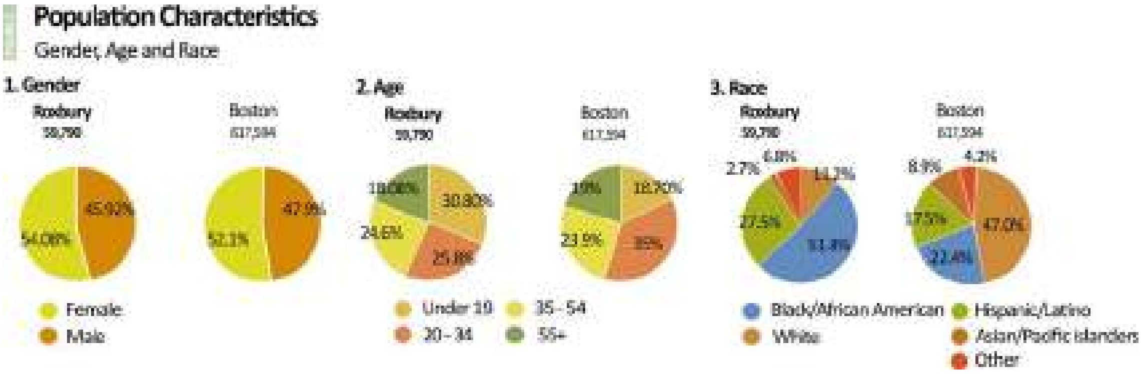
Nowadays, Roxbury is one of twenty-three neighborhoods in the city of Boston with 59,790 inhabitants. It is the second most dense neighborhood in the city with 15,331 people per square mile (Census 2010). It is located in the core of the city, near Northeastern University, the Orange Line in the Est, and the neighborhoods of Dorchester and Mattapan in the South Est boundaries (fig1).

Figure 62 Population and Density Roxbury

Roxbury’s population is composed of 30% youth, younger than nineteen years old. From the 1980s, Roxbury has been characterized by heterogeneous and multiethnic communities. However, 51.8% of Roxbury’s population are African American, followed by 27.5% Hispanic and Latinos, and only 11.2% are White people (fig.4).

Overall, Roxbury is one of the poorest neighborhood in the area of Boston with an average household income of $30,654 compared with the city average of $52,433. According to the Boston Redevelopment Authority (BRA) study, the neighborhood has a 36.2% poverty rate compared to a 21.2% poverty rate for the entire city of Boston. Moreover, Roxbury has a 12.9% of impoverished people rate in addition to the second highest rate of unemployment of the city, that is respectively 16.8% (BRA, 2014).

Figure 63 Population Characteristics Roxbury



According to its historical urban development, the neighborhood has maintained a residential aspect, that cover the 53.4% of the whole land use in the area. The residential area has 18,946 units that extend over 3.9 square miles. 11,220 of the 18,946 units are affordable houses[16](Census, 2010). Moreover, within the0ss units there are around 3,400 that are subsidized and managed by the BRA (Jennings, 2016).

The education sector for Roxbury includes; 4 colleges, 7 high schools, and 12 elementary schools (BRA, 2016). Moreover, the headquarters of the Boston Public Schools Administration recently moved into the Ferdinand Building in Dudley Square.

The Roxbury commercial sector is characterized by the presence of small businesses run by families. The more developed areas still remain in the Dudley Square, located in the northern part of the neighborhood between Dudley and Washington Street. It hosts many historical buildings (including the recently restored Ferdinand's Building), small businesses, associations and public services, all which contribute to making this area the most vibrant in the neighborhood. In contrast, there is not a large industrial sector in the neighborhood (1.3%), and it is located on the outer edges of Roxbury(fig.5). Open Space, such as the historical Franklin park designed in the 19th century, as well as city parks, community gardens and parkways make up 9.8% of the total area of the neighborhood for a total of 93 open spaces (BRA, 2016). Roxbury's land use is also characterized by another peculiar aspect: there are many developable lots still available in the area. Obviously, this is a controversial aspect that on one hand represents a great resource for the neighborhood while on the other attracts developers 'private interest that could led to urban gentrification processes.

Transportation has been a major issue for the neighborhood, due to the discontinuation of Orange Line service in the 70s that disconnected the neighborhood from the city. However, the current transportation network has been reinforced, especially around the Dudley area. Therefore, the Massachusetts Bay Transportation Authority (MBTA), the transportation agency for the entire Boston city, has renewed the historical transit hub at Dudley Station, and now operates 15 local routes as well as the Silver line, the last route serving the area along Washington Street and Dudley Square (fig.6).

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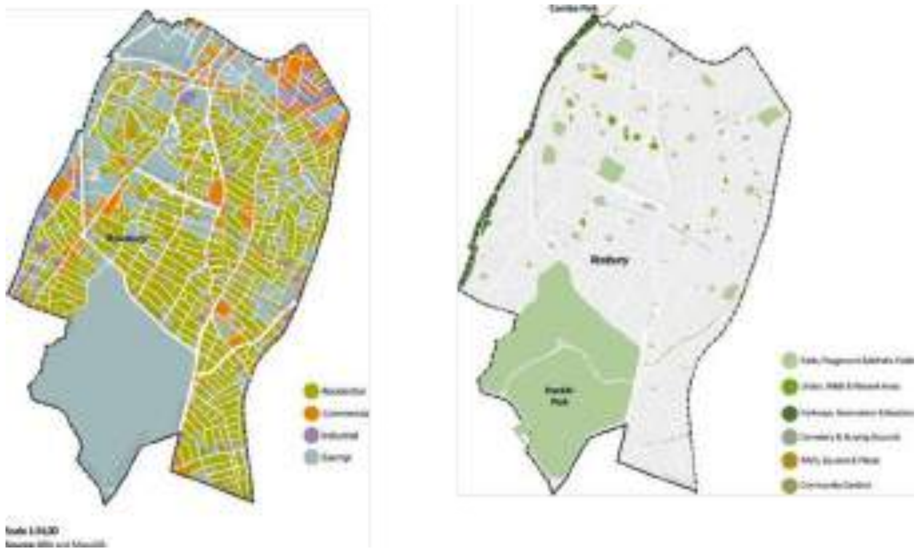
[16] The term *affordable housing* describes housing that are affordable without regard to citizens' income. The U.S. government sets housing costs at or below 30% of people income in order to be affordable

Figure 64 Land Use and Open Space Roxbury



Environmental and Social Issue

Roxbury has a strong history with preservation and restoration of its open space and natural resources. The neighborhood's economic decline, beginning in the 60s, was specifically linked to the exponential increase of polluted areas and the rise of environmental injustice. In 1999, the Boston Office of Environmental Health found that more than 64% of the 79 trash transfer stations, landfills, and other hazardous waste centers existing in Boston, were located in the neighborhood (Faber, 2007). Moreover, in the same years Roxbury was ranked as one of the most environmentally overburdened areas in the state (Faber, Krieg, 2002).

For these reasons, residents and local leaders founded many community-based organizations such as the Dudley Street Neighborhood Initiative (DSNI) and Alternative for Environment and Community (ACE) to revitalize the neighborhood by creating affordable housing and healthy public spaces within the neighborhood. These community-based organizations were also founded to fight the social and environmental injustice created by disinvestment policies, arson and illegal dumping. As a matter of fact, they have generated remarkable outcomes for the neighborhood such as the eminent domain obtained by the DSNI that led to the construction of 65 units of affordable housing and common gardens in 2001, as well as the ACE's commitment to promote the Massachusetts to Environmental Justice Policy, obtained in 2002. DSNI and ACE are currently still active in the neighborhood and are promoting different activities and programs that include public partnership too. Specifically, the DSNI is handling a Community Land Trust (CLT) project that will involve all the existing CLTs in the Greater Boston in order to provide structure and a share their strategy with the municipality that will be embedded in the 2030 housing goals (Cho, Li, Salzmant, 2016). Furthermore, in 2010 DSNI in collaboration with another non-profit called The Food Project (TFP), have inaugurated a neighborhood community greenhouse that hosts 27 raised beds and has boosted sustainable urban agriculture and local food networks in the city.

Figure 65 Transportation Roxbury

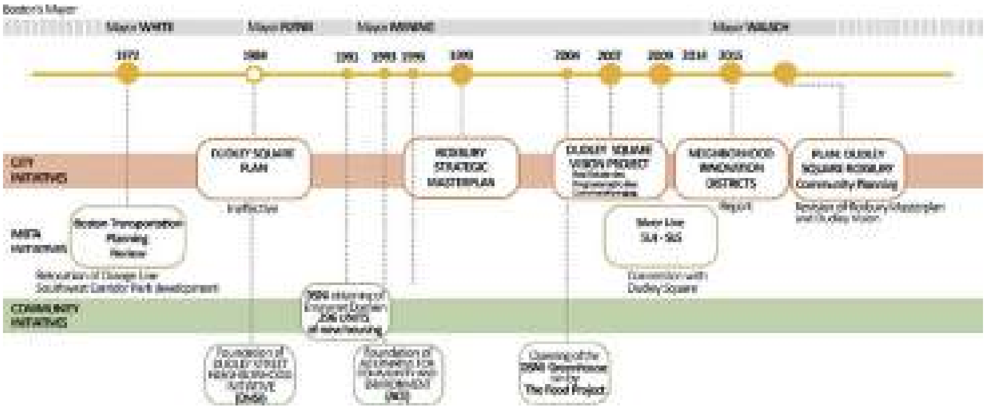
ACE, similarly to the DSNI is promoting practices of sustainable urban agriculture by spread community garden within the neighborhood. Moreover, one of the latest project the organization has been addressing regards the “transit justice” issues in a low-income areas.

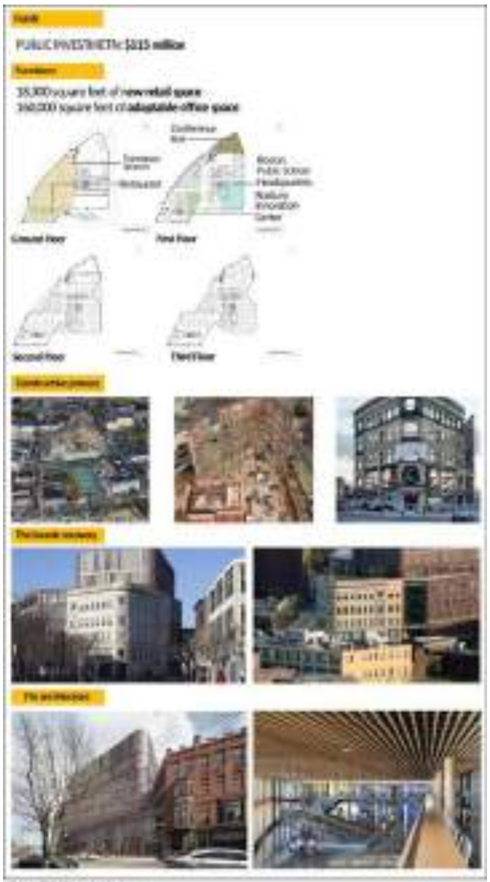
Previous Urban Policy in the Area

Roxbury has been affected by several urban policies among the last three decades (fig 7). Noteworthy, over the years the municipality, through its urban planning and economic development agency, has moved from a top-down approach to a community involvement approach. An example of this top down approach was exhibited when the Boston Transportation Planning Review relocated the Orange Line cutting off the neighborhood from the rest of the city. Eventually, new initiatives were implemented to encourage citizens to partake in these decision-making processes. The Roxbury Strategic Masterplan is a great example of this. The plan, initiated in 1999 and ended in 2004 implemented a public strategy to foster economic development. However, as the city vision conflicted with the citizen’s interest, Roxbury residents decided to elect representatives who became an effective body within the Masterplan decision making process (Plan Oversight Committee). The Roxbury Strategic Masterplan was the first example of community planning in Roxbury, and it paved the way for the following urban initiative called “Dudley Square Vision Project”. In fact, also this latter involved public participation through the creation of the Dudley

Vision Advisory Task Force. The task force collaborated with the municipality to review project ideas for the economic development of the neighborhood. Thus, this plan has led to the renovation of the Boston library branch, the new expansion of the Police Station and the strengthening of the Dudley Street through a new development of mixed-use commercial and retail stores. Lastly, the latest community planning process has started in the first weeks of the 2016, with the aim to verify and update all the previous policies and programs, starting from the Masterplan.

Fig. 7_Timeline of Urban Programs and Policies





Roxbury has been also subject to public-private initiative such the one started in 1995 under Menino administration: the “Main Streets Program”. This strategy, which is still active today, aimed to support existing business through funds improvement and technical assistance.

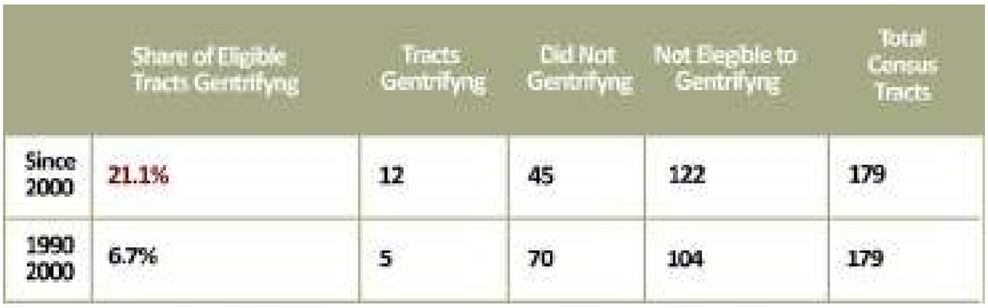
Regarding the transportation, in 2009 the MBTA has finally added the silver line connection that link Dudley square with the downtown area of the city while the lowest part of the neighborhood is still partially unserved and currently it is one of the mail claim for the residents.

In recent years the Boston Redevelopment Authority has continued its activities in the area, by completing 6 new project in the area. The most important was the renovation of the Ferdinand’s Building inaugurated in 2015 (fig.8), that hosts the Roxbury Innovation Center, few restaurants and small shops. Besides, it has been realized the Tropical Food Market as well as other projects for residential homes. Moreover, other four project are under construction while more than fifteen has been approved. As mentioned above, also the community-based initiatives have continued to develop, sometimes working alongside the public administration like in the case of the Neighborhood Innovation Distrct, the strategy analyzed by this report, that actively involved the participation of the DSNI.

Summary

Over the last fifty years the neighborhood has experienced phases of unequal distribution of environmental risks, exclusion from city decisions that affected the urban spaces, and lack of economic opportunities. However, all these circumstances led to the development of a strong network of community-based organizations that currently handle themes of public spaces, environmental justice, community land trust, affordable housing, and community advocation in general. All these agencies were able to promote collaboration between the community and the City. Starting from the 1999 Roxbury Strategic Masterplan the city begun to consult community and local leaders about planning projects of the neighborhood. Moreover, more recently the City invested funds to renovate the Ferdinand Building and it move inside the structure the school department and the Roxbury Innovation Center. It also renovates the Dudley Station, and built a new police station.

Figure 66 Boston Gentrification



	Share of Eligible Tracts Gentrifyng	Tracts Gentrifyng	Did Not Gentrifyng	Not Elegible to Gentrifyng	Total Census Tracts
Since 2000	21.1%	12	45	122	179
1990 2000	6.7%	5	70	104	179

Source: Governing analysis of 2009-2013 American Community Survey, US2010 Longitudinal Tract Data Base

Overall, all these investments are aim to the neighborhood development, especially in Lower Roxbury area, the part of the neighborhood that is closer to the downtown. However, if the local community will not be empowered by the implementation of these projects, the risk is to deeply increase the inequality within the City. In fact, Boston over the past years is suffering from even more episodes of neighborhood *gentrification (*fig. 8*)*. Usually, these phenomenon occurred in working class neighborhoods such as South Boston, Dorchester (Turchi, 2016) and more recently in Jamaica Plain, due to the neighborhoods' physical improvements that, besides do not often correspond to the community needs of enhancing public services (Stone, Stoker 2015), dramatically increase housing costs and lead to the displacement. As a matter of a fact, Boston has become one of the U.S. cities with the highest real estate market as well as a place of profound inequality within its different neighborhoods (Cho, Li, Salzman, 2016).

Therefore, current public and private intervention that are taking place in Roxbury may be able to firstly bring benefits to current residents, in order to spur a more equitable and inclusive economic development of the whole city.

The Initiative: Neighborhood Innovation District

General Framework

The most innovative scenes in the Greater Boston are born around Kendall Square (Cambridge) and the more recent Seaport Innovation District launched by Mayor Menino in 2010. Both these places are unequivocally recognized as innovation hubs able to support the emerging technological clusters and thus, the city's economic growth. As a result, the Innovation Districts have became a new recognized urban model that, according with Katz and Wagner definition are represented by a 'geographic area where leading-edge anchor institutions and companies cluster are connect with start-ups, business incubators, and accelerators'. This models aim to stimulates city economic growth by pursuing the interaction between physical, economic and networking assets (Katz and Wagner, 2014). Moreover, Innovation Districts reproduce peculiar characteristics such as: (i) the presence of development accelerator and incubator agencies, (ii) a vibrant environment for entrepreneurs networking opportunities, (iii) the proximity with university or other centers of research, (iv) a well-developed infrastructure system, that are physically changing the geography of the cities.

Starting from 2010, Boston urban policy have begun to go along this kind of initiatives that spur new innovation hubs and entrepreneurship around the city, and the Seaport Innovation District is its flagship initiative.

Seaport Innovation District

All the above mentioned characteristics that combine the existence of high tech start-ups, business incubator and a vibrant entrepreuners environment can be found within the Seaport Innovation District, a 1.000 acres' development born on a former industrial area created at the beginning of the century to support city manufacturing industry (fig.7). Nowadays, the area is still partially under construction, however it hosts many important accelerators and start-up incubators that has strongly contributed to the start of the project. In order to succeed, the city and the Boston Redevelopment Authority has operated by encouraging economic investement in the area and providing subsidized spaces to the companies (Public Sector Consultants Inc., 2012). Therefore, in 2010 one of the most competitive start-ups incubator, called *Mass Challenge,* moved in the area going away from its former location in the Cambridge Innovation Center[17]. Moreover, in 2011 have begun to arrive other big corporations and private companies such as the pharmaceutical giant Vertex. Another emblematic project located in the heart of the Seaport Innovation District is the District Hall, the first Public Innovation Center of the city that opened in 2013. This latter is a public-private initiative managed by a non-profit organization called Venture Café which already operated at the CIC, that provides a connection for start-ups and promising companies by offering business and social events, space for co-working, restaurants and café.

Figure 67 Seaport Innovation District localization

Overall, the project undoubtedly represents an economic success that has significantly contributed to the economic growth of the city by creating more than 5,000 new jobs and attracting 200 new start-ups (innovationdistrict.org). However, it collected negative aspects too that led to a speculative development that benefited developers and big companies. In fact, before becoming an Innovation District the neighborhood was a blue-collar area with its own history characterized by the presence of industrial manufacturing structures, the railroad located in the area since the 1845 (Boston Landmark Commission, 1995) as well as a community of artists that has settled in the area. However, in spite of these aspects, interests linked to the rise of Innovation District produced a rapid development starting from the 2004 that

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[17] Mass Challenge has benefited of the incentives for the free-rent

dramatically increase of the property values and led to the gentrification of the area. As a matter of fact, the average house prices per square foot rise from $391 in 2009 to $529 in 2014 (Bostinno.org). Therefore, this phenomenon turned the area in an exclusive environment, unaffordable for local community as well as for promising start/ups that have moved away from the area in order to find a more sustainable place within the city (Cohen, 2015). However, the Seaport Innovation District is still considered one of the more important initiative begin by the Menino's administration and continued by Mayor Walsh in 2014, that paved the way to the implementation of other projects focus on spread technology and innovation hubs in the city of Boston.

One of these projects is the *Neighborhood Innovation District*, a strategy that wants to emulate the Seaport Innovation District in a distressed area of the city. The ambitious goal of the initiative is to revitalize neighborhood's economies through boosting innovation within local entrepreneurships.

Neighborhood Innovation District

The Neighborhood Innovation District (NID) is a public strategy launched in 2014 by Mayor Martin J. Walsh that aims to increase innovation and entrepreneurship within low-income areas in Boston. Inspired by the Seaport Innovation District initiative, the NID wants to attracts not only technological start-ups from outside, but the entrepreneurial talents that already are part of the local environment.

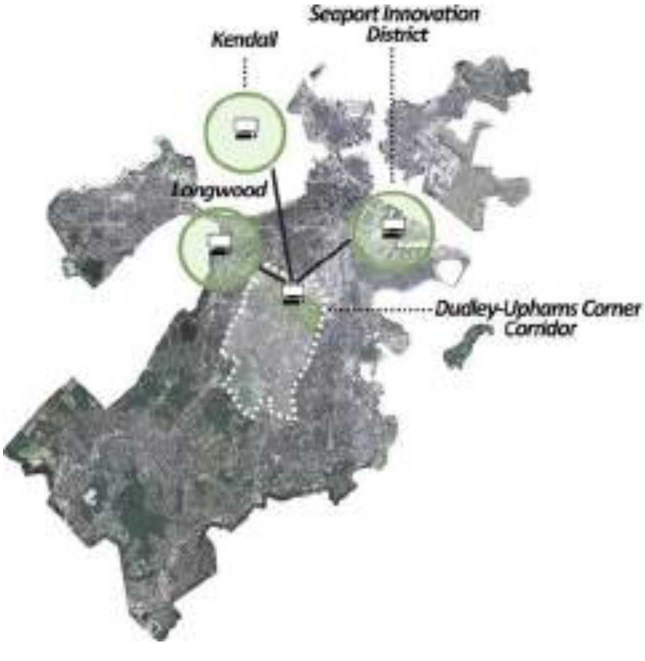
Moreover, it differs "from a more traditional Innovation District due to a strong leaning toward economic empowerment in addition to entrepreneurship". Therefore, the biggest challenge of the strategy is to operate in an existing distressed neighborhood without altering its sense of community and place, while boosting economic development and employment opportunities.

The Walsh administration has been the promoter of the initiative and in 2014 it has formed a Committee responsible of drawing up "policies, practices, and infrastructure improvements to support the development of innovation districts throughout the City" (cityofboston.org). The Committee after a year of work has completed the guidelines and has identified the pilot area where to apply the NID. Noteworthy, there were two main personalities that have chaired the initiative: John Barros, the chief of Economic Development of Boston City (who former was the Executive Director of the DSNI) and Edward Glaeser, Harvard professor of urban economy. The latter professional has long been involved in research about benefits that can be drawn by entrepreneurial clusters in urban area as well as the significant role of smaller average establishment size in urban economies (Glaeser et al., 2009), and so he was one of the most active personalities within the initiative.

The strategy has been created with the aim to have a wider representation of Boston realities, and for this reason the Committee has been composed by 27 professional including local leadrs, public servants and businesses experts. Specifically, the board was composed by: some specialists from education istitutions like Northeastern University, UMASS Boston, Babson College and Roxbury Community College; some others from insitutional authorities like BRA, Boston City Council, Massachussetts Senate and City Department of Neighborhood Development; other stakeholders from private sector that deal with entrepreunership and innovation such as Venture Cafè, Polaris Partners, Cambridge Innovation Center and the Center for Womand and Enterprise; and representatives of local communities such as the DSNI and Sociedad Latina.

Therefore, all these personalities involved in the Committee were distributed in four sub-committees each of which has worked independently regarding themes of (i) encouraging entrepreneurship, (ii) inclusion, (iii) infrastructure and (iv) neighborhood choice. Moreover, along the period that the Committee has been active, it has been organized three public meetings as well as “listening tours” with residents in over 15 neighbourhoods. These events have contributed to the definition of the pilot area and to the communication of the strategy within communities. The results achieved by the Committee have been collected in a final report published in September 2015, which contains recommendation and guidelines. With regard to the neighborhood selection, the choice fell on the Dudley Square-Uphams Corner Corridor, a northern portion of Roxbury neighborhood that, starting from Dudley square continues all along Dudley St. until Upham Corner.

Figure 68 Localization of the Project – Roxbury



The structure of the report is composed by two different parts. In the first section are highlight several recommendations summarized in four lead objectives that must lead to the success of the strategy: (i) ensuring an adequate entrepreneurial education programs, (ii) promoting a streamlined regulatory framework for new entrepreneurs, (iii) providing enough space for both retail activities and new affordable housing and (iv) delivering publicly-accessible business space and infrastructures that support the networking between private entrepreneurs. The second section give specific suggestions to the implementation the project in the Dudley Square-Uphams Corridor.

Overall, the report suggests the importance of spread other entrepreneurship and innovation center away from the wealthier areas of the city, such as the Seaport District and Kendall Square, in order to restore the balance between low-income neighbourhoods and the rest of the city. The NID wants to be a tool able to reduce economic inequalities within the city by reducing "displacement and to ensure that the benefits of land value appreciation are enjoyed more widely" (NID, 2015).

Key factors that are recommended in order to succeed regard firstly the necessity to build an *Innovation Eco-System* starting from the creation of new professional figures that operate within the District, such as the "community organizer", an expert that must be dedicated to connect "entrepreneurs with each other, forming spaces in which entrepreneurs can learn from one another, and connecting those entrepreneurs with the outside world" (NID, 2015). With this regard, it is clearly specified in the report that one of the key element for the success of the strategy is to connect the area with the existing technological hubs in the city (fig.7).

Local entrepreneurships are supported by the Committee by three different kind of interventions: mentoring, entrepreneurship bootcamp and target vocational training. According to the report, these measures must be implemented because in a disadvantage area, human capital represents a great resource, the talent pool that must be encouraged and boost by intensive professional programs tied to community needs.

Concerning the financial capital needed to operate an Innovation District, the guidelines suggest to benefit from the existing public programs that provide support for new business in a low-income neighborhoods and furthermore, guidelines suggests to take advantage from the District body itselves, that could be easily attract investors by reducing obstacles to opening new businesses. Lastly, Committee acclaims the necessity to benefit, within physical limits of the district, by specific tools that can facilitate permission processes to start-ups and new enterprises, consistently with the community needs. Another important aspect that is stressed by the report is about infrastructure. Hence, it points out the necessity to provide the District with working space and housing, as well as a good transportation network, that enable district residents and entrepreuners to be link with each other and with the whole city. Obviously, as the neighborhood innovation district operates in an existing area the challenge is to promote practice of reuse and renewal that must enhance co-working spaces that encourage networking. Moreover, it is highlights the necessity to furnish the area with incubators and accelerators related not only with technological fields but also with retail, food, etc. Lastly, the report stressed one the importance of having digital-accessible spaces (high speed internet, wireless networks, etc.).

Dudley Square-Uphams Corridor

The choice of the place fell on Dudley Square-Upham Corridor, the norther part of Roxbury neighborhood, as the Committee has considered it one of the promising areas in the city, with suitable physical and structural characteristics. Firstly, it has a strategic position, next to the downtown as well as from educational institutions such as the Northeastern University, Roxbury Community College and the Madison Park High

School. The latter aspect, it seems as a great opportunity to foster educational technology enterprises and star-ups. Secondly, transportation system is well-develop: there is Dudley Square that serves as a transportation hub and two MBTA'lines, the Orange and the Silver. Moreover, as mentioned in the part A of this report, the area has been subjected to several intervention and public investments such as: the renovation of the Ferdinand's Building that hosts the Roxbury Innovation Center (RIC) and the Boston Public Schools headquarters; the community planning process managed by the BRA, that could provide a deeper connection within locals as well as a direct source of knowledge of community needs. A further significant aspect is the presence of numerous stakeholders that already have established in the area: the high tech accelerator "The Smarter in the City", the non-profit "Venture Café" that together with the "Skylab" run the RIC and produced community programming, the "Initiative for Competitive Inner City" (ICIC), another non-profit organization founded by Professor M. Porter that is focused on foster entrepreneurship and industrial clusters development within inner cities, the "Dudley Square Main Streets Revitalization Corporation" that is dedicated to the commercial revitalization of the area, as well as community-based organization like DSNI, ACE and the Madison Park Development Corporation (MPDC).

* The area represents the extension of the DSNI Community Land Trust

Lastly, there is an important aspect which has influenced the choice: the availability of lands for development, that allows to realize affordable office spaces, as well as private investments.

Summary

Overall, the NID report has been accomplished after a year of work and it was published in September 2015. The Committee in charge for piloting the whole process has worked dived in four different sub-committees. The NID strategy encourages participatory approach mainly by organize three public meetings and a consistently numbers of tours within disadvantage neighbourhoods of the city. Until today, the purpose of widespread an Innovation District within low-income neighborhoods has been achieve only in a theoretical form. In fact, the strategy is still not being implemented even if the Committee dissolved right after the release of the report.

Initiative Outcome: Innovative Aspects and Critical Elements

Innovative Aspects

The Neighborhood Innovation District Committee has introduced several innovative aspects within the emerging literature of the Innovation Districts[18]. In fact, it expands the notion of traditional Innovation Districts by take into account not only economics processes but also social dynamics related to a neighborhood economic development. Therefore, NID Committee asserts that 'the Neighborhood Innovation District is designed to include the neighborhood and to provide widespread employment opportunities, not merely to provide good physical space for internet entrepreneurs' (NID, 205). Moreover, it says that 'the core idea of the Neighborhood Innovation District is that current community members are part of planning the district and end up as the district's primary beneficiaries' (NID, 2015). Thus, by setting up a specific sub-committee that handled the issue of *inclusiveness,* it has focused its efforts in fight the socio-economic dynamics linked to real estate development that usually disadvantaged the local community and benefited the profit-making speculators. Basically, the effort has been made on boosting practice to reduce displacement and to ensure benefits of land value not only for developers and private investors. Thus, learning from the Seaport Innovation District experience, that produced a devasting effect on the South Boston real estate market with the subsequent production of neighborhood *gentrification*, the NID Committee suggests two main strategies to protect local communities by displacement: (i) ensuring enough space for new housing and commercial space, by promoting a specific District Housing Plan, and (ii) providing tools for long-term affordability within residents.

Specifically, the District Housing Plan must ensure a commercial and residential real estate mixtures in accordance with community needs. To achieve this goal, the NID recommends a participatory planning process. Moreover, the Committee supposed that by providing tax incentives developers will be attract in the area and they will be willing "to build and offer start-up friendly space and housing affordability" (NID, 2015). In order to attract developers and investors in building affordable housing, the report proposes a specific tax system that tie the developers and the city in sharing downside as well as upside of property values changing. In other words, if the property values

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[18] The article published by Katz and Wagner, "*Rise of Innovation Districts: A New Geography of Innovation in America"* is one of the main reference within the Innovation Districts' literature. It identifies key characteristics of traditional Innovation Districts.

stayed low the developer do not pay, if it rises the developer is obliged to pay a premium tax. Instead, with regard to the establishment of affordable commercial spaces for start-ups the NID suggests that “there may be a set density at which developers can build without […] set-asides, but if developers want to go further, they must build extra space for the community” (NID, 2015).

Another innovative introduced by the strategy is about the importance of the education system. In fact, it stressed the importance of having both educational institutions and a strong community organization, as the “Neighborhood Innovation District can succeed, in part, by deliberately developing a talent pipeline, cooperating with educational institutions, businesses, community organizations, and the City of Boston” (NID,2015). For this reason, the Inclusion sub-committee has committed in finding the skills that a low-income neighborhood innovation district has to develop in order to create a good innovative ecosystem. Consequently, it has been suggested specific school’s programs for children, teenagers as well as adults that can complete the useful knowledge for an entrepreneur.

Lastly, the NID focused on the need to promote non solely high-tech innovation, but spur the non-technological one too, that invests in field such as food, social and small retails, the most characteristics endowment in disadvantage areas.

Thus, the expectation is that through the spread of innovation and technology within more traditional sectors such as the above mentioned, it could be generated positive impacts on small business and local econom and therefore it could be reduced the economic inequalities within the city.

Critical Elements

The Neighborhood Innovation District Committee dissolved almost one year ago. Nevertheless, the strategy has still not been implemented. Compared with the fast development occurred in the Seaport Innovation District, this deadlock appears as a failure of the strategy. Notwithstanding the remarkable investment of the City, like the renovation of the bus station, the new police station as well as the $155 million of financing for the renovation of the Ferdinand Building that currently hosts the Roxbury Innovation District and the Boston Public School headquarters, private investors are still difficult to find. As a matter of fact, nowadays only several private organizations are implementing actions in accordance with the objectives of the Neighborhood Innovation District. Non-profit such as the ICIC, Venture Café and Skylabs, as well as the philanthropic association Boston Foundation and the high-tech incubator called The Smarter in the City, are working on the economic development of the area with regards to innovation and local entrepreneurship.

The reasons of this delay could be several. However, one of the main cause may be sought within cluster literature, that stressed the enterprises necessity of being located among competitive environment in order to take advantage from the spillover effect (Porter, 2000). As a matter of fact, Boston innovative companies are still remaining in areas as Seaport District where they can easily found venture capitalist and angel investor as well as start-ups programs. In fact, start-ups accelerators and incubators such as MassChallange and Techstarts, are both located in the Seaport Innovation District and Kendall Square and do not got involved in the Neighborhood Innovation District vision.

Furthermore, another reason for the lack of investors may be found within the socio-economic characteristic of the area. Hence, Roxbury besides being one of the poorest neighborhoods of Boston it also hosts the biggest community of African-American of the city. According to the Census Bureau[19] Survey of Minority-Owned Businesses, black and Latino owned business for 0.5% of the total business revenue in Massachusetts. Moreover, in the 2014 annual study of home-lending trend, professor of economics Jim Campen found out that black and Latino communities still deal with a racial disparity in mortgage approvals (Campen, 2015) that resulted in a higher rejection rates than whites borrowers[20]. These data highlight the discriminatory barriers that minority faces in being involved in Boston economy and therefore, the resulting difficulty in applying projects as the NID that involved an environment that is predominantly surrounded by Afro-American and Latinos people in a percentage of 89.7 (BRA, 2016). Lastly, another weakness of the NID strategy is that it advocates for an old concept by calling for a 'combination of zoning and tax incentives can be used to encourage developers and landlords to build and offer start-up friendly space and housing affordability', while professor Gleaser, one of the main supporter of the strategy, declared that 'the Dudley Square community would need to accept fast-track construction permitting as the price of bringing in new economic activity'. However, this economic approach has its roots in the Thatcher administration in the U.K. and was implemented by the "Urban Enterprise Zones" during Regan administration, as well as the "Empowerment Zone" supported by Clinton (Calavita, 2000). Both these programs, had the goal of encouraging companies to locate in disadvantage urban areas by given them cutting taxes incentive as well as credits for number of hired employers. However, these strategies have often resulted to a failure for the economic empowerment of the neighborhood as well as for the community needs, while they have been convenient for the enterprises.

Summary

Overall, the NID Committee report differs from previous municipal initiatives (such as the Main Street Program), because it is focused on support innovation and entrepreunership within disadvantaged neighborhood, as tools to order to reduce city economic inequality. Certainly, the NID has been responsible of shift the focus of the Innovation Distrct from the solely idea of entrepreneurship towards a community oriented perspective that take into account the overall economic empowerment of the neighbourhood. Moreover, for the first time in the framework of Boston innovation

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[19] Statistics for All U.S. Firms by Industry, Gender and Race for the U.S., States, Metro Areas, Counties, and Placed. Survey of Business Owners

[20] According with the Campen study, 21% of Black borrowers were rejected for a mortgage in 2014 compared with the 6% of white barrowers.

policies, this approach has tried to produce a more participative strategy by involving different stakeholders within the Committee that has drafted the final strategy. Besides, the NID suggests to invest specifically in neighbourhood's human capital and current skills, by supporting the idea that existing neighbourhoods are 'already hubs of creativity, whether or not that creativity has been fully transformed into economic wealth' (NID, 2015). Therefore, a significant effort has been made to highlight the relevance of create training and educational network within the neighborhood. Lastly, the NID raised awareness on issue of neighborhood *gentrification*, by promoting solution that can prevented this phenomenon.

Overall, according with Stone and Stoker last research it seems to be confirmed the trend for which 'city actors cannot devote policy attention to the economic realm without engaging the social realm as well' (Stone, Stoker, 2015). Thus, certainly the NID represents the validation that economic development concern is not still detached from community-base one.

Nevertheless, some weaknesses as well has been shown by the strategy. First of all, the lack of continuity between the publication of the report and the implementation of the strategy. In fact, until today nothing has been done to further advance the strategy. Moreover, some aspects related with the issue of the entrepreuners attraction, reproduced and old-fashioned model based on tax incentives and credits for enterprises that has proven over the years to not to be a successful one for address community needs and neighborhood revitalizations.

Lastly, it is also noteworthy to highlight that without the implementation of the strategy that aim to promote local entrepreneurship by empowering local community and neighborhood affordability, the public and private investments might have turned in more development pressure at the expense of residents by facilitating gentrification phenomenon.

Unfortunately, given the lack of consistency between the theoretical recommendation and the implementation of the strategy it is not yet possible to further speculate about the efficiency of boosting local entrepreneurship and innovation within low-income area as methods to reduce city inequality. In fact, unitl today the strategy seems to be abandoned by the local admisnitration while the BRA is still continuing the community planning process that will led to the regeneration of the Dudley area (the northern part of Roxbury). Notwhorty, the Roxbury Innovation Center its pursuing its training activities within the community.

Dudley Square-Uphams Corridor: photographic tale

DUDLEY SQUARE AREA

Ferdinand Building

DUDLEY SQUARE AREA

Roxbury Innovation Center

DUDLEY STREET AREA

DUDLEY STREET AREA

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3. Greentown Labs

Andrea Simone, Almona Tani

Introduction

Economic and demographic growth trends have put pressures on the global environmental balance. Therefore, the emergency of environmental issues requires a shift in social and economic policies in order to generate sustainability.

The socio-economic sustainability transition is a process which requires long-term expectations and efforts for the invention, adoption and diffusion of clean technologies and an overall societalo change. The employment of clean technologies - defined generally as technologies used in products, services or production processes that reduce or optimise the use of natural resources and limits waste and pollutant generation in order to mitigate negative environmental impacts – faces challenges concerning public intervention (VEUGELERS, 2012).

Clean technologies are in conflict with conventional technologies which are characterized by existing infrastructures, hence more economic and already known by the consumers. These struggling elements hinder a further development of clean technologies which should be alleviated by the public effort to support the transition to more sustainable technologies. Moreover, there are R&D sunk costs generated by the research attempts and failures to realize new technologies and products which cannot be funded merely by incentives but need public support for market restoration (MAZZUCATO, 2015; HOPKINS and LAZONICK, 2012).

Indeed, in this report we will illustrate the inception and evolution of Greentown Labs, which is a public-private partnership initiative with the aim to become the largest incubator for clean technology start-ups in the USA. The initiative is characterised by a high localisation mobility, determining a path within the already existing "innovation districts" of Boston and Cambridge. It originally stemmed from the Boston area, but eventually it ended up in the Somerville area, following criteria such as space availability, rent prices, and public funds.

The study will first survey the urban and socio-economic context and the starting conditions of the area of Union Square where the initiative took place, focusing on the planning regulatory tools adopted by the Municipality of Somerville that fostered the settlement of Greentown Labs in the area. It will then focus on the evolution, the policy framework, and the effects of the initiative, providing some final remarks.

The Context and the Area before the Initiative

Union Square, Somerville (MA): the territorial and urban context at that time

A Historical Perspective of Union Square

Union Square is situated 2.5 miles northwest of Boston, in the southern end of the City of Somerville, adjoining the City of Cambridge to the south, Park, Laurel, and School

Streets to the west, Highland Avenue to the north, and McGrath Highway to the east. The neighbourhood started to be known as "Union Square" after it became a recruiting centre for Union soldiers during the Civil War.

The area was originally situated on marshland, but with the filling of the marsh, and heavy trading traffic, Union Square rapidly developed with commercial and residential growth, which initiated the change from a small rest stop on the way to Boston to a great commercial gateway. Traffic in and around Union square began to intensify after the development of the Medford Turnpike (Mystic Avenue) in 1803, and businesses, such as blacksmiths, wheelwrights and slaughterhouses, started to prosper. Regular routes to Boston started to be implemented, and a horse-drawn streetcar system was established in 1852 between Union and Harvard Square. The construction of row houses and apartment hotels along the streetcar line made Union Square an attractive area for Boston commuters to live: by the early 1900's, electric streetcars made up 88 stops a day in Union Square, bringing resident commuters to their jobs in Boston and Boston and Cambridge commuters to the burgeoning industries in Union Square.

As a result of the increased development of Union Square, farms began leaving the area and moving farther west. With the development of the automobile, a farmer could move his farm a greater distance from the city to where land was less expensive, and still be able to affordably transport his goods to Boston. On the other hand, the widespread use of automobiles provided consumers with greater mobility and deeply modified their shopping patterns. As in many other commercial areas throughout the US, Union Square began to lose ground to newer, more competitive retailing establishments in outlying locations.

Due to new transportation model and public transit disinvestment over the course of the mid-20th century, Union Square slightly evolved towards a neighbourhood-serving square, burdened with a regional traffic problem. Highways (such as the McGrath Highway and Interstate 93) replaced streetcars in order to serve communities located north of the Charles River. When the light rail system was abruptly suspended, local economy collapsed. Property owners started removing top floors of their buildings in order to lower their commercial property law taxes, thus pauperising Union Square's density and urban character. Stuck halfway from Boston and Cambridge with no fast connections, in 1980 the neighbourhood was designated as an "Urban Renewal area", where issues such as storefront improvements, traffic flow, public parking and streetscape improvements came to be preeminent. On these purposes, new parking lots were developed, the public safety building constructed, new tenants filled old public facilities, roads were reconfigured, street trees planted, the public plaza was constructed, and the storefront improvement program evolved.

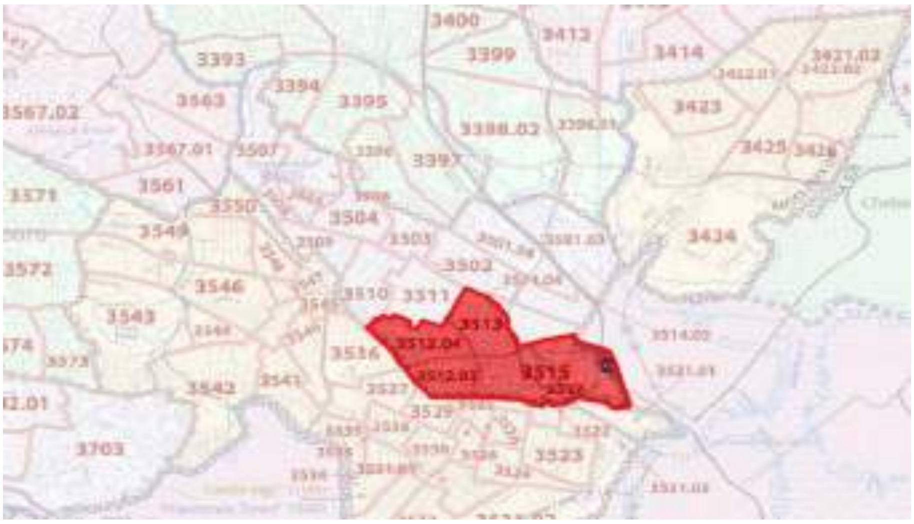
Union Square improvements in the 1980's made noticeable differences in the commercial centre and the area. At the same time, people started to look at Union Square as an affordable place to live with accessibility to employment centres, especially artists, young professionals, entrepreneurs, and families.

Figure 69 Historic view of Union Square [Source: Union Square Revitalization Plan, 2012]

The socio-economic conditions of the area

Demographics

Figure 70 Union Square Census Tracts Map [author's elaboration]

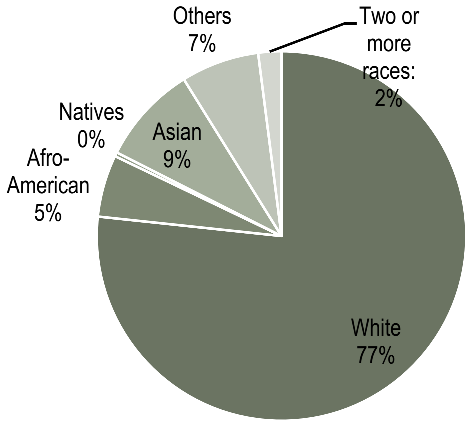


The demographic data used in this report was obtained joining 2009 U.S. Census Block Group data and 2015 data provided by the City of Somerville. The Union Square Area intersects six Census Block Groups, which fan out radially from the centre of the Square and extend into some of the surrounding area, as shown in Fig. 2:

Table 18 - Census Tracts – Greentown labs

County [Middlesex]	***Census Tract***	***Block***
25017	3512	001
25017	3512	002
25017	3513	001
25017	3513	002
25017	3515	001
25017	3515	002

Figure 71Union Square Ethnical Composition



The Union Square Area Block Groups have an estimated *population* of 14,910. The area is a growing multi-racial, multi-ethnic neighbourhood with 5% Black, 12% Asian or Pacific Islander, and 77% White. The *age distribution* in Union Square indicates that 25-29 years old is the largest age group, representing 18.2% of the total population, with the median age falling between 31-35. The social context pictured by these data is consistent with a relatively wealthy young neighbourhood, with more than 50% residents working in management, professional or related fields. The 2009 estimated *median household income* in Union Square is, indeed, $36,359, about 4% higher than the median income for the City of Somerville as a whole ($35,030). Of the 6,341 households, more than 43% are families, with an average size of 2,93 members. The Study Area had a 6.4% *unemployment rate* in 2015 and varying levels of *educational attainment*. Of the residents over the age of 25, 9% did not complete high school, 91% completed high school or higher, and 64% have a bachelors degree or higher. A closer look to census tracks data reveals that large pockets of unemployment fall within the areas labelled as 3512.04 and 3515, especially in the categories of middle aged people (23,9% of people of 45-54 years old are unemployed in census tract 3512.04), high school graduates (50% unemployed in 3512.04 and 27% in 3513) or Hispanic/Latino origin population (between 17,5% and 19,9% unemployment rate). On the other hand, low levels of labour force in census tract 3515 are largely due to the presence of a vast group of older residents (more than 21% is older than 60, compared to an average of 12% in the other census tracts), which also includes some relevant sacks of unemployment (above 14%). Therefore, the scenario pictured by these data reveals two main characteristics: on the one hand, the area closer to Union Square (the census tract 3512.03) is, on average, younger and wealthier than the other areas considered in the Study; on the other, demographics have been rapidly changing over the last years, most likely due to a process of gentrification of the neighbourhood that is becoming more and more attractive for young professionals looking for low rents and willing to live closer to a dynamic part of the City like East Somerville.

Figure 72 – Main occupations

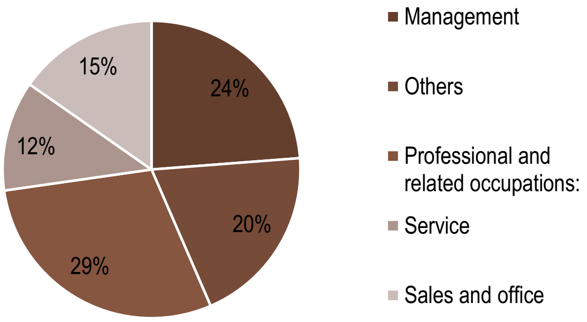


Figure73 Population by age

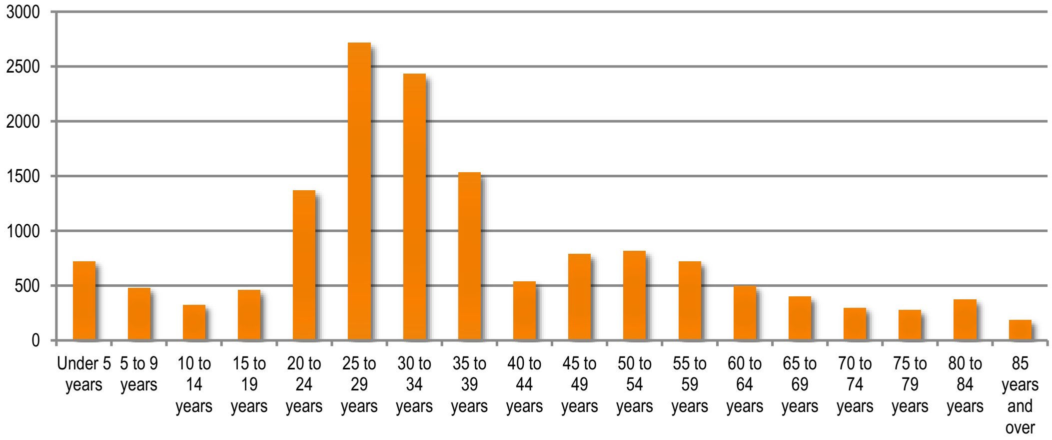


Figure 74 - Educational Attainment

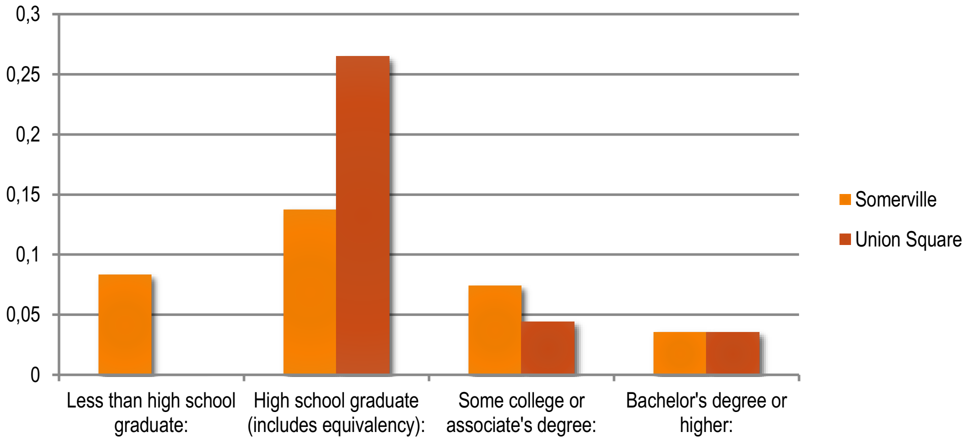


Table 19- Demographics detailed

Subject	Somerville		Census Tract 3512.03		Census Tract 3512.04		Census Tract 3513		Census Tract 3515	
	In labor force	Unempl. rate	In labor force	Unempl. rate	In labor force	Unempl. rate	In labor force	Unempl. rate	In labor force	Unempl. rate
AGE										
25 to 44 years	89,0%	5,2%	84,4%	3,1%	83,9%	7,8%	89,8%	9,5%	80,2%	0,0%
45 to 54 years	77,6%	8,4%	60,5%	12,1%	90,6%	23,9%	84,0%	0,0%	71,5%	0,0%
55 to 64 years	72,7%	8,7%	97,5%	14,7%	63,1%	3,7%	68,5%	7,0%	62,4%	14,5%
RACE										
One race	74,4%	6,6%	76,1%	4,4%	78,2%	7,7%	76,8%	8,3%	65,3%	2,2%
White	75,6%	6,5%	79,0%	5,3%	78,4%	9,5%	77,9%	8,7%	69,8%	2,7%
Afro-American	66,3%	13,1%	86,0%	0,0%	98,8%	0,0%	65,7%	0,0%	52,0%	4,4%
Natives	67,8%	0,0%	100%	0,0%	0,0%	-	0,0%	-	-	-
Asian	71,6%	4,2%	63,7%	0,0%	82,7%	0,0%	63,6%	0,0%	65,8%	0,0%
Others	69,2%	4,2%	51,5%	0,0%	48,3%	0,0%	85,3%	14,8%	50,7%	0,0%
Two or more races	77,0%	2,6%	100%	0,0%	74,3%	0,0%	56,6%	0,0%	80,0%	0,0%
Hispanic or Latino	73,0%	6,0%	54,7%	0,0%	64,3%	19,9%	75,0%	17,5%	47,3%	5,0%
White alone	75,3%	6,4%	80,5%	5,5%	78,9%	8,6%	77,8%	8,7%	70,4%	1,9%
EDUCATIONAL ATTAINMENT										
Population 25 to 64 years	85,2%	6,0%	84,6%	5,1%	81,5%	8,5%	86,0%	8,2%	76,4%	1,6%
< High school	67,0%	8,3%	75,1%	0,0%	64,0%	0,0%	67,0%	0,0%	44,0%	0,0%
High school	79,3%	13,8%	72,6%	8,6%	80,8%	50,0%	85,5%	27,2%	81,6%	8,3%
Some college or associate's degree	80,9%	7,5%	100%	5,9%	80,8%	3,9%	86,6%	6,6%	93,6%	0,0%
Bachelor's degree or higher	90,3%	3,6%	85,2%	5,2%	82,6%	2,4%	88,6%	3,9%	83,8%	0,0%

Business Inventory

Generally, an area's mix of stores is a major catalyst in determining the shopping patterns of local and non-local consumers. The more pleasant is the atmosphere and wider is the range of goods available, more strongly are the shoppers drawn to an area. Consequently, one measure of the attractiveness of a particular commercial centre is the "retail mix." According to the latest inventories available of businesses in Union Square, there are between 191 and 208 operating establishments, occupying approximately 988,460 square feet (s.f) of building space. The total count includes a large number of small ethnic restaurants and food stores, as well as business services and office spaces such as law offices, insurance, travel, and health services. Retail establishments include furniture, apparel, and jewellery. These censuses are helpful to identify several characteristics of Union Square's commercial habitat: the *retail presence* and the *unbalanced uses mix*, the predominance of *services-related businesses*, and the lack of *auxiliary businesses.*

As one of the most important crossroads of Somerville, Union Square has the potential to be a natural attractor of a wide range of business types, and to increase its current foot traffic. Nevertheless, commercial to industrial uses ratio is markedly divergent from the standard ranges: automotive and industrial uses make up 10% of the leasable area, compared to the typical 2%. Traditional retail, instead, constitutes only 24% of the total square footage in Union Square, which is substantially less than what is typical for a healthy commercial centre (62% retail).

Moreover, 56% of the total commercial square footage in Union Square is devoted to the category of service-oriented business (e.g. insurance offices, check-cashing storefronts, and hair salons) compared to the typical 15%. However, the size of each office is relatively small, with an average space of 4,600 s.f.. Therefore, many of the service related uses are not large employers or taxpayers that could make a significant contribution to the non-residential tax base of the City of Somerville. These conclusions contrast with the idea of several observers who have indicated that Union Square could benefit from an increase in office use.

Finally, the 45 restaurants and food establishments create enough of a mix to constitute a restaurant and specialty food market that draw people to Union Square. Generally, the restaurants are small to moderate in size, with the average being 2,600 s.f.. Nevertheless, additional activities that are often associated with a dining experience – such as cafes or dessert places, culture or entertainment businesses like theatres, galleries or artist studios – are still lacking, thus not providing that kind of support needed by the existing activities or helping to boost pedestrian activity on the street.

The "urban texture": settlement patterns and physical environment

Architecture and Streetscape

In spite of the fact that the historical backdrop of the Square began long time before Somerville turned into a town, just a single pre-Civil War building is standing today. The new wave of urbanism, started after the Civil War, boosted the evolution of the area into a noteworthy commercial hotspot and dramatically marked the overall cityscape of the neighbourhood. The extant few iconic historical buildings are concentrated in the Bow Street Historic District (originally known as the "Doctors' Row" because of the buildings combined uses as a residences and doctors' offices), but there are also three historical multi-unit houses in the Square: 1892 Richmond Building; 1898 Drouet Block; and the 1900 apartment building on the corner of Bow and Summer Streets.

Union Square has a significant residential structure in all directions from the heart of the Square. The character of the housing, however, is of the low-density variety: one-, two-, and three-family buildings. The Prospect Hill neighbourhood, at the north of the Square, hosts the highest property values, as it rises in elevation to provide views back to Boston, with well-maintained one- and two-family houses. More workmanlike residential accommodations can ben found in the south and east of the Square, with several triple-decker houses. To the south of the Square, the houses are more scattered and less well-maintained, as the parcels become larger and more industrial.

The area considered for the purpose of the present study extends west over Union Square, along the segment of Somerville Avenue that stretches from Park Street to Church Street. This segment was created around 1830 after marshlands were filled in and was intended to serve as a high capacity arterial road. The layout of the street and the characteristics of the infill buildings surrounding the area are markedly different from those in the Bow Street district, thus reflecting the original blueprint of the architectural style popular at the time of their construction in the late 19th and early 20th centuries. While, just after crossing Bow Street, Somerville Avenue turns into a slow moving, customer-friendly area that thrives with independent retail shops and restaurants, the one-way section of west Somerville Avenue has got more of an auto-centric design. Therefore, though this configuration undoubtedly helps fastening circulation of automobiles out of the Square, it also impacts the pace of revitalization of the area, reducing pedestrian activity and the ability of current businesses to increase the positive experience of users and therefore their chances of success.

Figure 75 – Building Vintage [Source: City of Somerville GIS] Public Spaces

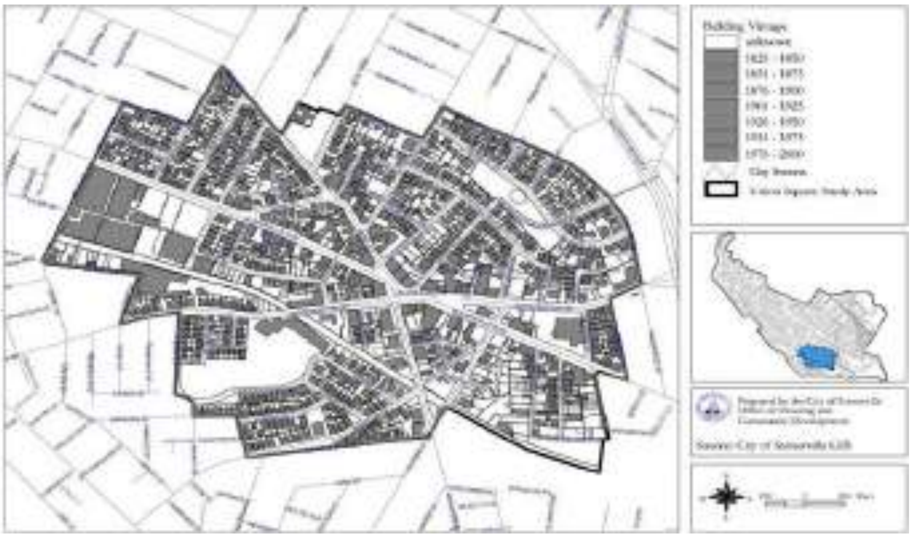
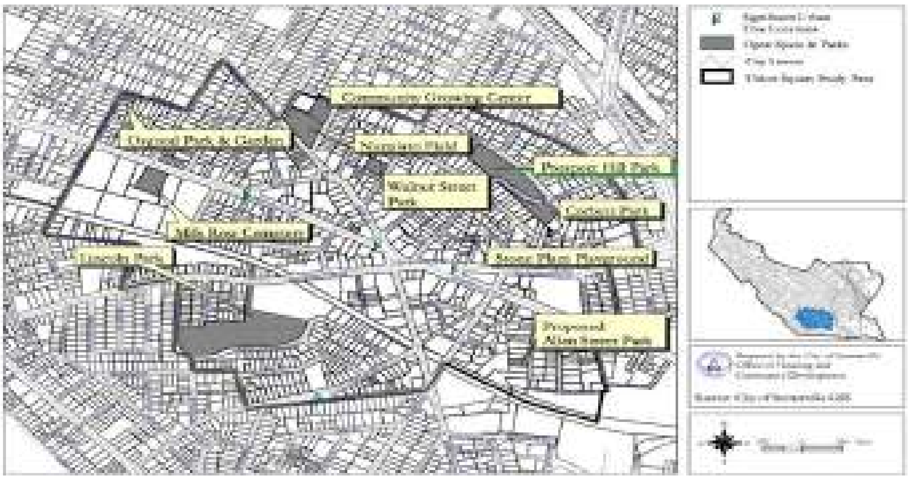


Figure 76 - Public Spaces [Source: City of Somerville GIS]



The quality of life in the community is greatly enriched by urban open space areas, parks, and landscaping within the streetscape, providing both active and passive recreational opportunities. Open spaces and landscaping buffer the visual clutter and auditory clatter of the City; the trees and plants add greatly to the health of the City's people by cleaning the air, providing shade and wind protection, and by visually enhancing the area.

The Union Square plaza is the major public space in Union Square and is centrally located, but the overall area also contains several public parks, playgrounds, and community gardens. Several of these areas have been renovated or enhanced in recent years, while others are in need of improvement. Fig. 8 shows a map of the major public spaces in the area.

Housing

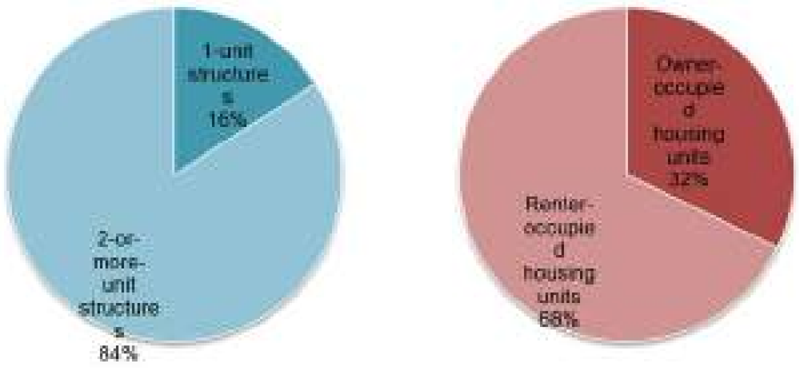
Overall assessment – For the past 30 years, housing development opportunities in Somerville have been essentially limited to the rehabilitation of existing stock and the repurposing of former industrial sites, so that property values have been constantly rising due to shortage of supply since 1990. Moreover, the abolition of rent control ordinances in the adjacent communities of Brookline, Boston and Cambridge drove lower income residents from these areas to start competing with the incumbent residents of Somerville, determining a wave of gentrification that has brought new tensions and demands on the market as well as positive impacts on the City. While many poorly maintained properties benefited from restoration and renewal, the escalation of property values has made home ownership within the City very difficult for low- and moderate-income residents, and the resulting rise of rental costs inevitably displaced some of the most vulnerable communities.

Affordable housing is, indeed, a major issue for municipalities, and can be mainly addressed with two basic methods: direct expenditure of public resources and regulations requiring or encouraging the private sector to provide low-income housing. Currently, Somerville is primarily adopting the direct public subsidy strategy, using an array of federal, state, and local resources, but it also has been very proactive in implementing a variety of regulatory tools, such as:

- the Somerville Zoning Ordinance (Inclusionary Housing, Article 13), which dictates that any private developer wishing to develop eight or more market rate housing units (home ownership or rental) must make a minimum threshold of 12.5% of the units available to low/moderate income households;
- the City's Condo Conversion Ordinance, which provides protection for elder, handicap and low-income tenants, far beyond what is dictated by state law.

Occupancy – According to a 2016 survey, the block groups within the Union Square area contain a total of 5,937 housing units, the majority of which is composed by 2-or-more unit structures, with a house density of 13.8 per acre. Of the occupied units in the strategy area, approximately 68% are renter occupied. Only 473 affordable units are recorded.

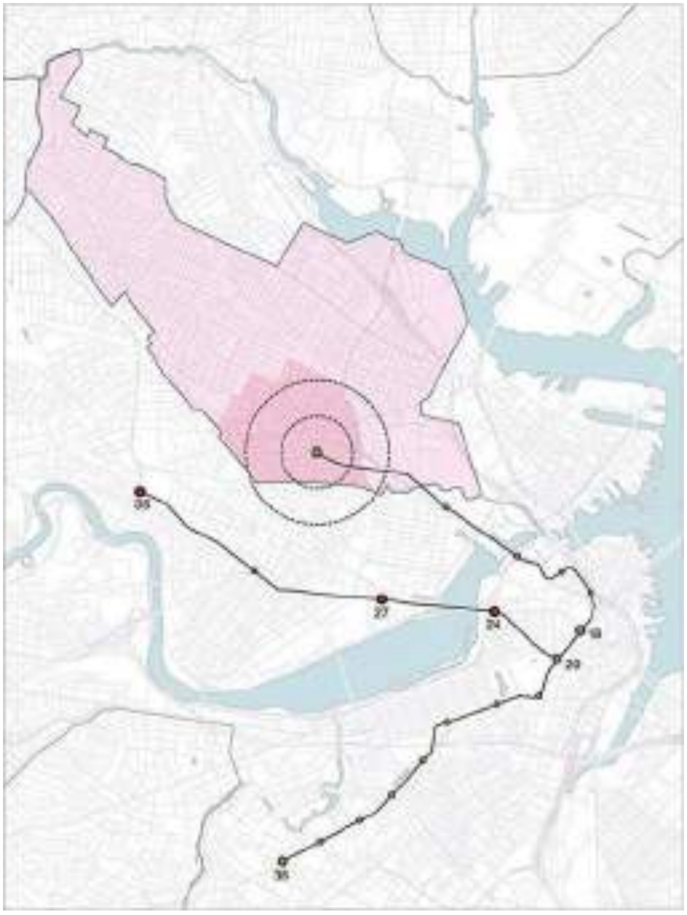
Figure 77 Units in structure (left) and Housing Tenure (right)



Circulation & Traffic

The history of Union Square public transport was characterized by a flourishing of transportation options and facilities till the mid-nineteenth, followed by a systematic disinvestment during the 1960's, 70's and 80's. For a long time, residents and workers have benefited of highly walkable neighborhoods and efficient economical public transportation, centered on Commuter rail and streetcar lines. However, large-scale social and economic changes, such as counterurbanization and the widespread use of automobile, along with new Federal regulations, such as the Federal Highway Aid Act (FHAA) and the Federal Housing Administration (FHA), have ultimately steered investments away from cities, discouraging urban home buying. Private investment followed government incentives, and families and businesses migrated to the suburbs.

Figure 78 - Green Line Extension Project



With the abolition of streetcar lines and the discontinuation of commuter rail service at the City's eight railway stations, public transportation in Somerville gradually collapsed. In 1950 the development of the Interstate 93, along with the existing McGrath Highway (which divided East Somerville and Brickbottom from Winter Hill and Union Square) contributed to the isolation of the neighborhood from the larger urban fabric, and the Somerville's culture of walking gave way to an emerging automobile culture.

Paradoxically, the development of Interstate 93 gave a substantial contribution to a new era of public transport planning, which is mostly depending on the extension of the Green Line. Indeed, proposals for an extension of the service from Lechmere all the way to Wolburn started in 1945, with a recommendation of a state-level commission on mass transit. Nevertheless, though many core elements of this proposal were carried forward in subsequent studies during the 1960's, '70's, and '80's, the project of Green Line Extensions (GLX) had never come into effect until the environmental impacts and health burdens placed on residents of Somerville by the construction of the new highway started to be taken into consideration, and the Commonwealth consequently committed to several mass transit investments. However, the GLX was supposed to be completed by 2011, but then pushed back to 2014, and then again to 2018, and now to an uncertain but forthcoming date.

GLX is definitely a matter of social, economic, and environmental justice. The Massachusetts Department of Transportation and the Massachusetts Bay Transit Authority have a commitment to enhance transit services in order to improve mobility and regional access for residents in the communities of Cambridge, Somerville, and Medford. The project is required by the State Implementation Plan and fulfills a long-standing commitment of the Central Artery/Tunnel (Big Dig) project to increase public transit. Moreover, the State must also safeguard air quality in urban areas by helping to reduce automobile emissions, as required by the Massachusetts Air Pollution Control Regulations.

The starting conditions of the area

In the following section, a thorough assessment of the pre-existing conditions of the neighbourhood will be provided, dating back to the period immediately preceding the revitalization process. Several problems have been afflicting the area for all over the last 30 years, determining an abrupt fall of private investment and accelerating the declaration of "decadent area" as defined in M.G.L. (General Law of Massachusetts) c.121B, §1. As such, it became eligible to be approved by the Commonwealth of Massachusetts Department of Housing and Community Development (DHCD) as an urban renewal area. Moreover, a closer look will be taken at the starting conditions of the area currently (and in the offing) occupied by the Greentown Labs facilities, which have been located within a former industrial site. The section will highlight the deep connection between the outdated planning regulatory tools of the area and the stagnation of private entrepreneurship that will lead to the development of SomerVision.

Union Square: finding of "decadence"

Over the past 30 years, Union Square hasn't faced relevant development processes and a large majority (more the 80%) of the existing structure were built prior to 1940. Renovation has also been rather lacking and mostly occurred between 1975 and 1980, meaning that most of the structures would not be compliant with current building codes. This implies that during various changes in ownership and a number of real estate cycles – including a boom market – there has been little private capital investment and the ordinary operations of private enterprise, acting alone, are unlikely to reverse the economic conditions of the neighbourhood. The reasons for this are to be derived from chronic conditions in the area that have existed for decades, and have eventually leaded the Municipality to approve a declaration of "decadence" under the M.G.L. in order to set up a proper renewal process. Along with endemic issues related to street patterns and soil/groundwater contamination, two other main obstacles actually prevented private redevelopment from achieving the goals of the community:

1. **Faulty parcelization**, given the plethora of small and oddly-shaped parcels that makes land assemblage unusually challenging and expensive;

2. **Incompatible land uses**, which reflect outdated zoning requirements.

Indeed, parcel sizes within the Union Square area range from 70 s.f. slivers of land to 7+ acre sites. While the size of parcels of residential properties (averaging 3,000 s.f.) are typical and adequate for their use in Somerville, many of the commercial lots, instead, have a similar size and do not fit most commercial uses. In the 2009 rezoning ordinance, minimum lot sizes for the various zones, mapped as transformation areas, were set at 15,000 s.f., 25,000 s.f., and 50,000 s.f. in order to call for larger scale development, though over 40% of the parcels are under the minimum size required. In addition to this problem, puzzling arrangement have ben set up by property owners by lease or other agreements to overcome oddly shaped parcels, thus jeopardising further options for development.

On the other hand, many of the land use types for commercial purposes that exist in the area today are a legacy of the former industrial characterisation of the neighbourhood, with several one-story buildings, warehouses and surface parking areas related to the presence of a major Ford Assembly plant in the past. These uses represent a disincentive for private investment and redevelopment. Specifically, parking lots, though somehow accessory for retail uses, mandated higher parking ratios that those currently in force. The proliferation of surface lots negatively impacts adjacent sites and over-serves the parking demand.

Setting the ground for a major cleantech incubator: location and previous uses

Historical narrative and economic use of the site – One of the most relevant examples of inadequate land use is the area south of Somerville Avenue at the crossing with Dane Street, the location of Greentown Labs starting from the fall of 2013. The site was formerly known as a leading industrial complex owned by the American Tube Works company, founded in 1851 after acquiring the patent for the production of seamless brass and copper tubes. The company is credited as being the first in America to manufacture seamless tubes that were originally used for locomotive, marine, and stationary boilers. In the late 19th and early 20th century, they expanded their production to include seamless tubes for domestic uses, such as indoor plumbing and heating fixtures. With more than 800 employees, it was reported to be one of the largest industries in the State of Massachusetts by 1912. Afterwards, the company remained one of the major regional producers of seamless tubes and was in operation until the Great Depression halted production in ca. 1933. The company remained in Somerville until 1934, the year after Walter O'Hara gained control of the organization. It is not listed in the 1935 Somerville City Directory, and in 1936 a Cambridge address is given for the company. Since the American Tube Works ended its Somerville productions, the remaining buildings in the complex have been used for various commercial and industrial functions, such as metal fence manufacturers, a paper retailer, a boxing club, auto body repair shops, self-storage, and small commercial offices. A great portion of the industrial complex was acquired by the Ames Safety Factory, founded in 1919 to produce durable and tamper-proof envelopes. Later, Ames developed color-coded files to hold medical records and packaging for floppy disks. The company had grown to about 600 employees in the mid-20th century, making sturdy envelopes, boxes, and file folders for medical records. But as the world started going digital, its business shrank, and eventually Ames was bought by a Wisconsin company rolling up similar manufacturers. The last 150 jobs at Ames vanished in 2010. Ames had once been among the biggest employers in the city and was considered “an institution”. The task of filling the 290,000-s.f. complex with tenants was a big issue for the municipality. However, as the story of the Ames manufacturing company was coming to a close, a new era of innovation was initiated in the same location. In 2011, two major leases were signed with Winebow, a wine import-export distributor, and Artisan’s Asylum, a non-profit community fabrication site that offers members access to a machine shop and classes. These new incumbent businesses were highly consistent with the former industrial use, keeping alive the manufacturing characterisation of the area and paving the way for the location of Greentown Labs in 2013.

Urbanscape – By the time of the development of the new City’s Comprehensive Plan, the former American Tube Works Company Complex was in fair condition and formed an identifiable intact group of early 20th-century, traditional brick, industrial buildings, although the overall integrity of the area had been somewhat compromised by the demolition of a number of historic buildings and the intrusion of modern buildings. The first group of buildings was built in this location ca. 1850-1860, but they were all demolished when the production plant was expanded and modernized in the late 19th century. By 1933, the American Tube Works constructed 15 buildings in the area bounded by Somerville Avenue, Dane Street, the former Fitchburg railroad tracks, and Church Street. Seven of these original buildings are still in existence, while the remaining (specifically, two of the drawing mills, the foundry, the proving mills, the shipping mills, and a storage house) have been demolished. Despite the removal of these historic buildings, the heterogeneity of extant building forms undoubtedly express the function and use of the buildings as well as of the complex as a whole. Intrusions into the area included a modern grocery store set back from Somerville Avenue by a large parking lot and a low-scale office building and parking lot located just north of the railroad tracks. These intrusions changed the overall setting of the district by altering the relationship between the buildings within the complex and between the complex and the railroad. Nevertheless, the area retains its integrity of location, design, materials, workmanship, and association.

The Challenge

The policy framework that fostered the location of Greentown Labs in the neighbourhood of Union Square leveraged his success with a sound mix of instruments that range from new zoning regulations to the direct provision of funds or the partnership with relevant public agencies, as it will further explained in the following section of this study (see §B). For the purpose of this section, preference will be given to the urban planning side of the policy design adopted by the Municipality of Somerville, by looking at the main steps that guided the reorganization of city planning in the last 5 years and the significant re-zoning ordinance that abruptly changed the evolution of the area. Finally, the location of Greentown Labs will be assessed in terms of relationship with the overall planning redesigning.

Planning the new Union Square

Steps – Three major planning ordinances catalysed the redesigning of Union Square's urban and economic structure.

1. 2012 Union Square Revitalization Plan

The Union Square Revitalization Plan is a 20-year plan approved by the Somerville Board of Aldermen in 2012. The plan was empowered by the declaration of the revitalization area as a "Decadent Area", which leaded to the development of an "Urban Renewal Plan" for its rehabilitation. It mainly serves as an action plan for implementing specific planning goals, thereby encouraging the investment of state and federal funds towards reaching those goals. Two significant community processes, undertaken in the previous years, informed the actions proposed in the plan: the comprehensive rezoning of Union Square in 2009, and Somerville's first comprehensive plan, known as the "SomerVision Comprehensive Plan", which is intended to run concurrently to the neighbourhood revitalization plan.

2. SomerVision 2010-2030 – Comprehensive Plan

SomerVision is 20-year plan that identifies shared values, sets measurable goals for the creation of new jobs, open spaces, development of new dwelling units, and transportation options, but it also illustrates the areas of the city that should be conserved, enhanced, and transformed in Somerville. It's simultaneously a plan for neighbourhood protection and a plan for growth. The major themes influencing the work of the steering committee in the organization of SomerVision are the following: neighbourhoods; commercial corridors, squares, and growth districts; resources; transportation and infrastructure; and housing. SomerVision also includes an implementation plan, which identified six priorities: station area planning, quality of life strategies, housing activities, sustainability programs, infrastructure and transportation improvements, and a zoning code overhaul. As stated in the executive summary, SomerVision has been intended to:

- *"Celebrate the diversity of our people, cultures, housing, and economy.*
- *Foster the character of residents, neighbourhoods, hills, and squares, and the strength of our community spirit as expressed in our history, our cultural and social life, and our deep sense of civic pride.*
- *Invest in the growth of a resilient economy that is centreed around transit, generates a wide variety of job opportunities, creates an active daytime population, supports independent local businesses, and secures fiscal self-sufficiency.*
- *Promote a dynamic urban streetscape that embraces public transportation, reduces dependence on the automobile, and that is accessible, inviting, and safe for all pedestrians, bicyclists, and transit users.*
- *Build a sustainable future through strong environmental leadership, balanced*

transportation modes, engaging recreational and community spaces, exceptional schools and educational opportunities, improved community health, varied and affordable housing options, and effective stewardship of our natural resources.

- *Commit to innovation and affirm our responsibility to current and future generations in all of endeavours: business, technology, education, arts, and government".*

Table 20- SomerVision Highlights

SomerVision Numbers	
30,000	New Jobs
125	Acres of New Public Space
6,000	New Dwelling units
1,200	New Affordable units
50%	Trips by Non-Automobile

Union Square Neighbourhood Plan (2016)

A neighbourhood plan (NP) embodies how each neighbourhood uses the framework of SomerVision, and in 2016 the residents of Union Square released their NP following the examples of Gilman Square and Lowell Station Area. It details the programs and policies that will foster the achievement of the goals for economic development, equity, public realm, housing, development, and mobility, as they were stated in the City's Comp Plan. The main rationale behind the NP is, indeed, to scale down the objectives set for the entire municipality, such 85% of development in 'transform' areas, or 30,000 jobs, specifying in which measure they will be pursued by the neighbourhood, which policy tools will be deployed and which area will be interested.

Table 21- Union Square Neighbourhood Plan Highlights

Union Square Neighbourhood Plan Numbers		% SomerVision
15,465	New Jobs	51.55%
12.32	Acres of New Public Space	9.86%
2,349	New Dwelling Units	39.15%
470	New Affordable Housing units	39.17%
50%	Trips by Walking, Biking, or Transit	(same)

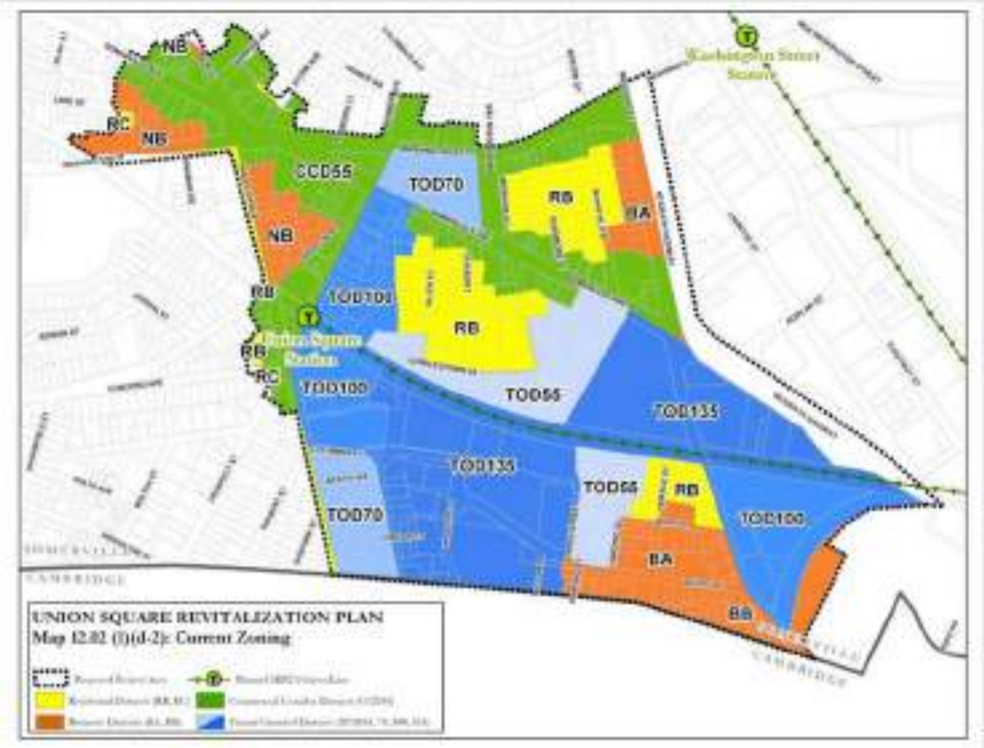
FOCUS ON NEIGHBOURHOODS BOUNDARIES DEFINITION

A closer look to the website Bostonography.com, which helped to map the neighbourhoods of Boston, Cambridge and Somerville online by letting citizens draw their own boundaries and name each neighbourhood themselves. A bottom-up, 'crowdsourced' mapping effort that was used to identify the many neighbourhoods that community members recognize today.

Zoning – In order to address specific issues and to overcome outdated planning regulatory tools (outlined in the previous section), the Municipality has gone through a deep process of re-zoning of the area since 2009. Specifically, two new zoning districts have been created:

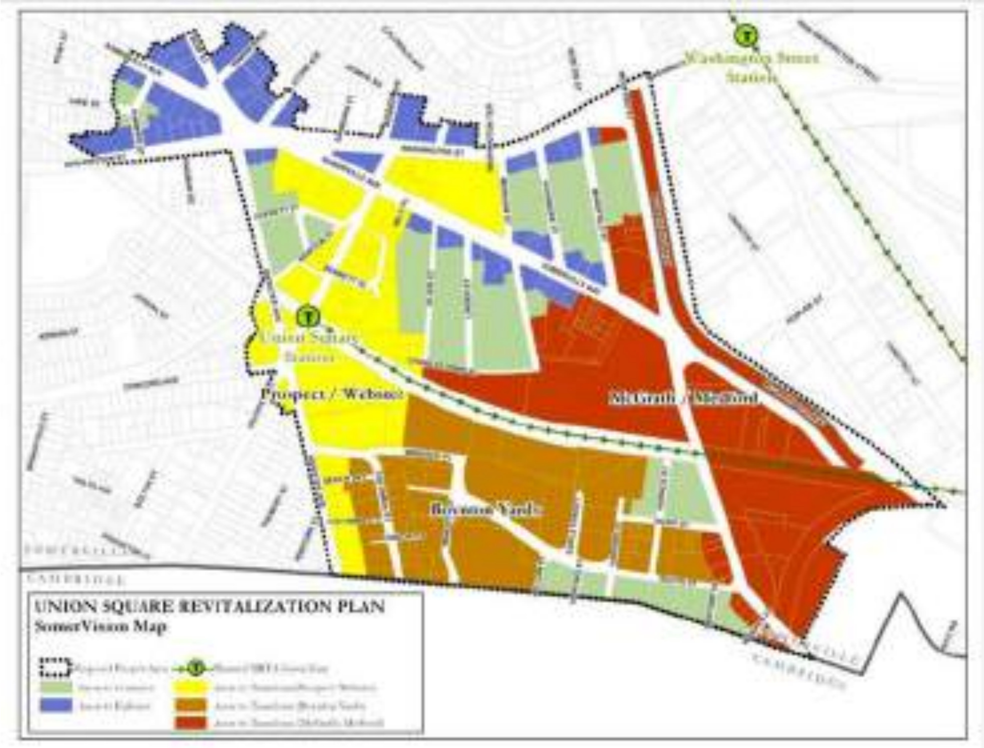
1. The **Corridor Commercial District (CCD)**, which mainly concerns the properties along corridors such as Somerville Avenue and McGrath Highway. The district recognizes that these areas may represent an important opportunity for an active mix of uses while also helping to address development challenges posed by faulty parcelization and the development of residential buildings in the surrounding, as well as the need to be accessible by multiple transportation options. The major objectives of the district are to:
    a. Encourage active mid-rise commercial and residential uses that contribute to a multimodal-friendly street;
    b. Increase commercial investment in high-profile, accessible areas;
    c. Preserve and complement historic structures;
    d. Discourage inappropriate auto-oriented uses along transit corridors;
    e. Promote pedestrian and bicycle activity.
2. The **Arts Overlay District (AOD)** is a subordinate zoning area with the aim of supporting the preservation and enhancement of Arts-Related Uses, particularly within Union Square. The district is also intended to enhance the area as a hotspot for a variety of uses such as retail, business services, housing, and office uses and to promote a strong pedestrian character.

Figure 79 2009 Re-zoning of Union Square [Source: Union Square Revitalization Plan, 2012]



Moreover, SomerVision provided the identification of three areas, which overlap with the aforementioned zoning districts: Areas to Conserve, Areas to Enhance, and Areas to Transform. Areas for conservation (shown in green in Fig. xx) are primarily residential and little or no change in land use or structures is expected. Areas for enhancement (shown in blue) are mostly coincident with the new CDC district and include parcels fronting Somerville Avenue and Washington Street. Although the sites included in these areas are particularly appropriate to contribute to SomerVision redevelopment goals, significant physical change is not expected, though transportation and other public infrastructure will undergo a deep renovation process. Finally, areas for transformation (other colors) are areas where large scale redevelopment is expected to occur in phases over time.

Figure 80 - SomerVision Map [Source: Union Square Revitalization Plan, 2012]



Greentown Labs: a key actor for SomerVision

The location of GTL in the area is consistent with the purpose of the AOD district, which is "to encourage the preservation and enhancement of Arts-Related Uses, particularly within Union Square". The area has been also identified as "Area to Enhance" in the SomerVision map, and the initiative actively contributes to the promotion of a new "innovation system" in the area. The use proposed increases jobs, commercial tax base, and the expansion of the innovative, creative, green technology company is consistent with the CCD district's purposes. The changes to the building are also consistent with the purpose of the district, since they enrich its character and the pedestrian experience with opening up the façade to have a view of the interior of the space along the sidewalk. Goals, policies, and actions of SomerVision plan that Greentown labs complies with include the following:

- Preserve and enhance the character of Somerville's neighbourhoods;
- Transform key opportunity areas;
- Make Somerville a regional employment centre with a mix of diverse and high-quality jobs.

It also meets several social and economic development goals of SomerVision. One of the goals is to invest in the talents, skills and education of people to support growth and provide opportunities to residents of all social and economic levels. A key action item under this goal is to establish new collaborations to train residents for medical, laboratory and new technology jobs. The Greentown Labs fits this type of business. The company creates a space in which innovation and technology is created in a collaborative and educational environment. Another goal is to ensure that the infrastructure for all utilities is sufficient in capacity and quality, of the best available technology, redundant, and supportive the desired level of future growth. The building will use green technologies and systems monitoring to ensure that the building is energy efficient and will bring visibility of these technologies to Somerville Avenue. Finally, SomerVision calls for 30,000 new jobs in the City by 2030 for residents and entrepreneurs. This proposal will bring 240 new jobs to help meet this goal in the research and development industry that will contribute significantly to Somerville's creative economy.

Figure 81 - Aerial picture of the location [Source: City of Somerville website]

Figure 82 - Greentown Labs - Parcels (current in red and forthcoming in blue)

POLICIES, STRATEGIES, GOVERNANCE

The launch of the initiative, its following modifications and its current state.

Greentown Labs (GTL) project was born in 2011 by three graduated students from MIT and one graduated student from Tufts University. They needed some lab space to work together, consequently they rented some space at the Cambridge Innovation Centre (CIC) in Cambridge, MA. One of the founder start-ups, called Oscomp Systems (Oscomp), was starting to think about building its first compressor prototype and while it was searching a suitable place where to realize the prototype it connected to other three companies, Coincident, Altaeros, and Promethean Power Systems, all of them being university spin-offs. Since their project was about “making things”, they needed more than a desk but a place where they could “make noise”.

After becoming seven companies in very few time they moved to the seaport area, which at that time was economically marginal and socially unsafe. Because Boston is a small city, it was running out of space and the seaport area was one of the few spaces left to develop. As a result, the seaport area had a fast resurgence, in fact, in a year and a half, the rent of GTL in Summer St. passed from 8 dollars/sq feet to 52 dollars/sq feet. During this period, the number of companies, part of GTL, increased from 11 to 16-17 companies.

They wanted to stay in the same neighbourhood, because they were near the "Innovation District" of Boston and it was also convenient for many members, but the area was no longer affordable in terms of rents. They met with the mayor's office in Cambridge, who was willing to have them to reside back there. However, the available spaces in Cambridge were also too expensive and the city could not offer anything to mitigate this. So, after some researches, they eventually found a space in Somerville, in an old manufacturing building which is part of the Ames Business Park, where they are currently located.

Today, GTL is located in a building of 30,000 sq feet, where 447 sq feet are used as prototyping lab space only, and it counts for 102 incubated companies with a success rate among alumni companies at about 86%. The member companies of GTL maintain their membership for 18 months and 14 days and they have a Technology Readiness level of 6, on average. The amount of money collectively raised by the members since their entry to the incubator goes up to 180 million dollars.

Governance architecture and participation procedures for population at large.

The scheme followed by GTL to bring start-ups work with them is clear and is based on a dense and interconnected network. First, although they don’t have any formal relation with universities, they benefit from an area with a high number of universities which most of them have business plan challenges. GTL follows all the awarding events such as MIT Clean Energy Prize and keep contact with the winners in order to attract them to GTL eventually. 9 of their start-ups are university-born companies. Moreover, the accelerators like MassChallenge are very important because, though they create short-term relations, they provide seed money and teach small start-ups the basics of how to become a business. After passing through the accelerators, start-ups go to the incubators such as GTL. When they arrive at GTL they are at an up-graded level, they already have a business-plan and a market for their products, as a consequence this is the step when they manufacture their products. At this step start-ups don’t have to be a completely ready company. GTL, in collaboration with its partners, offers specialized consultancy in IP and engage in finding investors, however start-ups need to have some money already raised by fund-raising or by investments because they have to pay the rent to GTL.

Universities → Accelerators → Incubators → Market

Consequently, until now GTL has worked with 102 start-ups and only 16 to 18 do not survive. The remaining start-ups have become mature companies. One of the most important characteristics the member companies of GTL must have is that they can't be in competition with each other. Indeed, they have to collaborate and exchange information since they have the opportunity to work in the same desks and in close contact with each other. Since, GTL considers spatial proximity a crucial factor of development, it is making efforts to maintain its former member companies in nearer areas. Actually, the member companies of GTL, once they are mature and leave GTL, they don't always remain in the state of Massachusetts because a lot of them develop technologies that are marketable elsewhere. However, more and more companies are localizing near each other and near GTL.

Considering this framework, GTL feels part of an ecosystem because they are aware of the fact that the absence of all the partners and actors involved in their working environment would have made it very difficult for them to achieve their goals and objectives. However, as far as concerning clusters in the Boston Area, GTL considers itself part of the clean technology cluster.

The GTL initiative can be framed in terms of a business incubator within the clean tech clusters as it offers business services for the clean technologies industry. In addition, GTL offers on-site access to a prototyping space, along with institutional membership to a maker space situated next door, the Artisan Asylum.

GTL provides several services that are considered strategic resources to clean tech start-ups, which have access to an extensive machine shop located on the prototyping floor, and tools at the neighbouring Artisan's Asylum. Moreover, the start-ups hosted within GTL can utilize free and low-cost software provided by many sponsors like Dassault Systems (SolidWorks), Mathworks, Autodesk, Altium, Ansys, Prosper IT and Microsoft. Marketing, public relations, human resources, graphics and design, real estate and liability insurance are examples of additional services provided within GTL.

Furthermore, GTL provides educational and formation programs. For this program highly specialized companies offer their expertise in topics that range from IP laws, to tax filings and raising capital, to expert discussions and trainings from sponsors and partners on specific tools and resources. Indeed, clean tech start-ups find within the GTL the technical expertise and the support of large companies, like Veolia, NationalGrid, Engie and CertainTeed Saint-Gobain.

Additionally, GTL develops acceleration programs to speed up clean tech start-ups' transition to market through two current programs. The first one called Greentown Launch concerns an in-house prototype acceleration program and the second one called Manufacturing Initiative, which strategically connects start-ups to local manufactures.

Finally, GTL stimulates networking with other entrepreneurs, angel investors, venture capital firms and strategic partners as one of the most important characteristics for the development of start-ups. At this purpose, it hosts regular events and programs, such as the monthly EnergyBar networking event which brings together investors, entrepreneurs, government representatives, university students and other actors interested in the clean technologies and renewable energy environment. Recent event partners include MIT Clean Energy Prize, Cleantech Open, SXSW Eco, Boston Cleanweb Hackathon, and many others.

Though GTL has become an unavoidable step in order to pass from the initial idea to the final market, it does not provide the inputs itself but it acts as a vehicle for venture capitalist innovation funds and government sponsored innovation initiatives. (5,254 types)

Policies, strategic planning tools and the challenges of partnerships

The case of GTL is an important lesson for the public initiatives. It explains how private entrepreneurship can become a driving force for the economic development of an area in the event that the public partners are engaged and assist the private activity with a mix of grants and particular programs.

A few time ago, the city of Somerville was considered a gateway city which means a city at the Boston's city boarder that had marginal economic activity. The new major of the city of Somerville recognised the value of growth and wanted to make this city a living example of a new economy, of lab spaces and research, of clean energies and all the related industries. In that period, the City of Somerville started its recovery and its Department of Planning and Economic Development started thinking on how to get some more innovation to the communities. In fact, in 2012 the city of Somerville adopted the 20-year urban and economic development plan called SomerVision, which intention is to attract innovative business activities in order to generate new employment opportunities. Actually, the benefits from this plan are twofold, on one hand it offered to GTL the perfect conditions of development and expansion, and on the other hand the city of Somerville benefitted from GTL location in different ways, among others in new job opportunities and in the requalification of the Ames old manufacturing area. This plan was an important tool because it was flexible. Although according to the zoning plan the Ames Business Park should have remained a manufacturing area, the Department of Planning and Economic Development explained that though GTL was not a manufacturing activity they were creating something, they were making prototypes.

The city was working on creating a new overlay by constructing innovative pockets in the city, thus creative spaces. In fact, Artisan Asylum, Brooklyn Boulders and Aeronaut Brewery were already located in the area of Ames Business District and GTL would have fit perfectly. This is the reason why the mayor of the City of Somerville went to visit GTL and they offered them the space as part of the Business Improvement District.

Fig. 1 - Localization of Greentown Labs within a dense network

The city of Somerville decided to give to GTL a 300,000 dollars loan in order to attract them locate in Somerville, at the former Ames Manufacturing area because there were no other space appropriate for the GTL work and needs. However, the loan was not free from conditions. The first condition concerned their business status, they had to change their status in for-profit instead of non-profit organisation. Currently, GTL is trying to reactivate its own non-profit branch. Moreover, the Future Economies Commission of this Municipality eased GTL in part through a working capital loan that utilizes Community Development Block Grant Funds, which contains requirements for new job creation and the constraint of not less than 51% of new job hires go to those who meet moderate- and low-income standards. So, GTL moved into their new home in Somerville, at 28 Dane Street, in the fall of 2013.

All the public bodies recognized the potentiality of GTL in Somerville, consequently any level of government assisted its localisation and expansion. The Commonwealth of Massachusetts as well contributed to GTL's expansion into Somerville through a $300,000 grant, provided by the Massachusetts Clean Energy Centre, a division of the Commonwealth's Executive Office of Energy and Environmental Affairs. MassCEC is an important actor at the state level. As a quasi-public agency they provide grants and pilot test areas for GTL companies. In addition, Rockland Trust Company also supported the expansion GTL by providing a commercial loan.

We examine here a central stakeholder like GTL which has gained the attention of important public and private actors at different levels. In addition to the grants achieved above, GTL has also benefited from many other public programs and projects for certain reasons.

Although venture capitalists are one of the key factors for the flourishing innovation activities of the private sector in the US, in this case they are not particularly attracted and active in the clean tech market (MAZZUCATO, 2015) because of its risky character. Clean tech is based on a mix of radical and incremental innovations (GEELS, 2005), consequently the potential economic and social returns of opening up new business segments and market creation within the clean tech sector would outweigh the costs of support. On this purpose, it advocates for an important public support, particularly in the initial part of the R&D process, in order to foster new technology based firms.

Among other agencies at the federal level, such as NSF and SBA, involved in financing the R&D activity and supporting the survival of start-ups members of GTL, they collaborate with the Department of Energy, although they don't get any money from them. In particular, they are part of the Incubate Energy Program, promoted by the Department of Energy in order to connect different incubators across the country. Through this network they have constructed formalised relationships with other incubators: one in New York, LACI in LA (the Los Angeles Clean-Tech Incubator), one in Chicago, another in Austin. The formalised relationship consists in hosting companies from the other incubators without making them pay the rent. In this way start-ups, members of different incubators, can exchange knowledge and learn from each other.

Although their progress is based particularly on networking with other actors at a horizontal level, GTL recognizes the importance of collaboration with anchor institutions like MassCEC, as a quasi-public agency, ENERNOC, at a private level, and universities as a fertile environment of innovation and new technologies.

Initiative outcomes: effects and impacts

The progressive evolution of the area and policy implications

The adoption of clean technologies, as a solution to the socio-political concern on environmental pollution, is conceptualized as the transition from traditional to innovative technologies, which reduces negative environmental impacts.

For this reason, GTL is in continuous expansion and the number of start-ups they host in their spaces is increasing. Since the presence of GTL in Somerville is definitely an attractor of start-ups, there has been an engagement from all the levels of government in stimulating and supporting this environment.

At the local level, the city of Somerville is building fab labs, which is a small maker-space, in high schools. In collaboration with GTL they are granting the construction of an engineering residence which will host and help everyone who have ideas to build them better and faster. Moreover, the city of Somerville has come up with a fabrication in Ames Business District. To stimulate innovation they are engaging to provide also physical connections, in addition to economic ones. Somerville is trying to get an extension of the green line of the Massachusetts Bay Transportation Authority (MBTA) because GTL is not far from Boston city centre but they are one mile away from the closest metro stop.

Moreover, in 2015, the city of Boston launched an initiative called the start-up zar. The responsible of this initiative, named by the municipality, has a planning background and he has been tasked to analyse the possibilities of the city to welcome start-ups and provide them physical connections in particular.

Concerning the state level, the state of Massachusetts as well has made certain efforts from a business point of view. In fact, it has adopted a non-compete agreement which is not accepted by all the states in the US, like California for example, but it is very important for contexts like GTL where start-ups work at the same desks and exchange information continuously. Furthermore, MassCEC, in collaboration with the city of Somerville, provide pilot test areas where start-ups can test their products.

The success history of Greentown Labs is explained by their continuous expansion and economic impact. The plans for the future include the organization of a water club in order to increase the number of companies which work in water technologies and the number of start-ups they host in their spaces. GTL has generated 512 direct job places and 288 indirect jobs in 2016 and they host 43 companies currently working at its space. They are planning to tack on additional space by moving into the building across the alley, 444 Somerville Avenue. The new space, which is slated to open by the end of 2016, will allow Greentown to provide 400 desks and host more than 100 companies at a time in the new 45,000 square-foot of lab space only.

“There is a lot more to be done, however in Massachusetts there are a lot of grants and programs in order to increase energy efficiency. In one year and a half the use of solar energy has become important and visible”, Micaelah Morrill, Director of Manufacturing Initiative at GTL.

Conclusions

Relevance of local assets for the effectiveness of the policies and strategies

Greentwon Labs offers an example of the role of local assets in order to develop new technologies and trigger innovation, which actually is a territorially-embedded process (Lundvall, 1992; Asheim et al., 1999) and emerges as a result of the collaboration between academia, industry and government (Etzkowitz and Leydesdorff, 1997). Therefore, local institutional and structural characteristics are the endogenous capacity of the territory (Iammarino, 2005) which coupled with exogenous circumstances generate innovation. The interactions between actors, institutions and exogenous pressures determine the performance of innovation (Smith and Raven, 2012).

Therefore, the researches for this report observed that the clean technology ecosystem in the Boston area accomplishes all the internal conditions, according to the literature on Strategic Niche Management that provides an evolutionary framework to the technological niche development process, in order to drive the transition toward a cleaner innovation. Actors at the technological niche level, together with local and global institutions share common expectations by means of goals to be achieved for a transition to a cleaner future. A dense network of academic institutions, firms, business infrastructures and public agencies is based on invention and technology transfer.

Moreover, according to the literature, policy intervention is very important for the implementation of clean technologies. Hence, we assessed the engagement of the public agencies in the Boston area. As a consequence, we identified the intervention of public agencies through several channels. They provide funding for research and grants to start-ups, support workforce programs and build business development infrastructures within a legislation framework for environmental protection.

However, from the interviews held with key actors in the clean technology context we identified lack of engagement at the public level concerning infrastructure and funding, which can hinder the diffusion of clean technologies in the Boston area. This shows the importance of targeted public policy for the deployment of clean technologies.

The lack of employment of clean technologies originates by a failure of the government to build a commercialization program while spending considerably for research and development (MAZZUCATO, 2015). Since one of the most difficult barriers to overcome for the deployment of clean technologies is the need for space and funds to construct prototypes at an early stage of the invention and, consequently, the inflated price of the final product, the US should engage in implementing regional feed-in tariffs in order to fix the price of energy and make it affordable.

Moreover, the organizational structure of energy and water technology industry in the Boston area is characterized by small companies, especially start-ups, spread all over the state. This industrial structure of clean technologies which struggles to develop and become mature is not attractive for venture capitals which are focused on safer investments. Therefore, there is the necessity for large amounts of public resources to be invested at the supply and demand side (MAZZUCATO, 2015).

The private actors of clean technology industry cannot face the challenges of innovation without the public support (VEUGELERS, 2012).

Externalities and the function of "clustering"

The case of Greentown Labs provides several strands of analyses, by means of territorial outcomes implications, institutional texture, and policy implications. The rationale behind the persistent interest in this project by local policy-makers is threefold: on one side, local governments typically target fields that appear to have long-standing comparative advantages in the city (CHATTERIJ ET AL., 2014), and the policies tend to reflect the new ideas and human capital that can be fostered by these sectors. Public support for clean-tech is seen, by these means, as a tool for dealing with the negative externalities, like carbon emissions, associated with traditional energy sources, which have been dominating the innovation scenario over the past two decades. In accordance with the theoretical model of urban economics developed by DURANTON (2007), cities grow or shrink are strongly related to the movement of industries across cities, which is highly determined by where past breakthrough inventions occurred. That is saying, in a nutshell, that industries follow innovation, and not vice versa. As remarked by CHATTERIJ ET AL. (2014, p. 10): "Boston will be home to the mousetrap industry while Boston is the site of the latest frontier of mousetrap inventions, but should a better mousetrap be invented in Memphis, the model [of Duranton, A/N] predicts that the industry would migrate from Boston to Memphis".

On the other side, local municipalities acknowledge the importance of "seizing" industries and strategic actors within their own territorial domains. Since the work of ROSENTHAL and STRANGE (2003), knowledge spillovers and branching-off processes have been proved to attenuate rapidly across the city, even over just few blocks, as showed for the case of Manhattan in ARZAGHI and HENDERSON (2008). This is why policymakers have initiated several programs that seek to increase the supply of entrepreneurs in specific neighbourhoods.

In terms of policy implications, the case of Greentown Labs shows that the function of "clustering" entreprenuers can also be performed by private developers (CHATTERJI ET AL., 2014), thus galvanizing the concept of entrepreneurial discovery and grassroots initiatives seeding. Public policies can, thus, layer over privately-founded initiative and anchor them to broader economic or territorial initiatives, as in the case of the City of Somerville. The 20-year program "SomerVision", by these means, provided a fertile ground for the development of Greentown Labs, and benefited from multiple positive externalities thanks to its location: among the others, the creation of new job opportunities, the requalification of a mature industrial area, and the establishment of a vibrant community of entrepreneurs, who are also encouraged and sponsored to pilot their green innovation in the city under the Somerville Green Tech Program.

By these means, Greentown Labs constitutes a convergence point of a complex network of public policy initiatives that act a different scale and with different objectives. Along with the municipal level, different federal public agencies, like the NSF and the SBA, are involved in the initiative in order to enable the production of radical innovation in the cleantech and foster sustainable transition, while at the State level, institutions like MassCEC, are primarily focused on encouraging start-up formation and growth, spurring knowledge transfer across various organizational boundaries, and creating a regional hub for the specific clean-tech sector. Therefore, a sound policy mix, at the state and local level, aiming at building and supporting clusters can be consistent with a leading role of private initiatives and should encompass a territorially-led vision in order to internalize the externalities that can come from innovation and new start-ups.

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Interviews

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4. LifeTech Boston Initiative

Leonardo Bianchi

Introduction

Industries agglomeration has been largely acknowledge as one of the factors that foster the innovation process and the economic growth. While the economic process pushes firms to locate near one another, the public policies hurry and implement this trend, playing a crucial role in the decision procedure of companies. The Boston Life Science Cluster is one of the sectors involved in this scenario and at the same time one of the strongest clusters in terms of economic magnitude.

This contribution surveys one of the policy initiatives promoted in the Greater Boston in order to implement the clusters of firms located in this area. The *LifeTech Boston* initiative, promoted by the Boston Redevelopment Authority, aimed to foster the life science sector through a bundle of different tools oriented to expand and attract new companies in the city.

A large body of literature in Economics claims that agents that are spatially concentrated benefit from economic advantages (Marshall, 1920). Short distances bring people together, favour information contacts, facilitate the exchange of knowledge and generate economies of scale. The larger the distance between actors and the more difficult becomes to produce positive externalities. Each firm located in an area in principle can benefit from external economies through the exchange with the actors of that place. These factors are changing the scenario of production: the bundle of goods is changing, the technologies of production are changing, and also the places of production are changing. The location of a firm is ever more important for the success of that firm, and even if the expenditures in the exchange of information and knowledge decreased in the last decades, the geographical proximity is still able to paly a crucial role in the economic performance of a country (Boshma, 2010).

Objective of the study

This work aims to investigate how public policies in US contribute to boost the agglomeration process of numerous firms in some specific areas, and in particular it has been studied the case of the *LifeTech Boston* initiative dedicated to fostering the growth of Boston's Life Sciences sector, that include the biotechnology industry, the pharmaceutical industry and medical devices industry, helping the existing firms to expand their business and recruiting national and international businesses.

A preliminary research, following Porter's methodology, highlighted how the Greater Boston is characterised by the presence of a strong Life Sciences sector that shows a high level of relatedness, thus benefiting from the exchange of information and knowledge and the development of a profitable network with Universities and research centres. The preliminary study shows the presence of relevant features for the Life Sciences industry, thus allowing a proper survey for the *LifeTech Boston* initiative. The strength of the cluster, in terms of its economic magnitude, and the cluster's relatedness with other economic sectors in the area of Boston represented the most useful criteria adopted for the selection of the case study.

US, a country overview

The Life Sciences clusters, in the United States, are following an agglomeration process that revolve around a limited number of areas, selecting the most suitable place based on the nature of their activities. On one hand, clusters with a large presence of small start-up and mid-tier biotech and specialty firms, with moderate increases in year-on-year employment and establishments. On the other hand, clusters that host large headquarter campuses or large manufacturing sites.

Obviously, the great concentration and diversification of the industry at large are impacting cities, where small and mid-size firms are driving the greatest part of spaces activities. In this realm, Boston is witnessing the increase of the real estate market related to the demand of new spaces. As companies get acquired or move into large spaces, vacancies are filled rather quickly with yet another promising life sciences company. These cities are experiencing new models to answer the increasing demand for spaces, and opportunities are coming from operations of parcelling off or redeveloping large spaces leaved by firms related to traditional sectors of production and now suitable for hosting start-up or small and mid-size tenants.

Figure 83 United States Life Sciences Clusters.

Source: Global Life Science Report; www.jll.com

UNITED STATES CLUSTER RANKING METHODOLOGY

Table 1 ranks relevant metro areas along several factors that measure the propensity for Life Sciences industry growth. Quantitative indicators of the industry performance were used to refine the list of clusters. Each cluster is scored against this list and ranking indicates its position among top life science markets.

Life sciences employment concentration

Weighting: 25.0 percent

Measured as the percentage of industry employment against total metro private employment. Higher percentages mean the industry has a greater influence on a given metro's economic success.

Life sciences employment growth

Weighting: 10.0 percent

A measure of economic success and job creation.

Life sciences establishment concentration

Weighting: 10.0 percent

Measured as the percentage of industry establishments against total metro private establishments.

Life sciences venture capital funding

Weighting: 20.0 percent

Reports the actual dollars invested during 2013 in life sciences industries. Demonstrates the potential for industry growth through private investment.

Life sciences National Institute of Health funding

Weighting: 20.0 percent

Reports the actual dollars invested during 2013. Measures the potential for industry growth through public investments.

Life sciences patents

Weighting: 15.0 percent

Measures the actual patent approvals awarded by the U.S. Patent and Trademark Office (USPTO) for a given metro area.

Source: Global Life Science Report; www.jll.com

US, the country outlook

The Greater Boston Area tops the list of fourteen United States cities on economic magnitude as Life Science Cluster.

The first position in the national ranking is given in particular by both the National Institute of Health and venture capital funding, the highest in the country, with a public intervention of 2005 million dollars and private investments of 1374 million dollars, while this area presents lower year-on-year employment growth than San Diego and San Francisco Bay Area.

Looking at the economic outlook, all three cities are expected to lead the United States' life Sciences industry in the coming years due to their heavy concentration of establishments and employers. The geographical proximity to research institutions fosters the production of patents, positioning San Francisco Bay Area and Boston respectively at the top and second position.

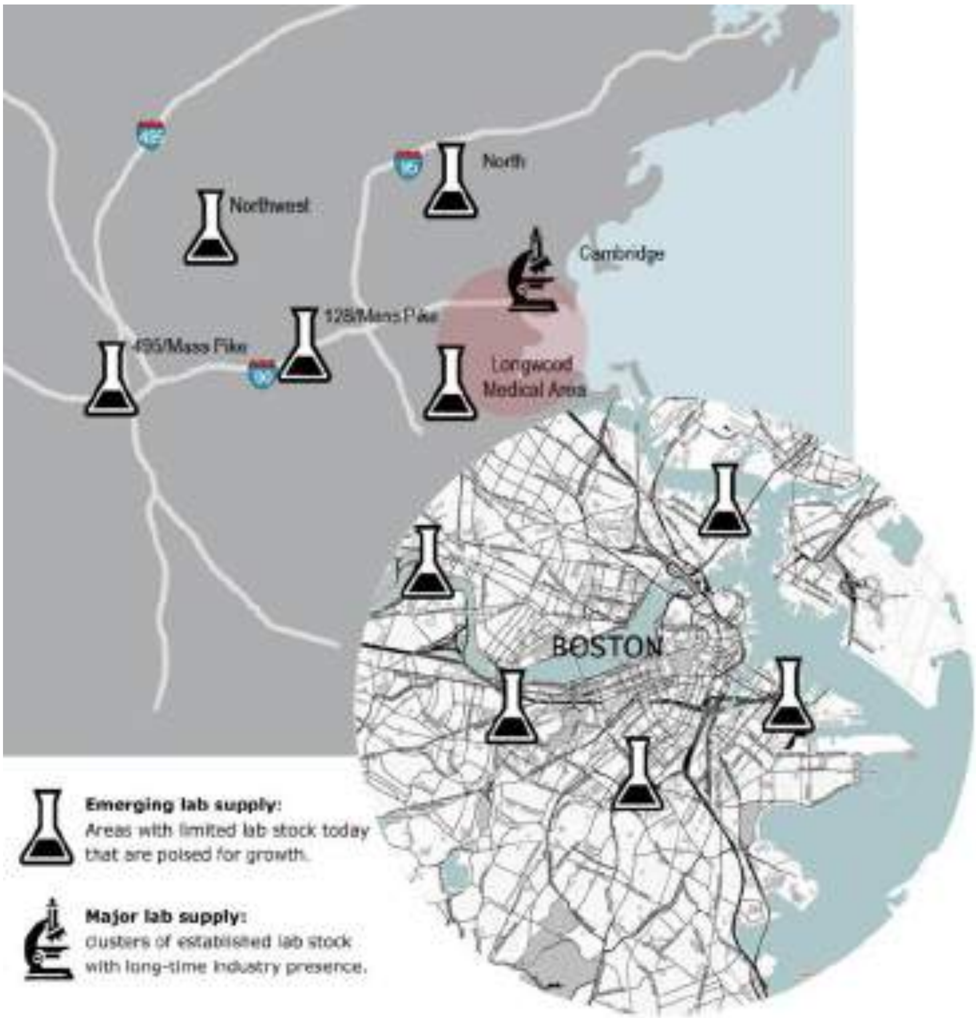
Table 22 - United States Cluster Ranking. Source: Global Life Science Report; www.jll.com

	Life Science Employment concentration			Life Science Employment growth			Life Science Establishment concentration			Life Science Venture Capital funding			National Institute of Health funding			Life Science Patents				
	25.0%			10.0%			10.0%			20.0%			20.0%			15.0%			Weighting	
Cluster	**%**	**W. Score**	**Rank**	**%**	**W. Score**	**Rank**	**%**	**W. Score**	**Rank**	**$ (Mln)**	**W. Score**	**Rank**	**$ (Mln)**	**W. Score**	**Rank**	**#**	**W. Score**	**Rank**	**Weighted Score**	**Rank**
Greater Boston Area	4,5%	20,2	3	1,5%	5,5	3	1,6%	8,2	2	1374	20,0	1	2005	20,0	1	1412	13,0	2	86,9	1
San Francisco Bay Area	3,8%	17,6	4	15,2%	10,0	1	0,9%	5,0	7	729,1	14,2	2	873	10,7	6	1652	15,0	1	72,4	2
San Diego Metro Area	5,8%	25,0	1	2,7%	5,9	2	1,4%	7,3	3	640,6	13,4	4	785,6	9.8	8	956	9,3	6	70,7	3
Raleigh-Durham Metro Area	4,6%	20,6	2	1,2%	5,4	4	2,0%	10,0	1	262,6	9,7	8	893,1	10,8	5	303	1,8	13	58,3	4
New York City	1,8%	7,1	11	-1,2%	3,8	9	0,7%	1,7	12	661,1	13,5	3	1648	17,0	2	1325	12,3	3	55,4	5
Los Angeles	2,5%	12,9	7	-0,1%	5,0	7	0,6%	0,0	13	359,3	10,8	6	959,7	11,3	4	1231	11,5	4	51,5	6
Philadelphia Metro Area	2,8%	14,0	6	-1,6%	3,3	12	1,0%	5,5	6	245,7	9,1	9	809,3	10,1	7	837	8,3	7	50,2	7
Suburban Meryland	2,3%	11,6	8	-4,5%	0,0	14	1,2%	6,4	4	407,7	11,2	5	989,1	11,6	3	639	6,2	8	47,0	8
Minneapolis Metro Area	3,1%	15,1	5	-1,3%	3,6	10	0,9%	5,0	7	174,1	6,4	10	297,8	2,8	13	1180	11,1	5	44,0	9
Seattle Metro Area	2,0%	8,9	10	-1,3%	3,6	10	0,9%	5,0	7	275,7	10,0	7	773,8	9,6	9	411	3,2	11	40,4	10
Denver Metro Area	2,2%	10,7	9	-0,1%	5,0	7	1,1%	5,9	5	99,3	3,6	13	312,9	3,0	11	335	2,2	12	30,4	11
Southern Florida	1,4%	3,6	13	0,1%	5,1	6	0,8%	3,3	10	133,1	4,9	11	304,4	2,9	12	456	3,8	10	23,5	12
Chicago Metro Area	1,0%	0,0	14	-2,8%	1,9	13	0,6%	0,0	13	110,0	4,0	12	682,7	8,3	10	505	4,4	9	18,7	13
Indianapolis Metro Area	1,5%	4,5	12	0,2%	5,1	5	0,8%	3,3	10	3,1	0,0	14	106,7	0,0	14	170	0,0	14	12,9	14

The Boston Life Sciences Cluster

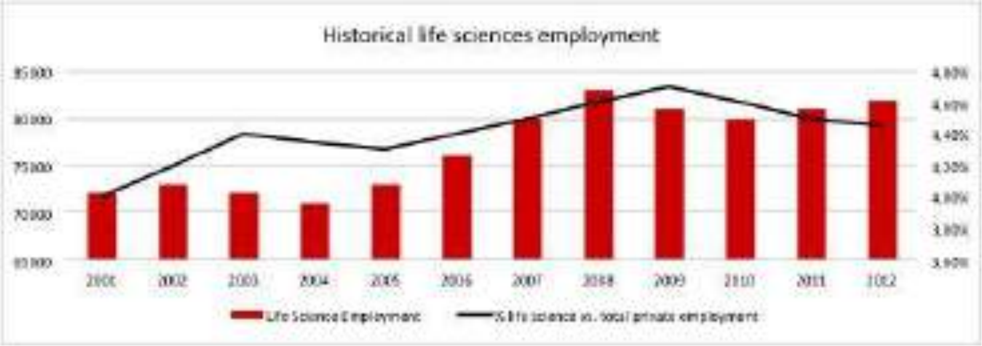
The Greater Boston Area shows a strong advantage as it hosts a huge number of academic and research institutions, but also venture capital firms, start-ups and pivotal headquarters of important multinational companies. All these features are making this area one of the most competitive and resilient markets in the nation.

Figure 84 - Greater Boston Life Sciences Cluster



This cluster includes different municipalities, and beyond the City Business District also the suburbs provide an important value option in the choice of localisation for firms, insofar, the Greater Boston Area represents an area that goes beyond the municipality of Boston. Nowadays developers look with great interest to the suburbs as a place where is possible to convert old office into working space, supplying new solutions as second and third generation laboratories.

Figure 85 - Historical Life Sciences Employment

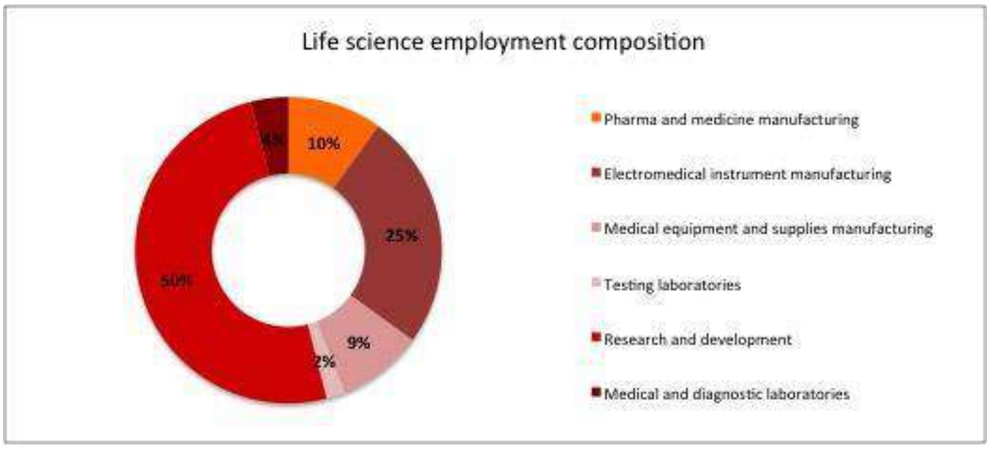


Source: Global Life Science Report; www.jll.com

Proximity to higher education and research institutions is revealed crucial for life sciences firms' growth as shown by the high correlation between top life sciences clusters and top educational hubs. This advantage in the Greater Boston lead to a strong capability to innovate, as demonstrated by the 1412 patents in Life Sciences in 2013, 47% as medical equipment and instruments and the other 53% as pharmaceutical and biotechnology products.

The competitive landscape and demand for highly skilled labour has led to sustained wage growth for life sciences employees. Annual wages have exhibited 7,6% growth since 2011, with the average salary being just shy of $80000 in 2015, in an area that is characterized by an important presence of jobs related to the Life Sciences industry.

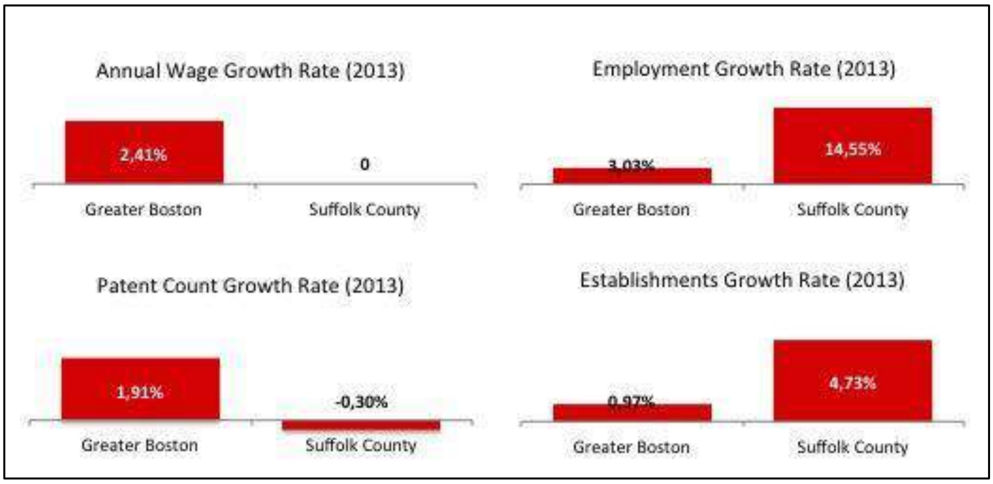
Figure 86 Life Science Employment Composition



Source: Global Life Science Report; www.jll.com

A comparison between the Greater Boston Area and the Municipality of Boston, indicated as Suffolk County, shows different rates of growth in employment, annual wage, number of establishment and patent. Apart from the annual wage growth rate that, is zero in the Suffolk County, in the years the Boston Municipality witnessed to a growth in the number of employers and establishments that corresponds to a greater concentration in the City Business District than in the suburbs. On the other hand, a worse performance in the patent pattern is related to the nature of the establishments that are placed in Suffolk County, where is higher the number headquarters than research centres.

Figure 87 Greater Boston and Suffolk County Indicators



Source: own realisation

The *LifeTech Boston* initiative

Description of the initiative

The "Life Tech Boston" is a BRA (Boston Redevelopment Authority) Business Development initiative, launched in 2004, dedicated to fostering the growth of Boston's Life Sciences industry. Working with start-ups, growing and well-established companies, it expands existing Life Sciences companies in Boston and recruits national and international businesses. This approach is designed to attract, retain, support, and strengthen Boston companies engaged life technology and related technology industries.

In February 2013 was launched the BRA Business Development Division bringing the *Back Streets Boston, Life Tech Boston, CreateBoston, RetailBoston, Innovation Boston, CleanTech Boston*, and *Onein3* initiative under one department. The Business Development Division's mission is to attract, retain, and grow world class companies and strengthen the city's professional workforce.

Objective and strategies of the initiative

The *"Life Tech Boston"* initiative aims to assist companies looking for a new localisation, offering services and identifying financial resources. In this activity they built a network of partnership as consulates and trade and investment organisations on attracting international business to the city. In order to attract out of State companies they work with State partners and research centres as *MassBio* and *Massachusetts Life Science Centre* (MLSC). The initiative promotes Boston at national and international conferences and events and forges partnerships with the healthcare community, local networking groups, and life science real estate community.

“LifeTech Boston” on the map

The policy assists companies looking for a new localisation, with city services, and identifying financial resources. In this activity, they promoted 5 areas of possible localisation.

Figure 88 - LifeTech Boston initiative on the map

Source: www.bostonredevelopmentauthority.org

1. Longwood Medical Area

The Longwood Medical Area is located three miles southwest of downtown Boston, and it represents an area of research, health care and academia. 43000 people including scientist, researchers and staff daily work in this area, where 19000 students attend their classes in 7 campuses (Brigham & Women’s Hospital, Children’s Hospital, Dana-Faber Cancer Institute, Harvard Medical School, Harvard School of Public Health, Harvard School of Dental Medicine, Merck).

The site is characterized by the presence of the healthcare industry, that covers the greatest portion of the 215-acre, but this area has attracted also a number of pharmaceutical and lab-using companies.

The majority of the 18,1 million of square feet are buildings institutionally owned that host office and laboratories.

A great concentration of public private partnership initiatives and joint venture have planned to build and modernise 414000 square feet for laboratories, offices and clinical space, while Dana-Faber has committed to 154100 square feet for its offices.

The importance of the area in the real estate market is given also by the project of Brigham & Women’s Hospital to build a 360000 square feet medical research building on Emmanuel College's campus, and by the project of the Winsor School to build a 300000 square feet lab facility.

The key players involved in the *LifeTech Boston* initiative in the Longwood Medical Area were *Kowa Pharmaceuticals* and *Dana Faber* that moved to their headquarters after a coordination period with the BRA offices for the assistance with City's permitted process.

2. Charlestown

Charlestown hosts the Massachusetts General Hospital, the Spaulding Rehabilitation Hospital, and an Incubator space.

As the other areas in the city, also here the real estate market is invested by a great demand for laboratories and offices space. It is the case of *Cogito*, a company that serves organizations that improve people's health and well-being using psychological sensing systems that analyse subtle and embedded behavioural signals. The company needed financing support and space for its office and the role of the *LifeTech* Boston was to look for a loan from the Life Tech Innovation Fund for company's first office and equipment and to select a site for the location of *Cogito*.

3. Harvard University – North Allston

Harvard Innovation Lab is an initiative by Harvard Business School for team-based entrepreneurial activities and interactions among Harvard students, faculty, entrepreneurs, and members of Allston and greater Boston. The area is located in the Allston and Brighton neighbourhood in west Boston.

The Key player in the activities of the *LifeTech Boston* Initiative was Genzyme, a contract research organisation that works with biotechnology, pharmaceutical, and reference laboratories.

The company needed assistance in converting old offices into laboratory spaces and at the end of the operation the result were 30 new employees.

4. Crosstown Cluster

The Crosstown Cluster is a Network of alliances, partnerships, collaborations, and consultancy hosted in the City Centre between the neighbourhoods of South End and South Boston.

Several companies as *Advanced Proteome Therapeutics*, *Inc. Arietis Corporation*, *Matrivax Research & Development Corporation* found here spaces for their laboratories and offices.

The cluster is located in a central area, very close to services of the financial district and to Tuft Medical Center, a pivotal actor for research and development in the Life Sciences industry.

5. Innovation District

The Innovation District is a component of the "*InnovationBoston Strategy*". As earlier happened in others cities, in 2010 the public administration decided to realize an

Innovation District: "*a geographic area where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators and accelerators. It is also physically compact, transit-accessible, and technically-wired and offer mixed-use housing, office and retail*" (Katz and Wagner). The intent was to create a neighbourhood able to attract financers, resources, and talent mimicking the success of *22@Barcellona*, the world's first Innovation District, located in Barcellona.

The Innovation District project aims to redevelop the South Boston Waterfront, an area with an history that dates back to the 19th century, underutilized, that in the past hosted industrial activities related to the fishing sector and boatyards, transforming the Seaport's area into a hub of innovation and entrepreneurship.

The Boston Innovation District spans approximately 1000 acres and includes three sub-districts: Fort Point, Seaport, Boston Marine Industrial Park. The project is managed by the Boston Redevelopment Authority (BRA) that provided partial funding for the construction of new public spaces, building a network with private companies and using financial instruments like the public private partnership to ease the burden of the costs of the project on the City's budget.

The *LifeTech Boston* Initiative, helped many users to find a place in the Seaport District, that represents a strategic area due to its proximity to downtown. The Seaport is the only City Business District submarket with a significant landscape poised for future development. The first Big-pharma name that signed in the District was Vertex when company moved to its new headquarters of 1,1 million square feet at 50 Northern Avenue and 11 Fan Pier Boulevard in the Seaport. The District Hall, the other big facility of the area, is a large public space where innovators can congregate, opened in 2013 and represents the centrepiece of Boston's Innovation District. The building offers 12000 square feet of meeting space, and was the result of a public-private partnership between the BRA and private investment. The City plans to add new spaces to the Massachusetts Convention Centre, the major anchor in the district, with a project of 1 billion dollars and to implement the project with the construction of new private housing units.

Overview of the activities

In 2013 Life Tech assisted 20 companies. As a result, six new life science companies moved to Boston, creating 50 jobs: *CareCluod* from Florida; *Hemarina* from France; *Human Metaboloma Technologies* from Japan; *Z-Medica* from Connecticut; *908 Devices*; *KNODE Inc.* from Cambridge. Five life science companies expanded their presence in Boston, adding 33 new jobs: *Sampleò Technologies* – new manufacturing facility in *Boston Marine Industrial Park* (BMIP); *inviCRO* – new state of the art laboratory facility in BMIP; *scPharmaceuticals* expanded their presence in the city; *Rest Devices* expanded their offices and moved from Point Channel to the Leather District; *CloudHealth Technologies* settled into their new home in the Front Point Channel relocating from the Venture Development Incubator at UMass Boston.

They worked with 15 consulates and trade & investment organisations, State partners, including *MassBio* and *Life Science Massachusetts* on attracting international business to Boston.

In 2013 Life Tech staff attended 2 conferences and 2 industry related events, as well as hosting a round-table conference: attended the *BIO International Convention* (BIO) held in Chicago and met with 30 life science companies; attended *2013 Financial Times US Healthcare and Life Science Conference* in New York where they connected with the sector's national and international leaders and met companies and trade organisations; partnered with *CareInnovators*, on the *CareForward* event aimed to bringing the Massachusetts health care community together for a day; partnered with *Bio Tech Tuesday* on their first biotech pitch event, including a pitch session for ideas, table pitches for innovative products, and informal networking; hosted a round-table discussion with members of the life sciences real estate community to generate ideas on how *Life tech* might better support tenant needs as the industry grows.

Conclusion

In today's constantly evolving workforce, firms face the problem of securing a workforce with suitable skills, while workers face the problem of deciding how much to invest in what skills. In this scenario the ability to attract, develop and retain skilled employers is fundamentally important to company growth and clusters represent the solution for companies to hire and acquire a suitable workforce.

The proximity to higher education and research institutions in Boston is crucial for Life Sciences firms and weighs heavily into real estate decisions.

The *LifeTech Boston* initiative, as public policy, played a pivotal role in the allocation of resources focused on the solution of localisation problems for companies that decided to move in Boston. The BRA selected five areas of development for the Municipality of Boston designated for host laboratories, offices and research centres related to the Life Sciences Industry. Given its prime urban location, Boston and the Suffolk County in general continues to increase its efforts to attract more and more life sciences tenants.

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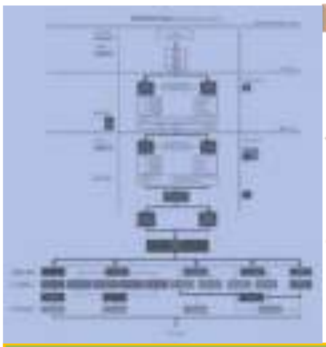

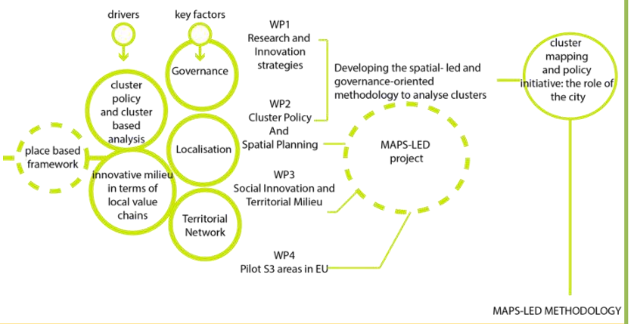

RESERACH FINDINGS
TARGET AREA ANALYSIS
ANNEX 1

MARCH 2017

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Multidisciplinary Approach to Plan Smart specialistation strtaegies for Local Economic Development
Work Package no.2

S3: CLUSTER POLICY & SPATIAL PLANNING

Deliverable 2.3
KNOWLEDGEDYNAMICS SPATIALDIMENSION AND ENTREPRENEURIAL DISCOVERY PROCESS

TARGET AREA ANALYSISANNEX 1

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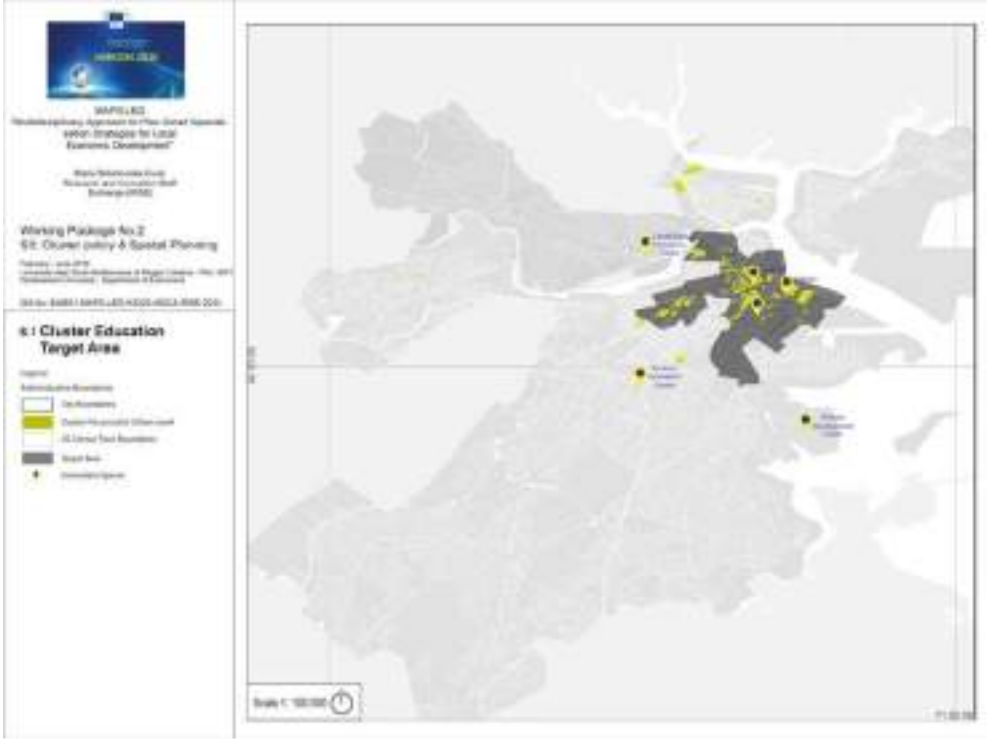
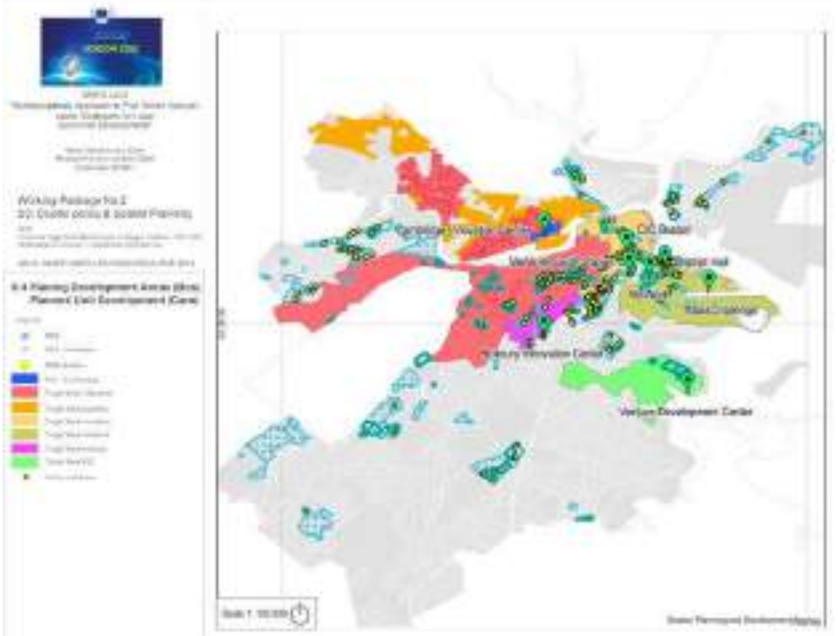
PART 1: Urban Regeneration

Target Area and Cluster Localisation



Cluster(s)	Financial Services
City(ies)	Boston
Cluster-oriented Policy Initiatives	District Hall, We Work, Boston Innovation District

Planning initiatives corrispondence

1.East & West First Street Planning And Rezoning, 1999, South Boston; 2.Boston Marine Industrial Park Master Plan Update, 2000, South Boston; 3.South Boston Waterfront Public Realm Plan,2001, South Boston; 4.South Boston Waterfront Municipal Harbor Plan,2001, South Boston; 5.Fort Point District Planning (100 Acres),2009, South Boston; 6.East & West First Street Planning And Rezoning,2011, South Boston		
City of Boston (Census Tract)	Source:	*For socio-demographic indicators, data have been collected by Census Tract (source: census.gov)*

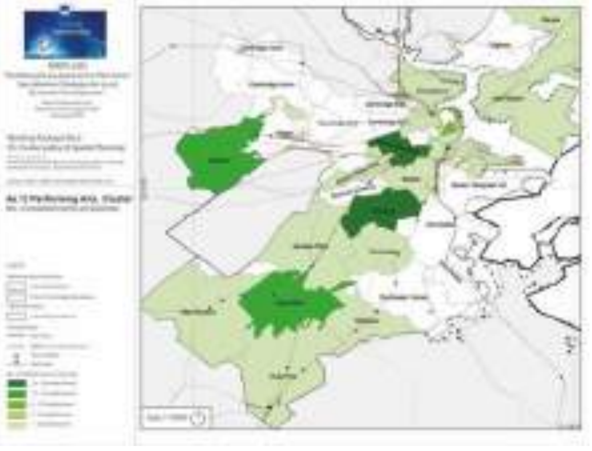
	GIS map elaborated by PAU Unit ESRs/ER during the WP1 Preliminary Research Activities 25025010600 25025010702 25025020301 25025020303 25025030300 25025060600 25025061200 25025070101 25025070300 25025070700 25025981700

Target Area description

The Target Area Financial Cluster is concentrated in the neighborhood of South Boston. The TAFs, based on cluster mapping methosology at urban level, intercect two main clusters the Financial Services and Performing Arts.

The cluster Financial Servivces comprehends 8 neighborhood of BOSTON: Downtown crossing, North End, West End, Beacon Hill, Financial District, theatre district, Chinatown, Back Bay, South Boston. More in particolar from maps analysis(Figure 1) is evident the high number of establishment per zipcode(30-35) in the target area.

The Performing Arts Cluster(fig.2) have a major concentration along the Charles River, in the areas between Longwood and Downtown, with a particular agglomeration of establishments in the Back Bay area, thanks to the presence of well known facilities such as the Isabella Stewart Gardner Museum, the Museum of Fine Arts and the Boston Opera House in the Theatre District.

Fig.1 Financial Services Cluster (No. of establishment Per zipcode)	**Fig. 2 Performing arts(No. of establishment Per zipcode)**
	

Cluster structure

The maps elaborate (Fig. 1 and Fig. 2) represents the surface of land use in which there are establishments corresponding to the studied clusters. In regards to its spatial configuration, the Cluster shapes a corridor that crosses the city of Boston from East to West, so from South Boston to Allston. In addition to this area, a Cluster Occurrence in the Zipcode 02124, relative to Codman square, Ashmont can be observed.

The abovementioned establishments are related to the NAICS 2007 codes, and according to Porter's definitions, each NAICS 2007 code is matched with sub-clusters forming clusters. "Clusters are geographic concentrations of industries related by knowledge, skills, inputs, demand, and/or other linkages."[1]

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[1] M. Delgado, M. Porter, and S. Stern. Defining Clusters of Related Industries (2016). http://www.clustermapping.us/resource/defining-clusters-related-industries-2016

Sub-cluster: “Conceptual subcategories that help to describe the content of each cluster. These sub-clusters are based mainly on industry definitions.”2

According to the NAICS classification, The Performing Arts Cluster is divided into two Subclusters:

- Performing Artists
- Promoters and Managers

The occurrence of each Subcluster has been verified both in every ZipCode and in the whole City of Boston. As a result, is possible to deduct that with almost the 59% the Performing artists Subcluster occurs more than the Promoters and Managers one.

The Financial service is divided IN 5 Subcluster:

1. Financial Investment Activities
2. Monetary Authorities - Central Bank
3. Credit Bureaus
4. Credit Intermediation
5. Securities Brokers, Dealers, and Exchanges

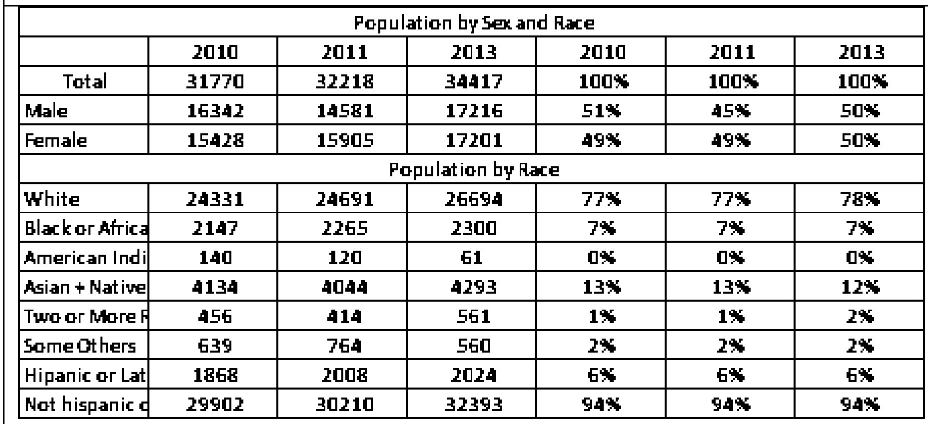
Fig. 3 Financial SERVICES Subcluster Occurrence per Zip Code

Fig. 4 Performing Arts Subcluster occurrence per ZIPCode

PART 2: Sociodemographic Analysis

Population By Sex and Race

Tab.1 Population By Sex and Race



Population by Sex and Race						
	2010	2011	2013	2010	2011	2013
Total	31770	32218	34417	100%	100%	100%
Male	16342	14581	17216	51%	45%	50%
Female	15428	15905	17201	49%	49%	50%
Population by Race						
White	24331	24691	26694	77%	77%	78%
Black or Africa	2147	2265	2300	7%	7%	7%
American Indi	140	120	61	0%	0%	0%
Asian + Native	4134	4044	4293	13%	13%	12%
Two or More R	456	414	561	1%	1%	2%
Some Others	639	764	560	2%	2%	2%
Hipanic or Lat	1868	2008	2024	6%	6%	6%
Not hispanic o	29902	30210	32393	94%	94%	94%

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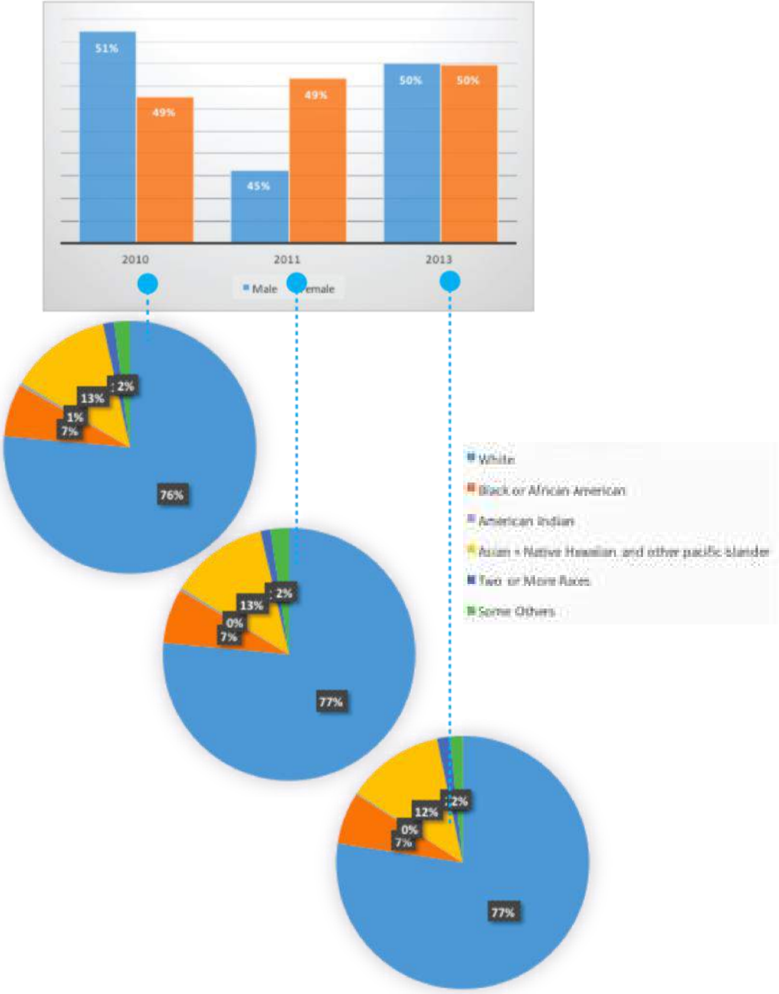
[2] M. Delgado, M. Porter, and S. Stern. Defining Clusters of Related Industries (20 http://www.clustermapping.us/sites/default/files/files/resource/DPS_Defining_Clusters_2015-jeg-lbv017.pdf16).

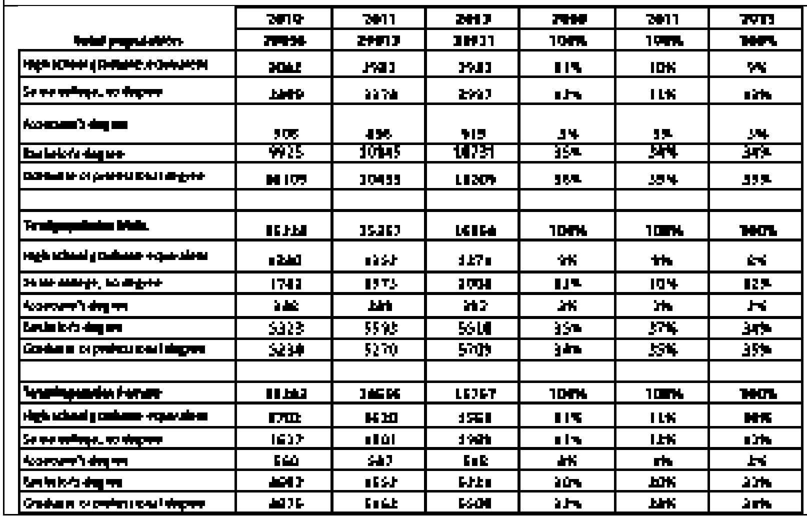
Fig. 1 Population by Sex and Race



Comments: The Target area was traditionally an Irish working-class neighbourhood. From graph analysis emerge a high percentage of Caucasian people, about the 77% with respect to the other race. Actually, the target area is composed of Irish Catholic community. In fact the income per capita in South Boston is 59% higher than the national average, probably thanks to new development process in the area. The target area becoming an attractive zone among young professionals and families thanks to the easy accessibility at Downtown and at the implementation of public services

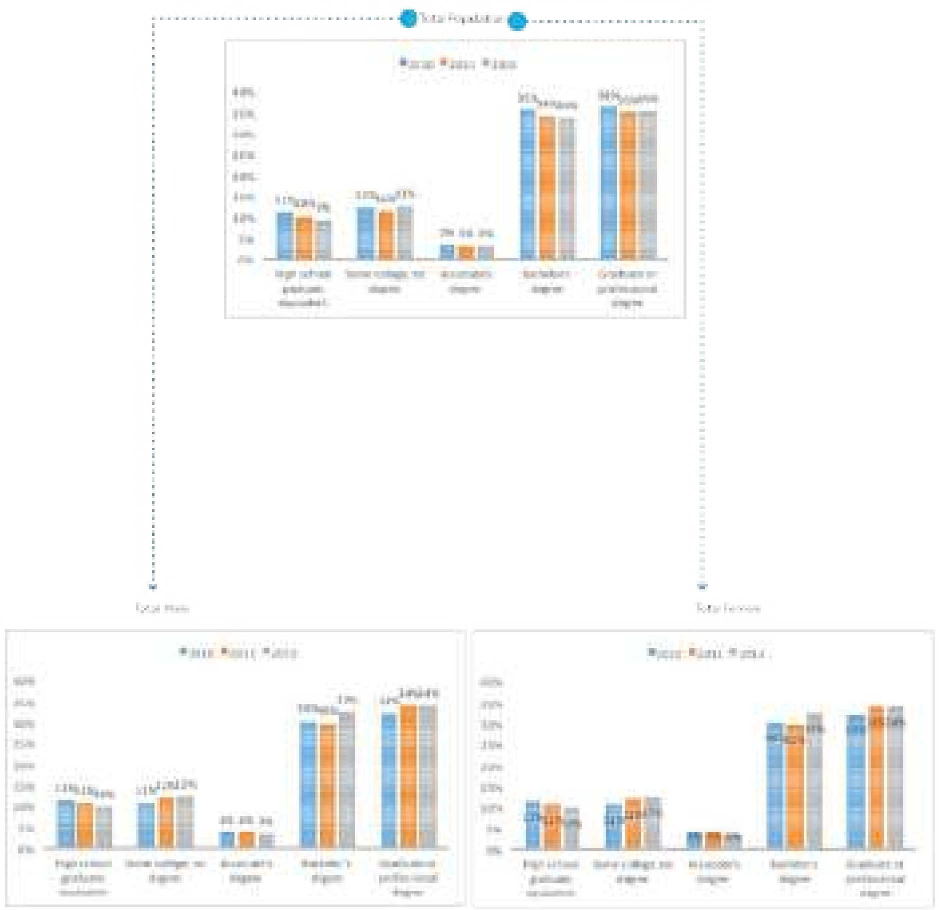
Educational Attainment by Sex and Degree

Tab. 2 Educational Attainment By Sex And Degree



	2010	2011	2013	2010	2011	2013
Total population	[illegible]	29913	31931	100%	100%	100%
High school graduate, equivalent	3062	2983	2983	11%	10%	9%
Some college, no degree	[illegible]	3376	2997	[illegible]	11%	[illegible]
Associate's degree	908	896	915	3%	3%	3%
Bachelor's degree	9925	10845	10731	35%	36%	34%
Graduate or professional degree	[illegible]	10433	11209	36%	35%	35%
Total population Male	[illegible]	15263	16164	100%	100%	100%
High school graduate, equivalent	[illegible]	[illegible]	1270	9%	[illegible]	6%
Some college, no degree	1743	1575	2034	11%	10%	12%
Associate's degree	[illegible]	[illegible]	362	3%	3%	3%
Bachelor's degree	5323	5595	5510	35%	37%	34%
Graduate or professional degree	5234	5270	5705	34%	35%	35%
Total population Female	[illegible]	14656	15767	100%	100%	100%
High school graduate, equivalent	[illegible]	1630	1561	11%	11%	[illegible]
Some college, no degree	1637	[illegible]	[illegible]	[illegible]	12%	[illegible]
Associate's degree	560	567	[illegible]	4%	[illegible]	4%
Bachelor's degree	[illegible]	[illegible]	[illegible]	30%	30%	[illegible]
Graduate or professional degree	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Fig. 3 Educational Attainment By Sex And Degree



Comments: The target area's workforce is highly educated. Between 2000 and 2010, Target area's population with a bachelor's degree or higher increased from 28.2% to 54.8%.
The graph shows as during the three years analysed the level of Graduate or professional degree is growing until to arrive at the 36% for male and 34% female
These dynamics are activated by the presence of young professionals that are moving in the area for to live and work.

Labor Market

Tab. 1Employed and Unemployed by sex and Race

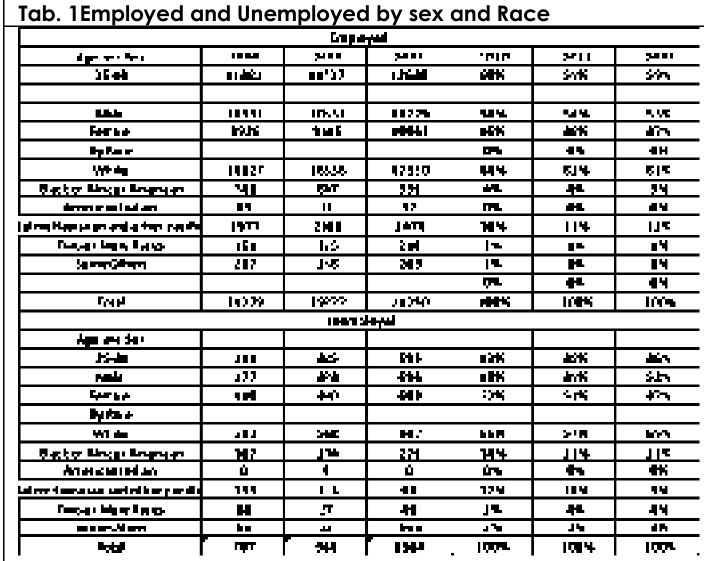


Fig. 1 Employment by Sex and Race

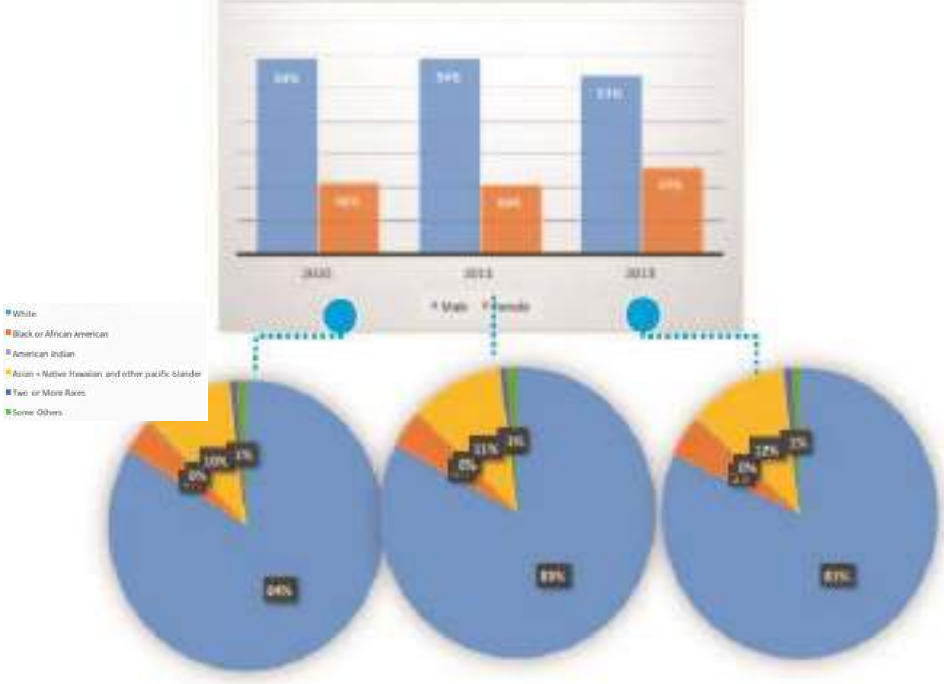
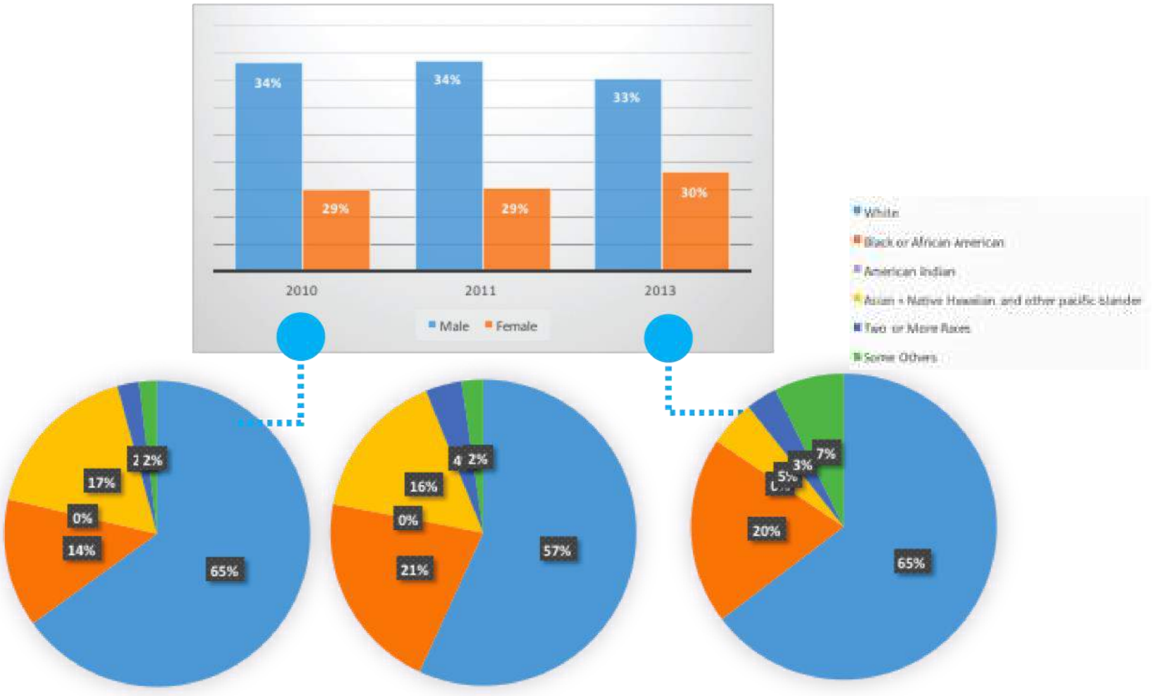
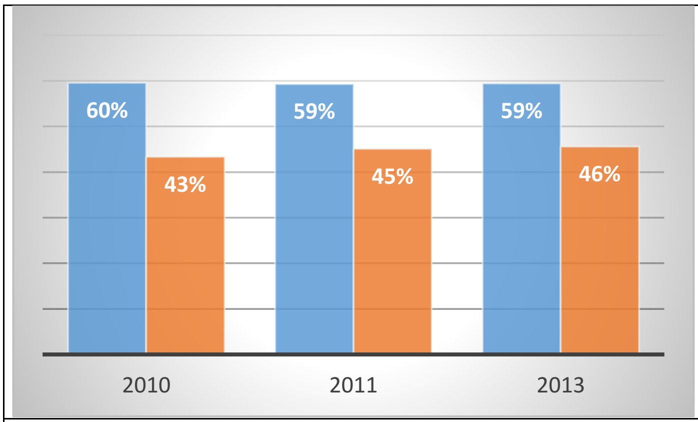


Fig. 2 Unemployment By Race

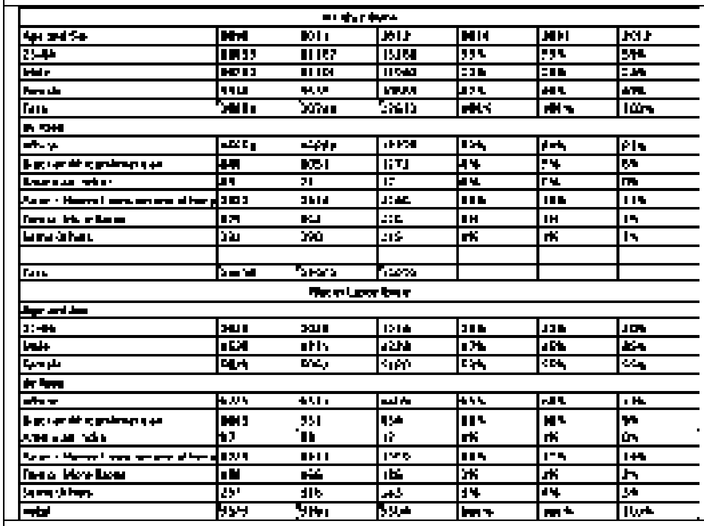


Comments: There are 698,875 jobs in Boston: approximately 434,700 jobs (62.2%) are filled by workers who live outside the city and commute. The remaining jobs are filled by Boston residents. The proportion of Boston workers who live in Boston has remained roughly steady since 1990, at 39.4% in 1990, 35.2% in 2000, and 37.9% in 2010. Comparing graphs(employment and unemployment by sex and race) in the target area emerges that from 2011 to 2013 the level of employed for male decrease but increasing the employed for female.



Comments: The majority of the Boston resident labor force is between the ages of 25 and 44.In fact the graph highlight the high percentage of employed beetwen 25-44 with respect to the unemployed.In the target area is very high the percentage in labor force and emerges a low level in unemployed.

Tab.2 In Labor force and Not in Labor force



Comments: From graphs analysys emerges the high percentage of females in not in labor force about the 55% respect to 45% of males category. The graph show the high percentage of male category 25-44 in the Labour force and the low percentage of female category 25-44 in not in Labour force. According to the BRA(Boston Redevelopment authorities)the cause can be the Female residents over age 65 have the lowest rates of unemployment, perhaps because they are likely to retire and leave the Labour force if they become unemployed

Fig. 1 In labor force By Sex and Race.

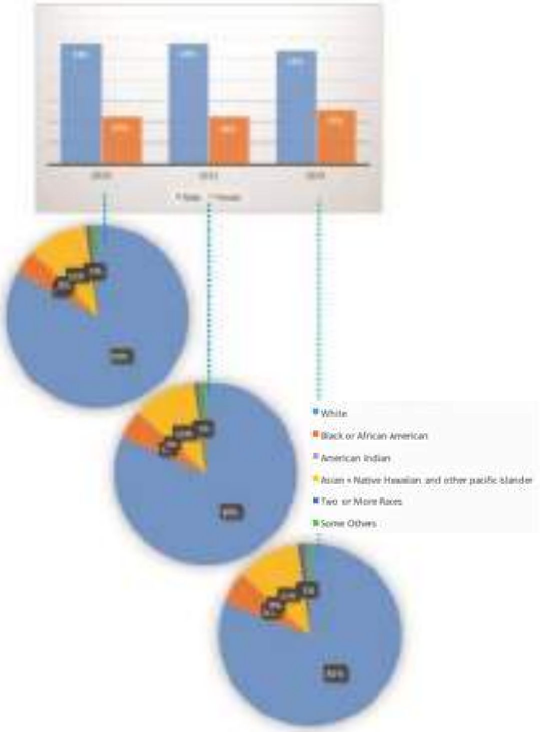


Fig. 2 Not in Labor force by Race

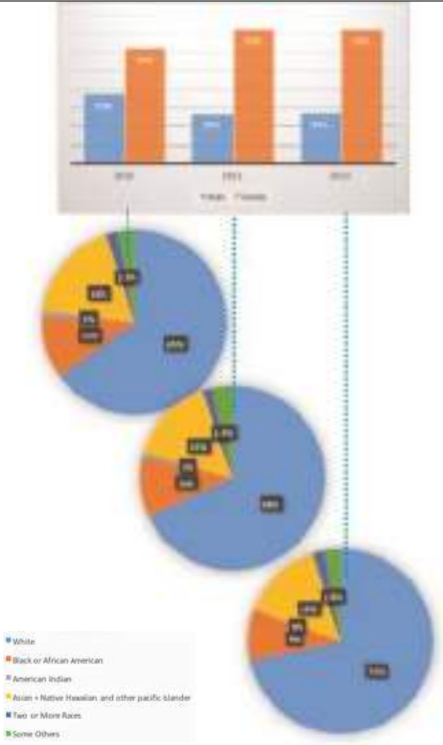
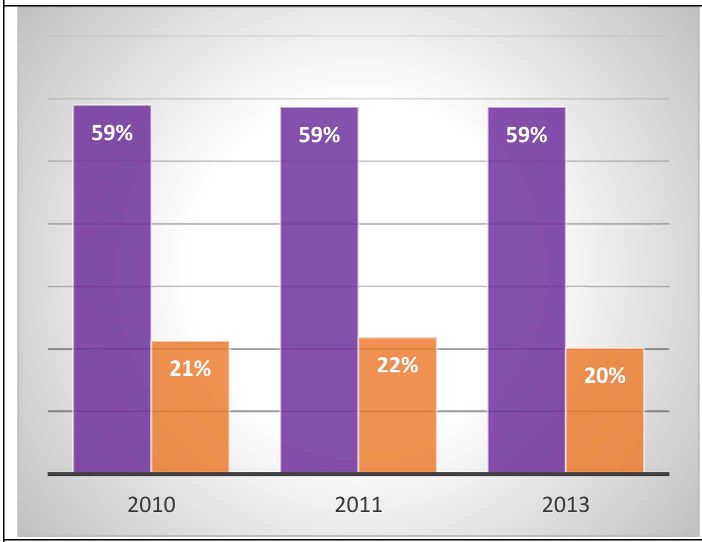


Fig. 3 In Labor force and Not in Labor force (25-44)



Comments: During the three years analysed the high percentage in labor force 25-44 of 59% has a costant growth with respect to the low percentage of not in labor force residents. The target area is a very working-class neighborhood.

Housing Stock

Tab. 1 Housing stock

Housing Occupancy						
	2010	2011	2013	2010	2011	2013
Total housing units	19287	19865	20800			
Occupied Housing Units	17471	17632	18545	91%	89%	89%
Vacant Housing Units	1816	2233	2255	9%	11%	11%
Occupied Housing Tenure						
Owner-occupied housing u	6539	6673	6704	34%	34%	32%
Renter-occupied housing u	10932	10959	11841	57%	55%	57%
Vacant housing unit						
For rent	358	527	613	20%	24%	27%
Rented or sold not occupie	293	399	462	16%	18%	20%
For sale only	177	94	127	10%	4%	6%
For seasonal, recreational o	414	461	459	23%	21%	20%
all other vacants	542	752	594	30%	34%	26%

Fig. 1 Housing Occupancy

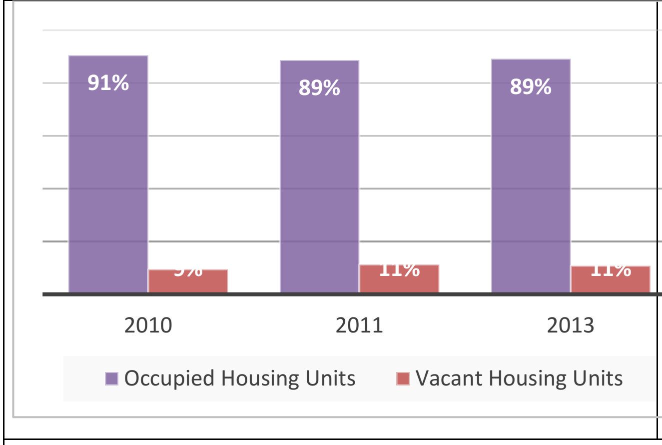


Fig. 2 Occupied Housing Tenure

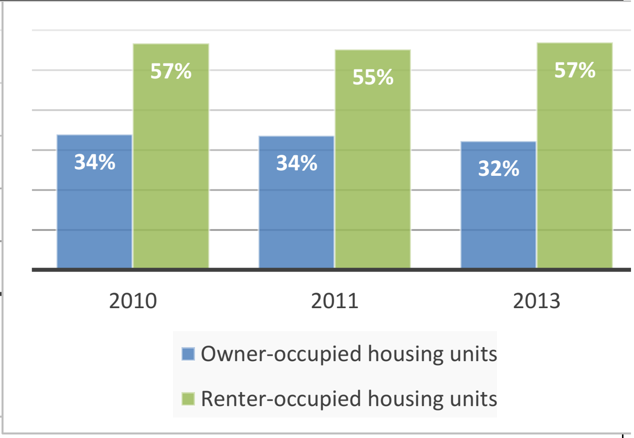
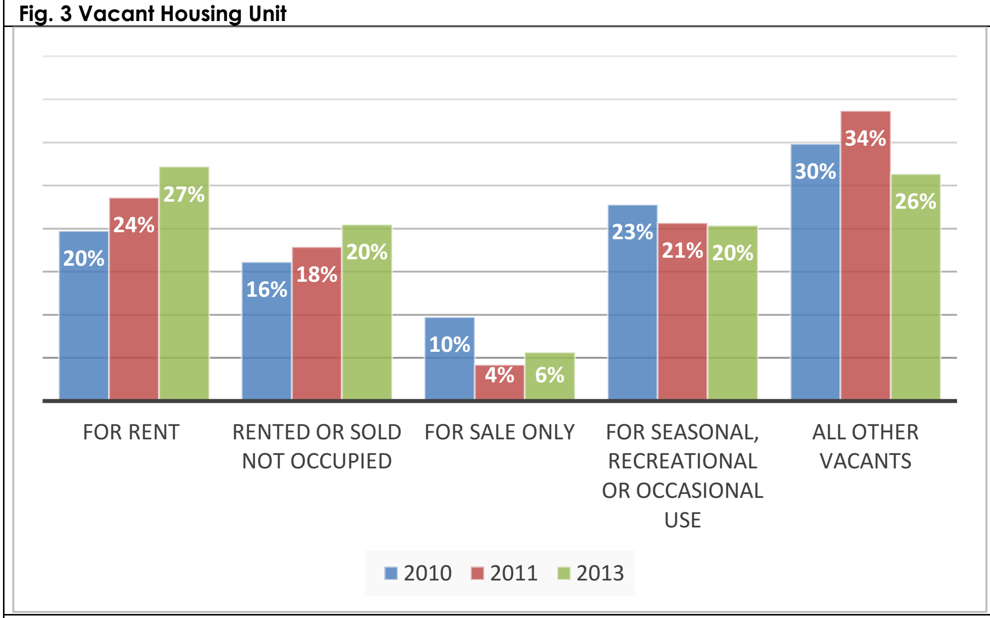


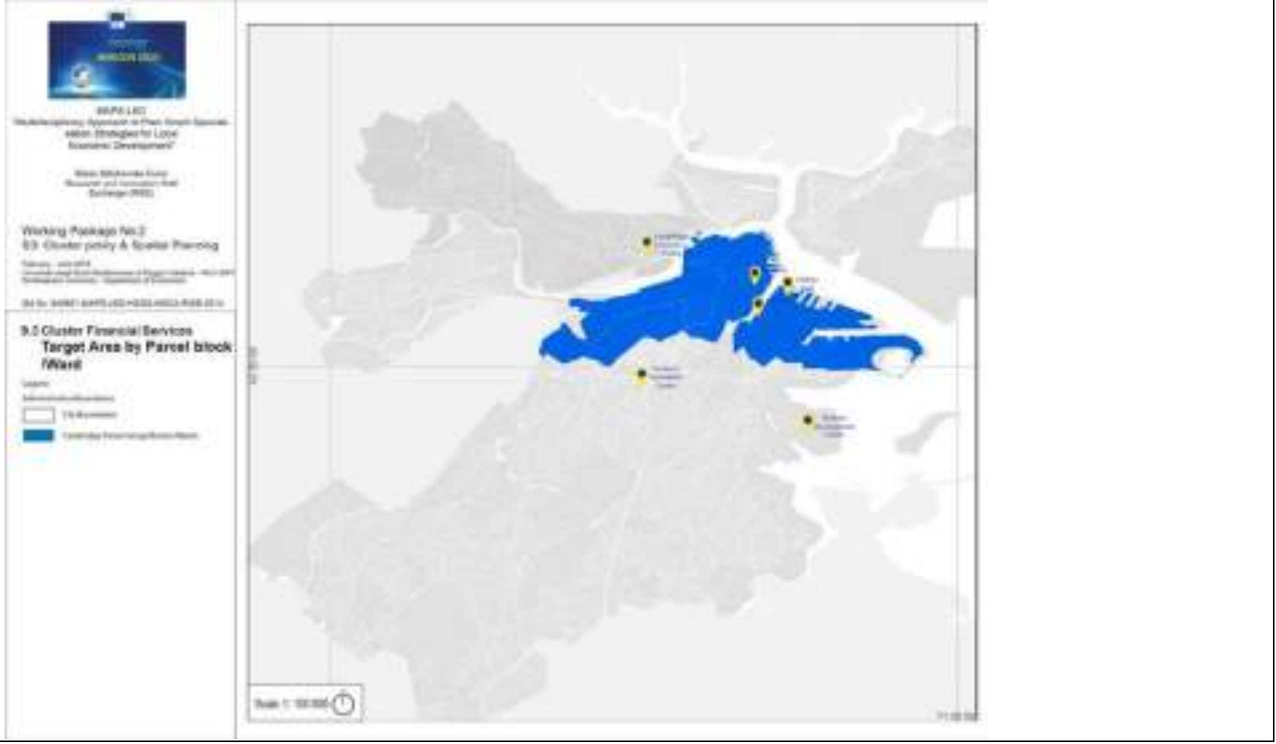
Fig. 3 Vacant Housing Unit



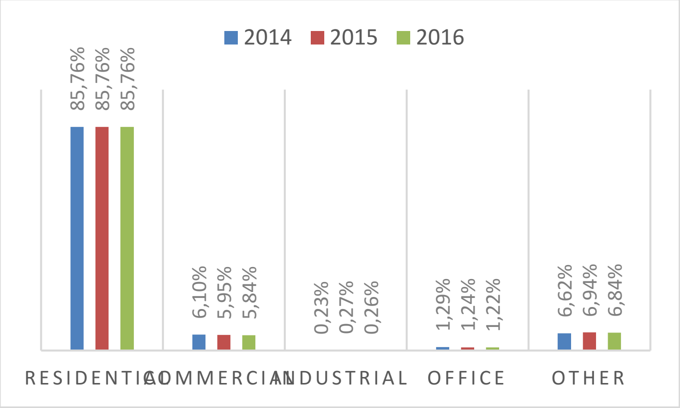
Comment: In 2013 there were 273,113 housing units in Boston, up 8.4% since 2000 . In the target area the housing unit are 20800. Housing unit growth between 2000 and 2010 was the strongest decade since before 1950: Boston added 20,546 new units of housing, for a decade-long growth rate of 8.2%. Since 2010 to 2013 the housing unit in the target area preserve a costant growth. The graph analysys shows the high percentage of Occupied Housing unit the 91% in 2010 until to the 89% in 2013. The vacant housing unit higlight the high percentage of housing unit for rented, a 23% for seasonal recreational but emerge an high number in 2011 all other vacants.

PART 3 Real Estate

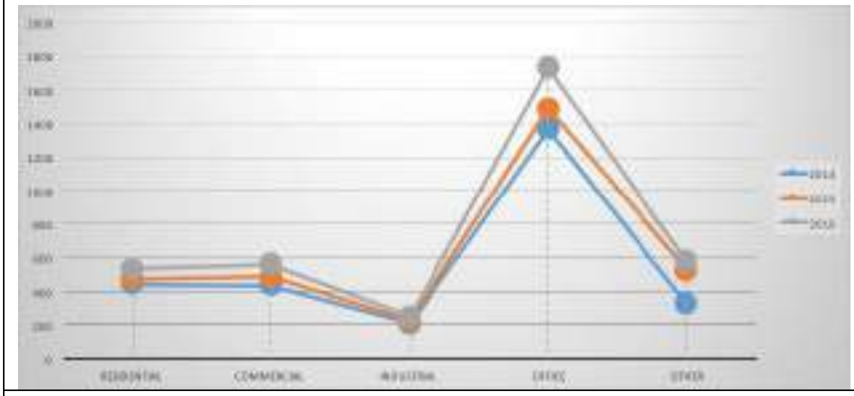
Target Area Parcell Block



Property Type



Property value per category

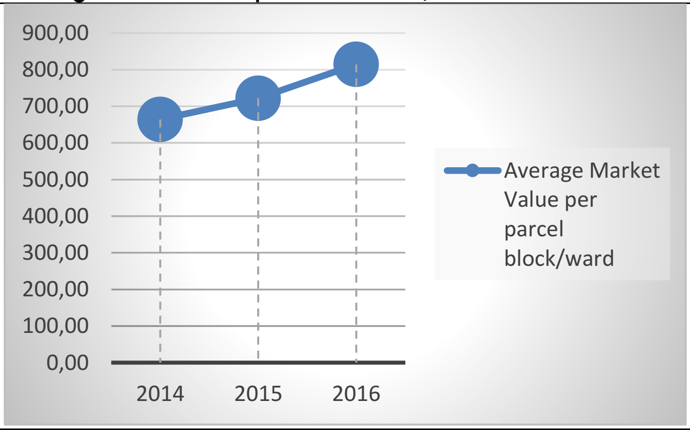


Comments: Despite the recession, the Boston housing market has remained strong(source: Boston Redevelopment authorities).Adjusted for inflation, assessed values of both residential and commercial properties have increased and now exceed their pre-recession highs.

The assessed value of residential properties has grown faster than that of commercial properties since 2001. The total assessed value of residential properties was higher than the total assessed value of commercial properties in 2016. The graph highlight the property value per category and in particular shows the total assessed value of office was higher than the total assessed value of residential and commercial.

Boston has approximately 63.1 million square feet of office space with an average vacancy of 10.9%, and 6.3 million square feet available as of fourth quarter 2014 representing a net growth since the end of the recession of 1.0% per year. The average asking rent for office space citywide for 2014 was $51.97 per square foot . The annual absorption for the year 2014 was 1.77 million square feet, most of which was located in the South Boston Waterfront, Financial District, and South Station areas.

Average-Market Value per Parcel Block/ward



Comments: The average market value of residential is growing in the last year. At long time this phenomena generate a gentrification process. In long-term the high value of house generate gentrification dynamics.

PART 4: Services

Trasportation and Infrastracture

Target Area	Indicator	Variables	2007?	2014	2015
Boston	Infrastructure	[illegible]	n.a	27	27
		[illegible]	n.a	4%	4%
		No. Of Bus Stops [No.]	n.a	306	316
		No. Of T [illegible] [No.]	n.a	55	40
		No. Of Bike [illegible] [No.]	n.a	4	6
	Services	Total Number of [illegible] station [illegible] the study area [No.]	n.a	5	5
		Rate of [illegible] accessible for wheelchair [illegible] the study area [%]	n.a	41%	41%
	Accessibility	Residential [illegible] close to any station [illegible] [No.]	n.a	7211	7209
		Commercial Units close to any station [No.]	n.a	664	409
		Office [illegible] close to any station [No.]	n.a	264	220
		Retail [illegible] close to any station [No.]	n.a	506	442
	Parking	Public [No.]	n.a	1	1
		Private [No.]	n.a	224	3209
		Average [illegible] of parking [%]	n.a	n.a	20

Target area map with centroid spatial identification

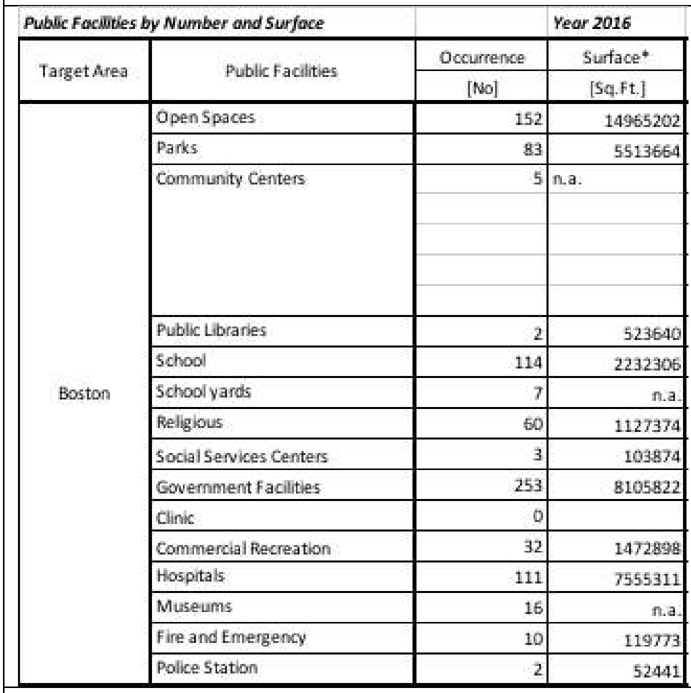
	Centroid coordinates
Latitude	42,346906
Longitude	-71,06021

Target Area distance from the main Infrastructures

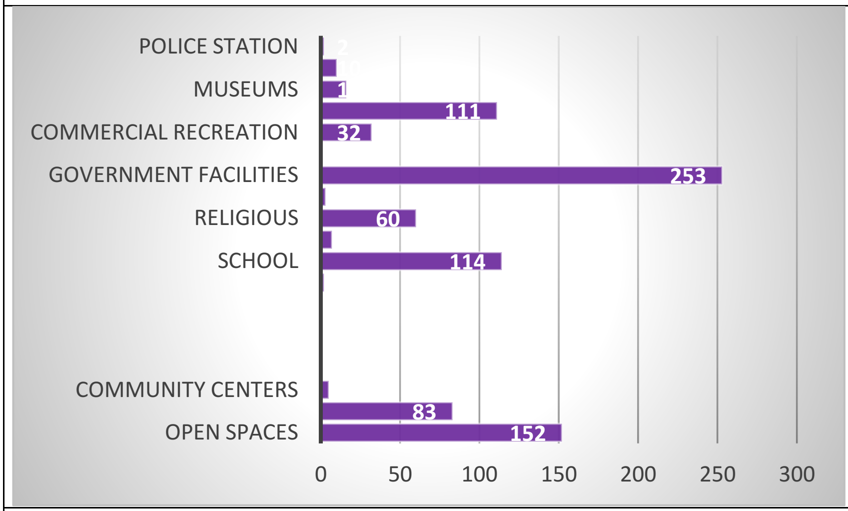
Target Area	Indicator	Variables	by Subway	by Bus	by Car
Target Area	[illegible]	Distance to the closest International Airport [Km]	n.r.***	7,84	7,60
		Distance to the closest Port [Km]	n.r.***	1,74	2,60
		Distance to the closest Highway [Km]	n.r.***	0,88	1,20

PART 5: Innovation Facilities

Public Facilities by Number and surface

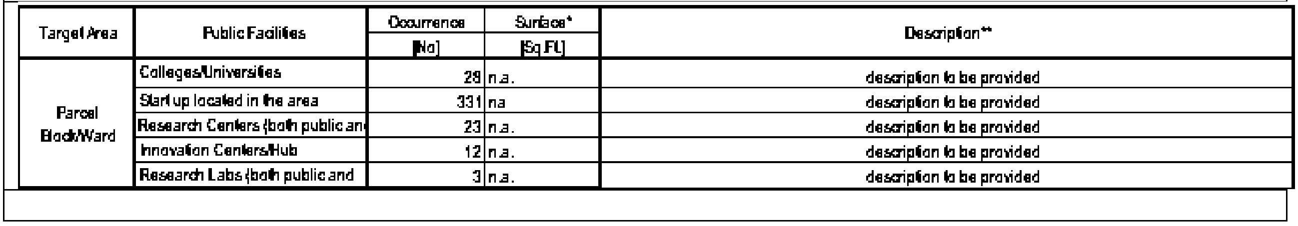


Public Facilities by Number and Surface			*Year 2016*
Target Area	Public Facilities	Occurrence	Surface*
		[No]	[Sq.Ft.]
Boston	Open Spaces	152	14965202
	Parks	83	5513664
	Community Centers	5	n.a.
	Public Libraries	2	523640
	School	114	2232306
	School yards	7	n.a.
	Religious	60	1127374
	Social Services Centers	3	103874
	Government Facilities	253	8105822
	Clinic	0	
	Commercial Recreation	32	1472898
	Hospitals	111	7555311
	Museums	16	n.a.
	Fire and Emergency	10	119773
	Police Station	2	52441

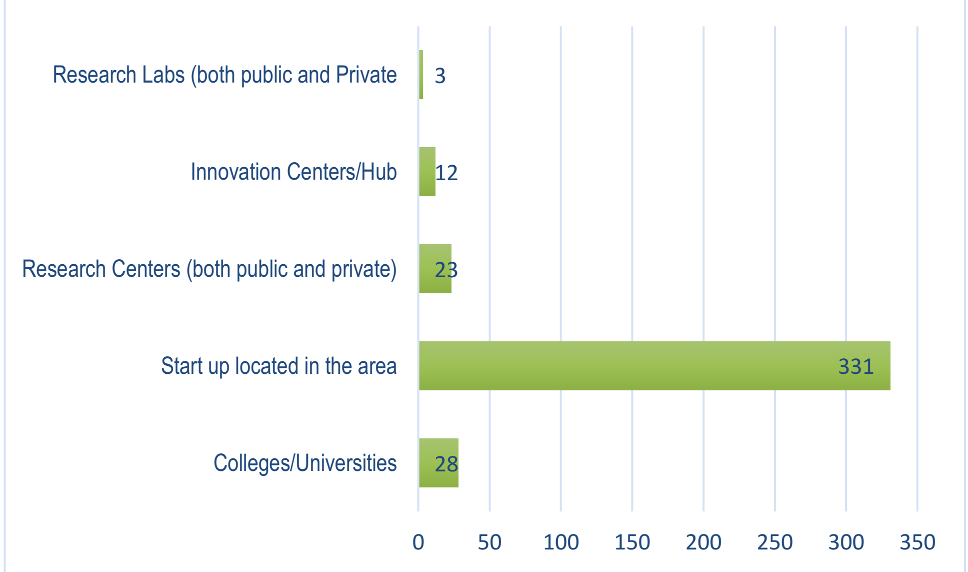


Comments: The Analysis highlight the high number of Governament facilities in the area. Today the Financial target area represent a highly desirable residential neighborhood, it is home to both long-time residents and a new wave of young professionals who are drawn to the area's open space, parks and community center initiatives. More in particular emerge Fort Point, it is a hub for the arts community, and has a large population of creative and artist people.

Innovation facilities



Target Area	Public Facilities	Occurrence	Surface*	Description**
		[No]	[Sq.Ft.]	
Parcel Block/Ward	Colleges/Universities	29	n.a.	description to be provided
	Start up located in the area	331	na	description to be provided
	Research Centers (both public an	23	n.a.	description to be provided
	Innovation Centers/Hub	12	n.a.	description to be provided
	Research Labs (both public and	3	n.a.	description to be provided

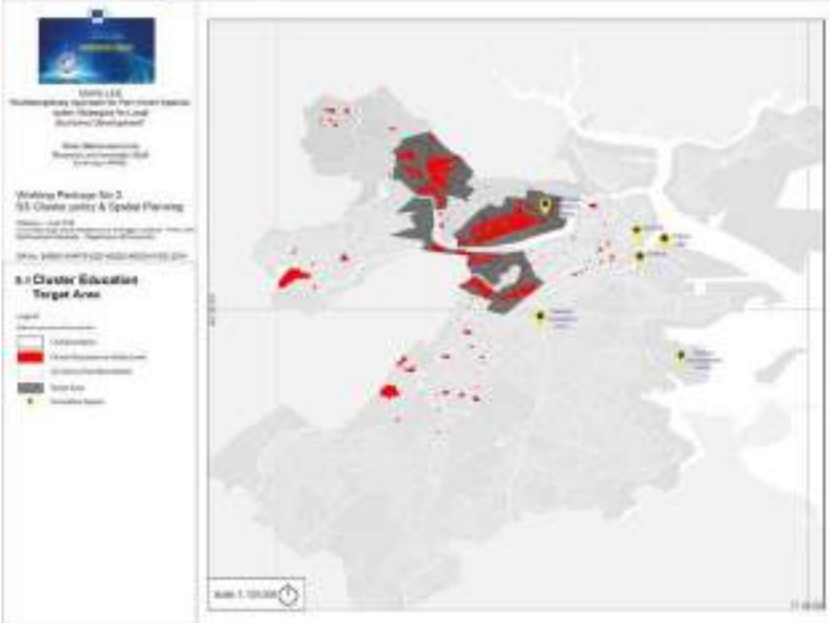


Comments: The graph highlights the high number of sturt up located in the area about 331 unit and innovation hub. In particolar, Boston's Innovation hub located in the Fort Point is an authentic neighborhood known for its creative community and support for local businesses. WeWork's red brick building, complete with a sports bar inspired lounge space, fits in seamlessly to the surrounding area of collaborative spaces. Thanks to work of young residents implementing dynamics of innovation and knowledge concentrantion creating a new future for the area.

Cluster Case Study: Target Area Education and Knowledge creation

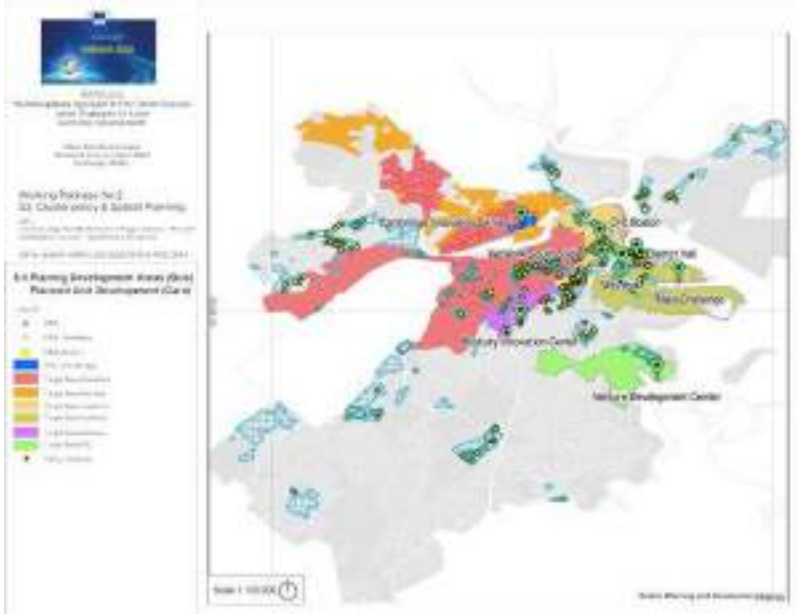
Carla Maione with Laura Biancuzzo, Gianmarco Cantafio

Target area identification

Cluster Localisation


Cluster(s)	Education and Knowledge creation
City(ies)	Cambridge -Boston
Policy initiatives	Cambridge Innovation Center

Planning Initiatives Corrispondence

1.Eastern Cambridge Planning Study And Eastern Cambridge Rezoning (Ecaps), 2001, East Cambridge; 2. Eastern Cambridge/Kendall Square Open Space Study, 2016, Area East Cambridge; 3. Kendall Square Central Square (K2-C2) Plan, 2011-2015,Mit; 4. Ecodistricts - Kendall Square Eco District Pilot (****),2011-2015, Mit.	

Census Tract	City of ımbridge Census Tract)	25017352300	City of ston (Census Tract)	25025010103
		25017352400		25025010104
		25017353101		25025010203
		25017353102		25025010204
		25017353200		25025010300

	25017353600	25025010403
	25017353700	25025010404
	25017353800	25025010405
	25017353900	25025010801
	25017354000	25025010803
	25017354100	
	25017354500	

Source:	For socio-demographic indicators, data have been collected by Census Tract (source: census.gov)

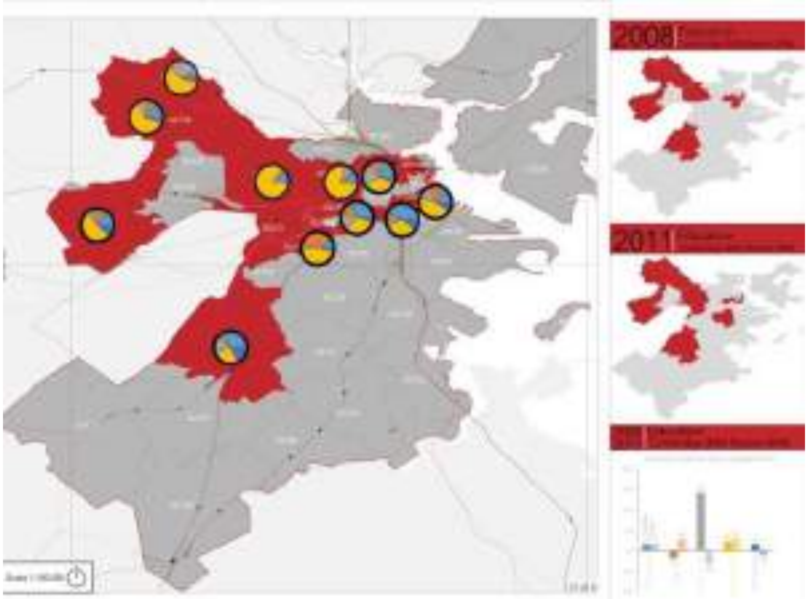
Target Area description

The target area Education is the main of the 11 strong clusters, analyzed during the activities of WP1, in Boston and Cambridge. According to Porter's definition; "Educational cluster is a group of geographically neighboring interconnected companies and organizations connected to them, working in a certain area and characterized by common activities and mutual reinforcement" (Porter 2008)[3]. It's strength consist in the opportunities that it create in the region, in terms of job creation and investment's attraction.

The localization of Educational cluster in the urban area depends from many aspects but one in particular is important to underline, the year of foundation of universities. The main universities, in terms of establishments and number of students are founded between 1636 (Harvard) and 1898 (Northeastern). It mean that the areas in which was more convenient create new education institutions, was determined by the existent conditions in a certain period. The maps (fig.2) illustrate the density of establishment per zip code, and the dark red areas indicate the maximum of concentration. Comparing the map is evident that the main concentration is in the areas in which there are the oldest universities, in this case is Cambridge.

The presence of several colleges and universities, between Boston and Cambridge, creates the conditions that generate positive externalities for the local economy. According to Porter's analysis, three parameters are used to evaluate the strength of the educational cluster in the area; performance, specialization and the number of establishment. The analysis of these parameters provide the confirmation of the effective strength of the cluster, in the period from 2008 to 2011, the years of global crisis, decreased the rate of establishment's growth , but in the two years after there was a recovery that compensated the decrease. Regarding the employment in 2013 Education provided 43,527 employees in Boston and 16,420 in Cambridge, it mean that the 27% of Cambridge and the 13% of Boston workforce is employed in education.

Cluster structure



The educational cluster is composed, for the areas of Boston and Cambridge, of 37 institutes, divided into five sub-clusters, as evidenced the figure, the difference between Cambridge and Boston emerges in the cluster structure especially into activities linked with training and research. Cambridge has high numbers of research

---

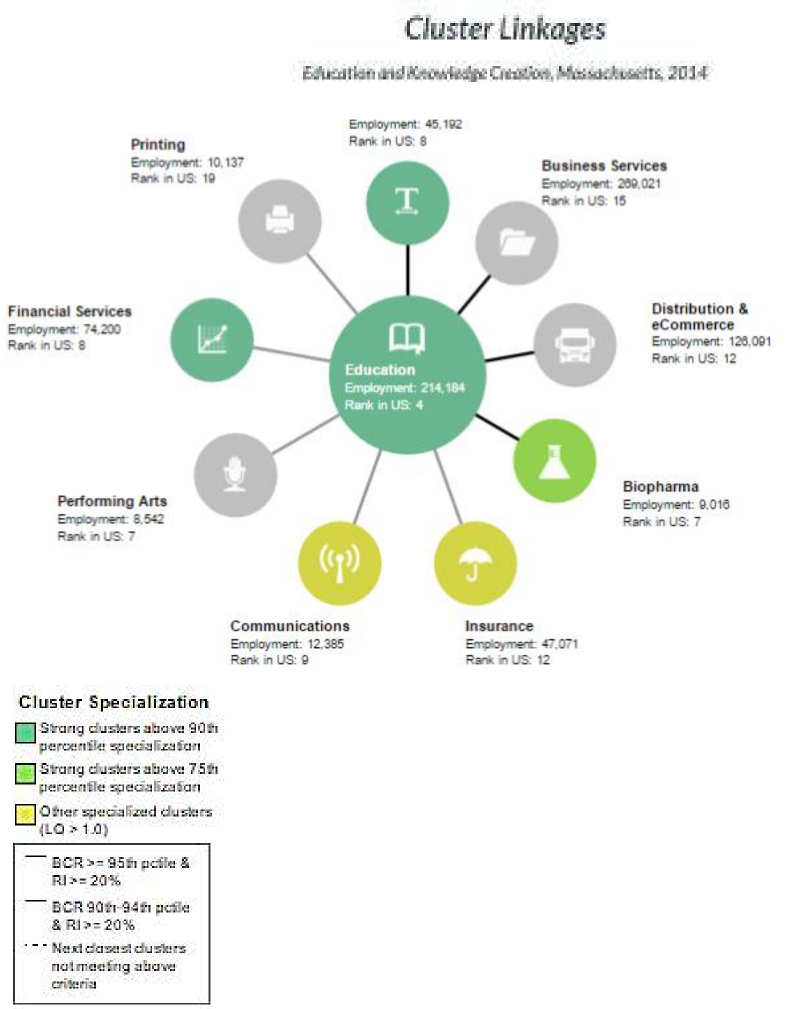
[3] Porter, M. (2008). Clusters and Competition: New Agendas for Companies, Government, and Institutions. Boston: Harvard Business School Press.

organization, while Boston presents high numbers of activities linked with training programs. On 11 zip codes, 5 have a percentage of research organization more than 50% and are concentrated in Cambridge, and three have a percentage of Training activities more than 35% and are concentrate in Boston in the area of the financial district.

Related Cluster

The figure show the inter-industry linkage, this is important in the understanding of what kind of industry acts around a cluster. In this case education is strongly linked with marketing and financial services, (over 90th percentile specialization) but also Bio pharm plays an important role in this cluster (above 75th percentile specialization).

Bio Pharm is one of the most important research activity in the area of Kendal in Cambridge and this explain the reason of the difference in the percentage of research organization in Cambridge compared to Boston.



PART 2: Sociodemographic Analysis

Population By Sex and Race

Tab.1 Population By Sex and Race

Population by Sex and Race						
	2010	2011	2013	2010	2011	2013
Population by Sex						
Male	18634	18571	41028	23%	22%	48%
Female	21885	21210	43934	26%	26%	52%
Total	82763	82985	84962	100%	100%	100%
Population by Race						
White	58086	58310	60280	70%	70%	71%
Black or African America	2101	2099	5634	3%	3%	7%
American Indian	93	29	138	0%	0%	0%
e Hawaiian and other pa	13700	8590	13821	17%	10%	16%
Two or More Races	866	2261	2986	1%	3%	4%
Some Others	1174	2216	2103	1%	3%	2%
Hipanic or Latino	6149	5763	7058	7%	7%	8%
Not hispanic or latino	76614	77222	77904	93%	93%	92%

Comments: The Target area became a working class neighbourhood with a sizable immigrant population in the mid-nineteenth century, with the beginning of the industrial revolution.
For many decades this neighbourhood included a number of major manufacturing and industrial businesses.
Today the target area is very largest and intersect different neighbourhood, the major changes in land use have transformed large manufacturing and industrial areas into the educational district.
The graph highlights the high percentage of Asian and Hawaiian people 17% with respect to the 7% of black or African.
The 97% percentage of Not Hispanic or Latino reflect the character of the community that live in the area

Fig.3 Hispanic or Not Hispanic

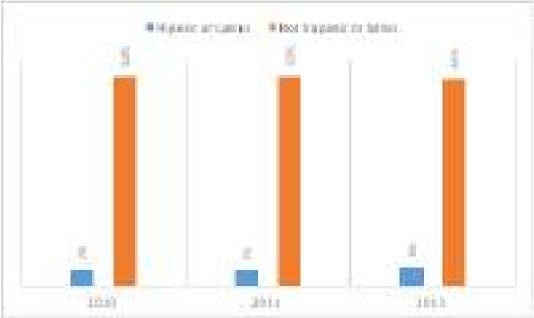
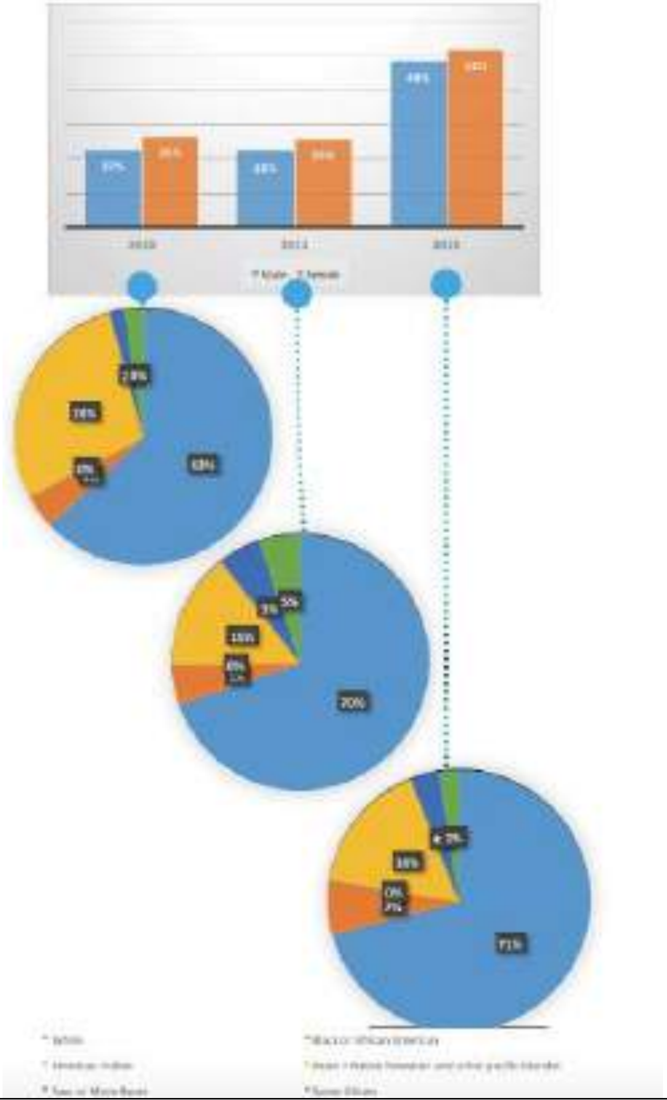


Fig. 2 Population By Sex and Race

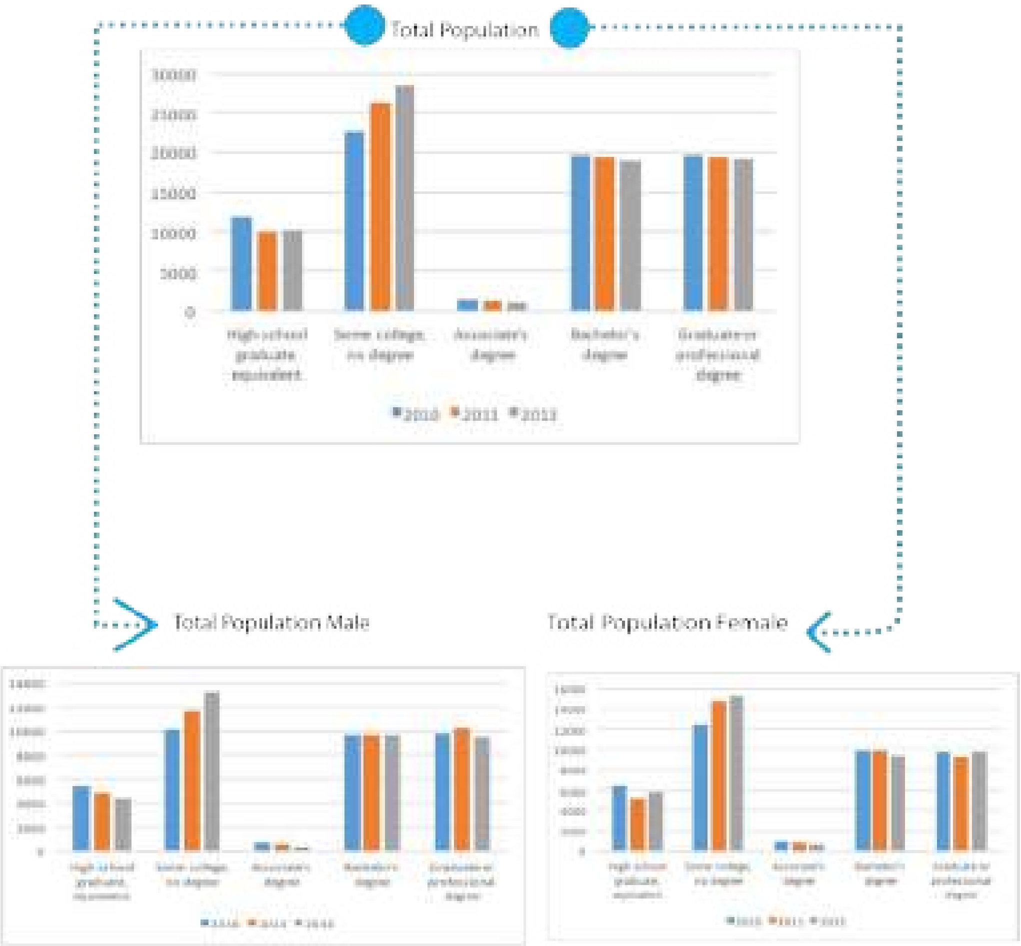


Educational Attainment by Sex and Degree

Tab. 2 Educational Attainment By Sex And Degree

	2010	2011	2013	2010	2011	2013
total population	**77668**	**78529**	**80714**	**100%**	**100%**	**100%**
High school graduate, equivalent	11835	10060	10264	15%	13%	13%
Some college, no degree	22644	26430	28495	29%	34%	35%
Associate's degree	1554	1343	1104	2%	2%	1%
Bachelor's degree	19614	19498	19061	25%	25%	24%
Graduate or professional degree	19567	19509	19178	25%	25%	24%
Total population Male	37278	37812	38841	100%	100%	100%
High school graduate, equivalent	5419	4837	4410	15%	13%	11%
Some college, no degree	10140	11671	13288	27%	31%	34%
Associate's degree	691	559	380	2%	1%	1%
Bachelor's degree	9712	9677	9710	26%	26%	25%
Graduate or professional degree	9798	10282	9486	26%	27%	24%
Total Population Female	40390	40717	41873	100%	100%	100%
High school graduate, equivalent	6416	5223	5854	17%	14%	15%
Some college, no degree	12504	14759	15207	34%	39%	39%
Associate's degree	863	784	724	2%	2%	2%
Bachelor's degree	9902	9821	9351	27%	26%	24%
Graduate or professional degree	9769	9227	9692	26%	24%	25%

Fig 1 Educational Attainment sex and Race



Comments: From graph's analysis is evident as the 35% of people have completed a Some college or Degree, the 25% have finished a Bachelors's degree and an other 25% have concluded a Graduate or Professional Program. The cause is strictly linked at the high number of Education Institute, research organisation and public schools in the area. Overall, unemployment rates decrease as educational attainment increases. It is highest for those who did not graduate from high school and lowest for those with a Bachelor's degree or above.

Labor Market

Tab. 3 Employed and Unemployed by sex and Race

Employed						
Age and Sex	2010	2011	2013	2010	2011	2013
[illegible]	18311	17838	18746	45%	[illegible]	33%
Male	30083	30680	30608	54%	63%	31%
Female	31928	31308	33873	51%	64%	37%
By Race						
White	31631	30003	33866	77%	76%	31%
Black or African American	3691	3566	3566	7%	7%	3%
American Indian	57	46	65	0%	0%	0%
Asian + Native Hawaiian	5489	6306	6607	15%	16%	7%
Two or More	1700	1048	1483	4%	3%	1%
Some Others	955	961	867	3%	2%	1%
				0%	0%	0%
Total	40513	39781	44952	100%	100%	100%
Unemployed						
Age and Sex	2010	2011	2013	2010	2011	2013
[illegible]	908	986	1349	24%	29%	38%
Male	1717	1757	1964	52%	50%	53%
Female	1548	1713	1797	48%	50%	47%
	3265	3462	3411			
White	2276	2463	2427	81%	71%	84%
Black or African American	462	490	412	14%	13%	11%
American Indian	11	17	4	0%	0%	0%
Asian and Native Hawaiian and other pacific islander	508	316	608	13%	9%	12%
Two or More Races	61	148	67	2%	3%	2%
Some Others	56	129	87	2%	4%	2%

Fig. 1 Employment By Sex and Race.

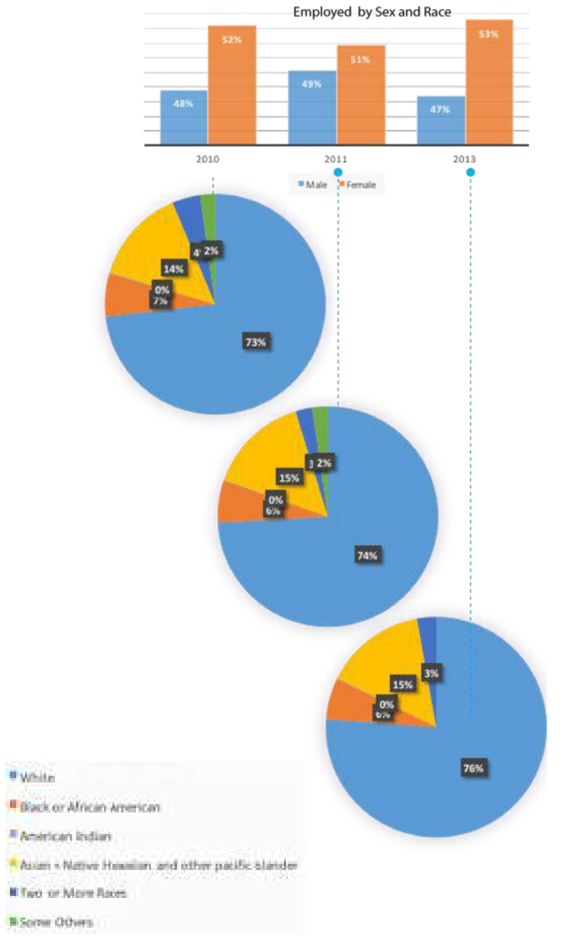
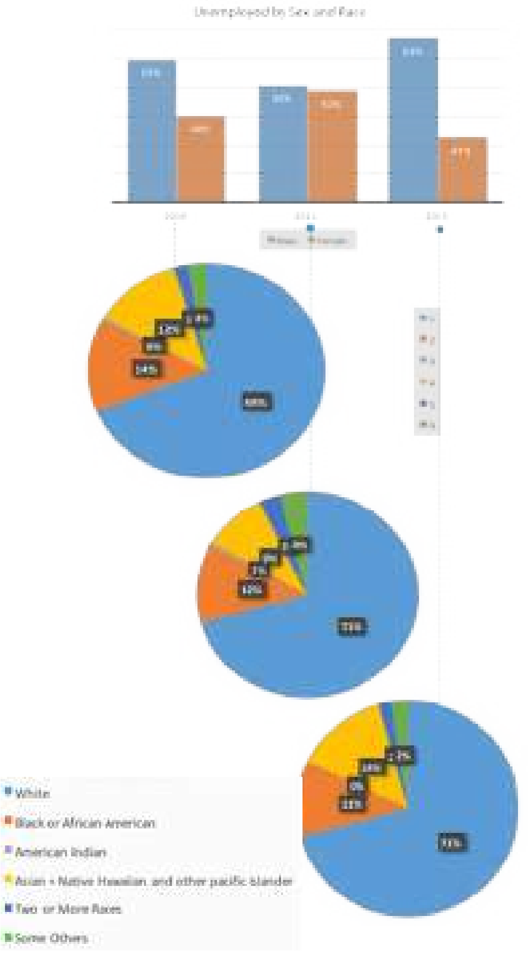
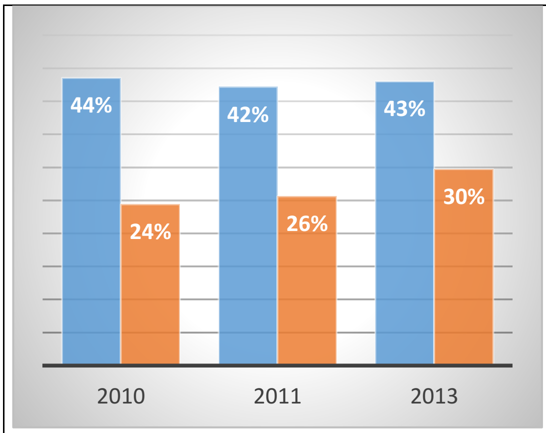


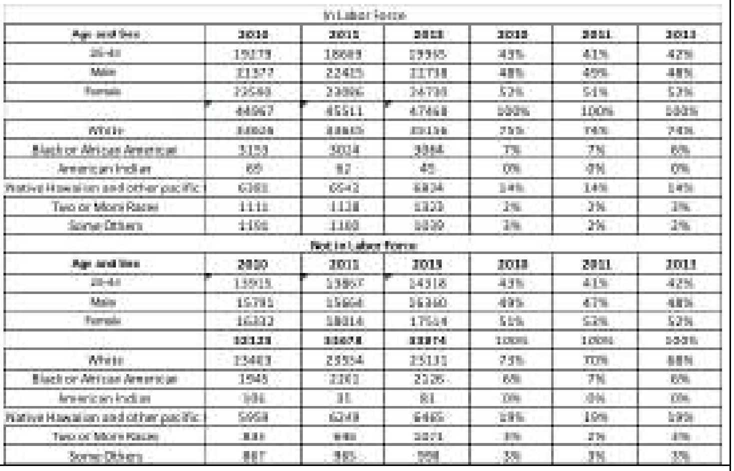
Fig. 2 UnEmployment By Sex and Race.



Comments: In 2013 Education provided 43,527 employees in Boston and 16,420 in Cambridge, it mean that the 27% of Cambridge and the 13% of Boston workforce is employed in education.The Employment and Unemployment in the area is a very dynamics process. The presence of several colleges and universities, between Boston and Cambridge, creates the conditions of generate positive externalities for the local economy. The MIT, Harward and Northeastern and other scientific organisation have accelerate new economic process. Infact, the Graph (employment by sex and race) shows the high percentage of employed femals with respect to the male unemployed.



Tab.4 In Labor force and Not in Labor force



In Labor force

Age and Sex	2010	2011	2013	2010	2011	2013
25-44	19279	18689	19995	43%	41%	42%
Male	21377	22415	22738	48%	49%	48%
Female	23590	23096	24730	52%	51%	52%
	44967	45511	47468	100%	100%	100%
White	33026	33635	35156	75%	74%	74%
Black or African American	3153	3024	3084	7%	7%	6%
American Indian	65	82	45	0%	0%	0%
Native Hawaiian and other pacific	6381	6542	6834	14%	14%	14%
Two or More Races	1111	1128	1323	2%	2%	3%
Some Others	1151	1160	1039	3%	2%	2%

Not in Labor force

Age and Sex	2010	2011	2013	2010	2011	2013
25-44	13915	13867	14318	43%	41%	42%
Male	15791	15664	16340	49%	47%	48%
Female	16332	18014	17534	51%	53%	52%
	32123	33678	33874	100%	100%	100%
White	23403	23554	23131	73%	70%	68%
Black or African American	1945	2201	2126	6%	7%	6%
American Indian	106	31	81	0%	0%	0%
Native Hawaiian and other pacific	5958	6249	6465	19%	19%	19%
Two or More Races	831	640	1071	3%	2%	3%
Some Others	887	985	998	3%	3%	3%

Comments: Among cities other than Boston where Boston residents work, Cambridge employees the most, with 5.5% of the Boston resident in labor force. Infact the graph show the high percentage of category 25-44 in employment and the 26% category 25-44 in unemployed.

Fig. 1 In labor force By Age and Sex

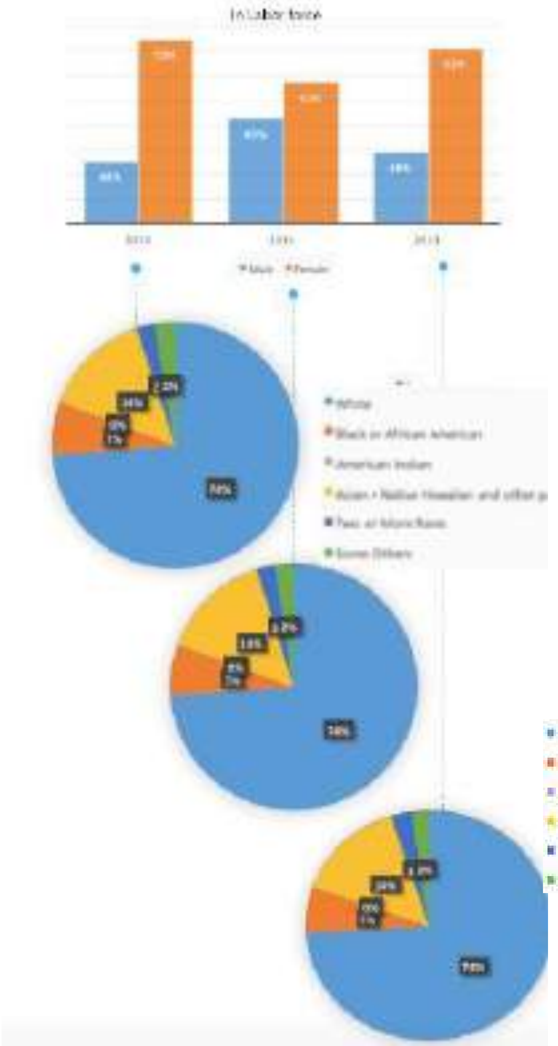
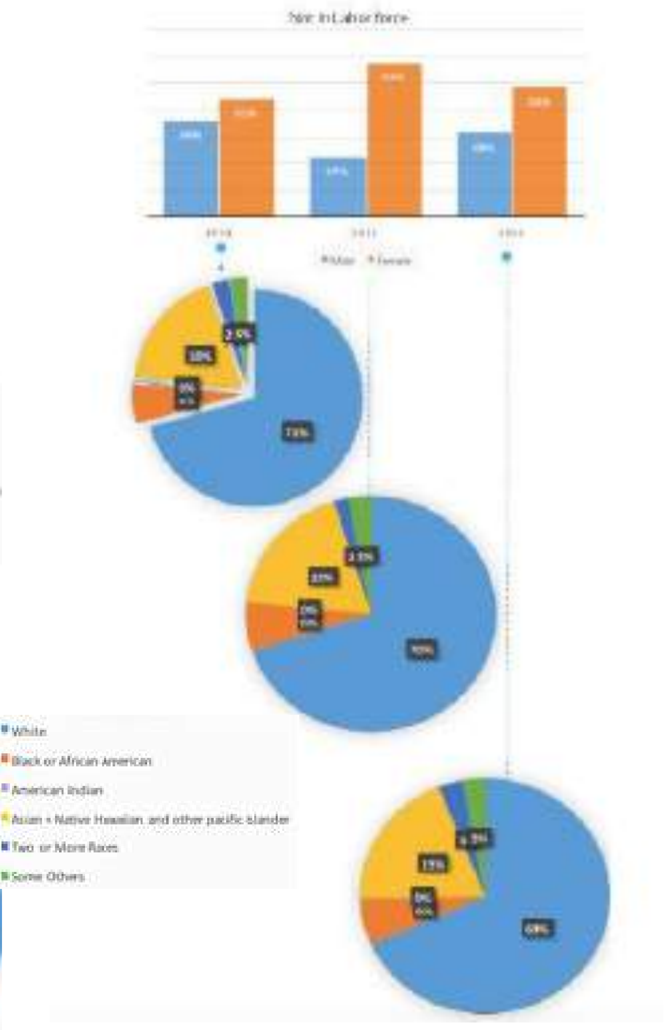
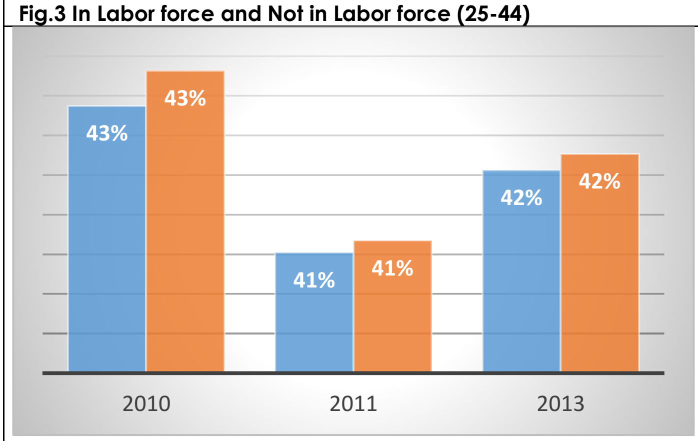


Fig. 2 Not in Labor force by Sex and Race



Comments: Target area's core industries are reflected in the city's largest private employers, which are all in the education, health care, and finance industries. From Graph's emerge as the female category have living particular difficulty in the work force process. Since 2010 the level of female in labor force is growing but decrease the percentage of male in Labor force.

Fig.3 In Labor force and Not in Labor force (25-44)

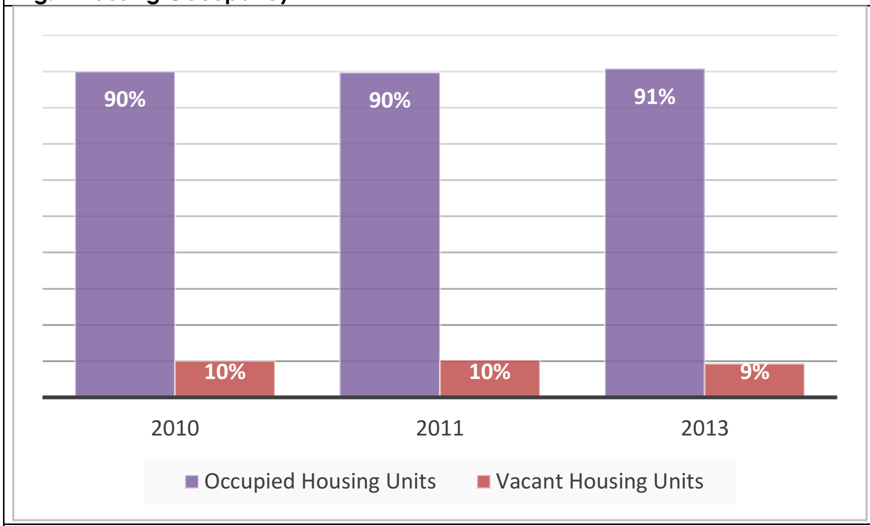


Comments. The knowledge and service sectors of the economy accounted for almost all job growth in Boston. Comparating In labor force and not in labor force 25-44 emerges the high percentage of young without jobs, but in 2013 this percentage decrease, the cause can be the role of private and public istitution in investing for knowledge activities and services sectors.

Housing Stock

Housing Occupancy						
	2010	2011	2013	2010	2011	2013
Total housing units	34725	33822	32681			
Occupied Housing Units	31238	30336	29659	90%	90%	91%
Vacant Housing Units	3487	3486	3022	10%	10%	9%
Occupied Housing Tenure						
Owner-occupied housing units	7615	7341	6914	22%	22%	21%
Renter-occupied housing units	23623	22995	22746	68%	68%	70%
Vacant housing unit						
For rent	1455	1381	1006	4%	4%	3%
Rented or sold, not occupied	795	672	662	2%	2%	2%
For sale only	179	186	122	1%	1%	0%
seasonal, recreational or occasiona	559	604	594	2%	2%	2%
all other vacants	499	543	634	1%	2%	2%

Fig. 1 Housing Occupancy



Comments: Housing unit growth between 2000 and 2010 was the strongest decade since before 1950: Boston added 20,546 new units of housing, for a decade-long growth rate of 8.2%.
In 2013, in the target area the housing unit are 32681. Since 2010 to 2013 the housing unit in the target area preserve a costant growth. The graph analysys shows the high percentage of Occupied Housing unit the 91% iand the vacant housing unit about the10%.

Fig. 2 Occupied Housing Tenure

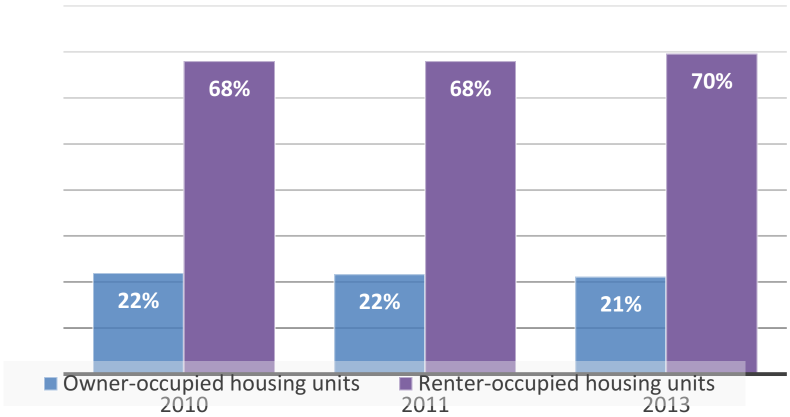
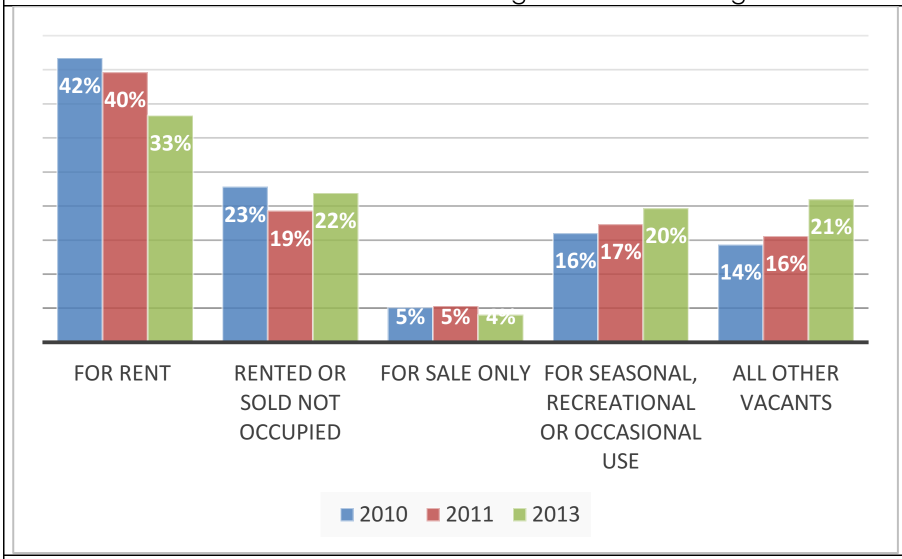


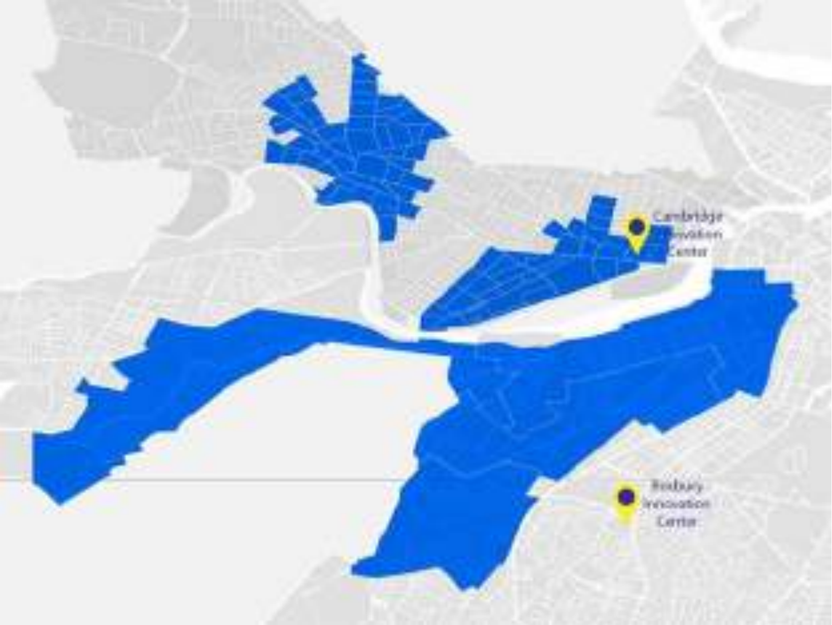
Fig. 3 Vacant Housing Unit



Comments: Creating and maintaining a diversified housing stock that is accessible, affordable, and energy-efficient are important priorities for the Cities of Boston and Cambridge.
The graph higlight the high percentage of housing unit for rented, a 23% for seasonal recreational but emerge an high number in 2011 all other vacants. Is evident that the apartment for rent in the target area are for students, visitors researchers and professional people.

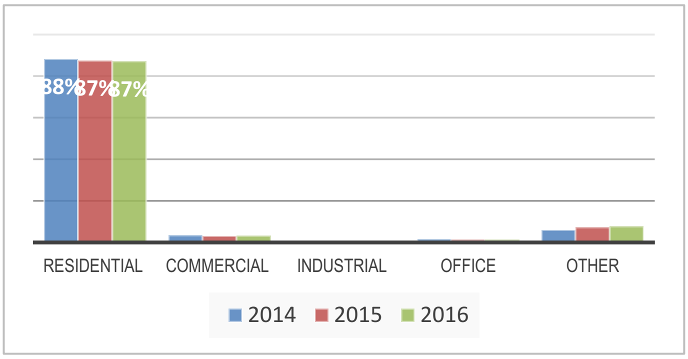
PART 3 Real Estate

Target Area Parcell Block

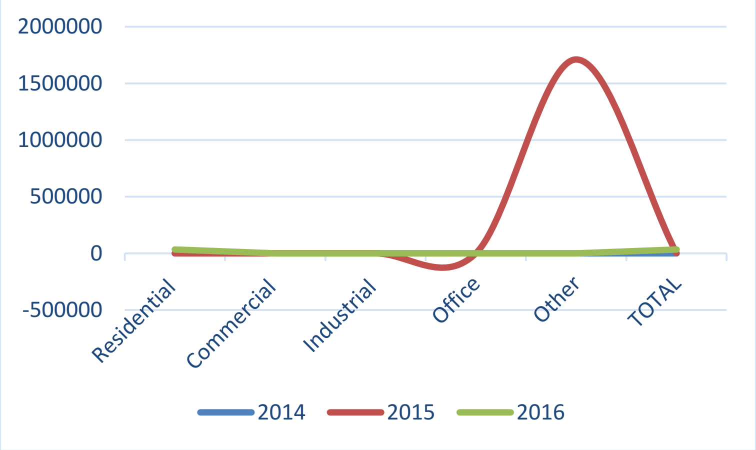


Property Type

Fig. 1 Property value per category



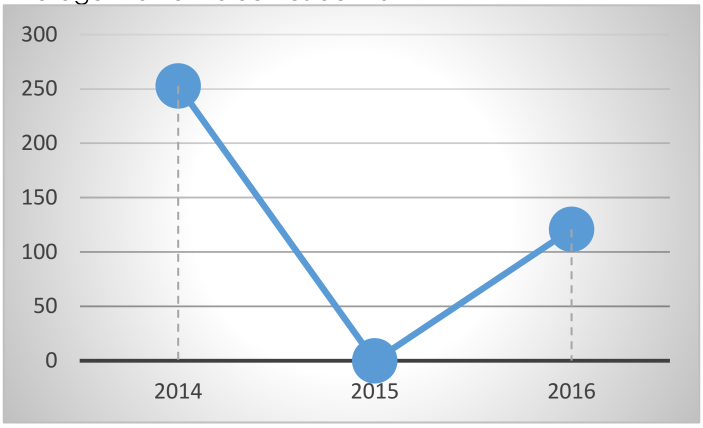
Average-Total Assessed Value per Parcel Block/ward



Comments: The housing market in Boston and Cambridge is very strong(source: Boston Redevelopment authorities). In Boston and Cambridge the assessed value of residential properties in has grown faster than that of commercial properties since 2001. The total assessed value of residential properties was higher than the total assessed value of commercial properties in 2016. Infact the graph highlight the property value per category and in particular shows the total assessed value of Other was higher than the total assessed value of all prosperities. In 2015 the average market value for residential decrease the cause can be the inflaction. Adjusted for inflation, assessed values of both residential and commercial properties have increased and now exceed their pre-recession highs.

Average-Market Value per Parcel Block/ward

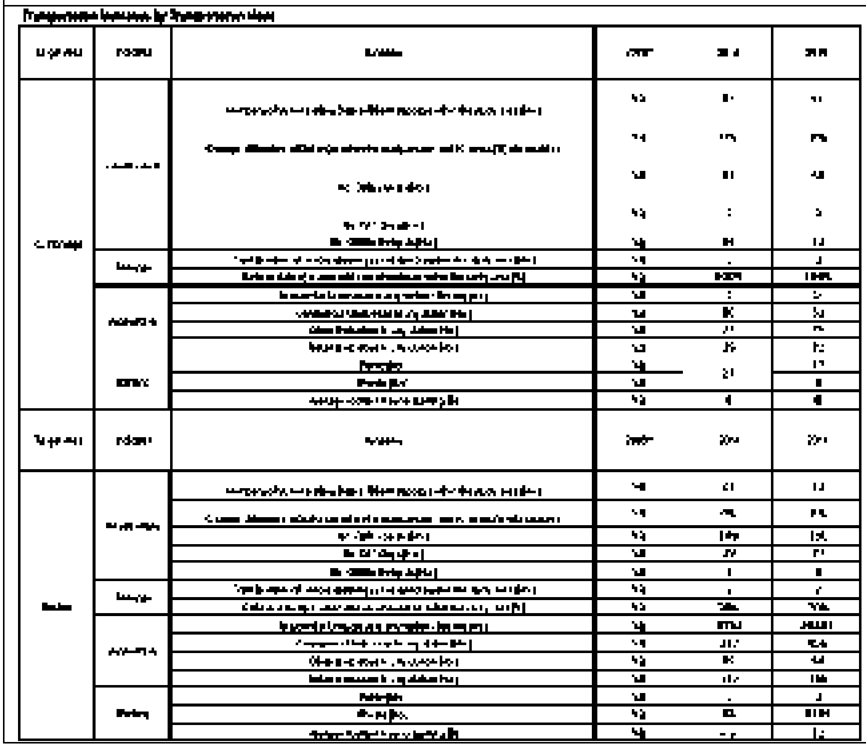
Average market value Residential



PART 4: Services

Trasportation and Infrastructure

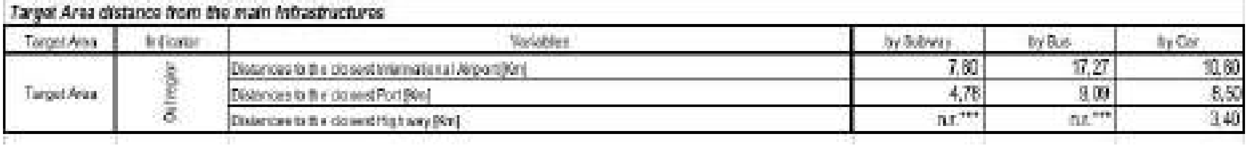
Transportation Indicators by Transportation Mode



	Centroid coordinates
Latitude	42,351134
Longitude	-71,109528

4.1 Target area map with centroid spatial identification

Target area distance from the main infrastructure

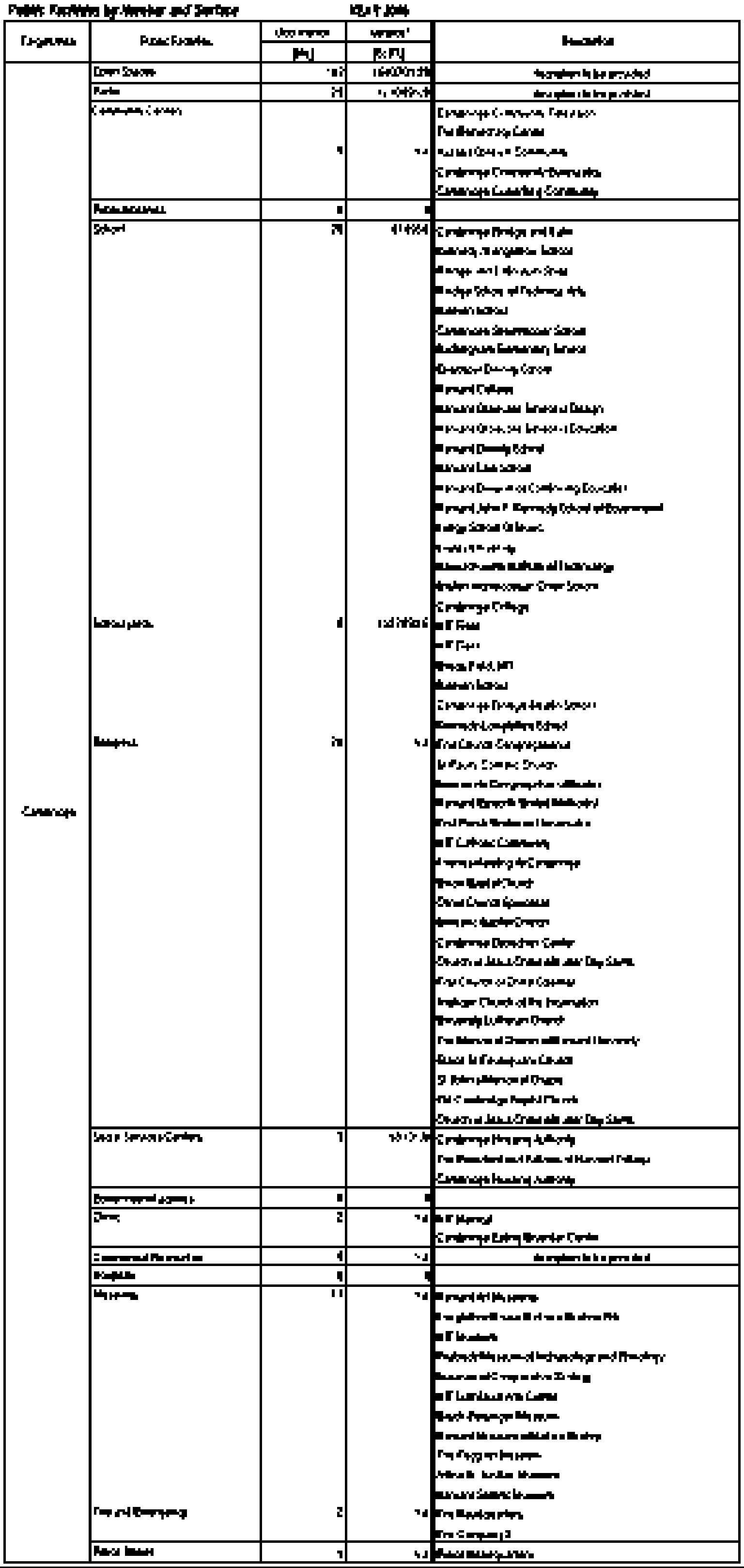


Target Area distance from the main Infrastructures

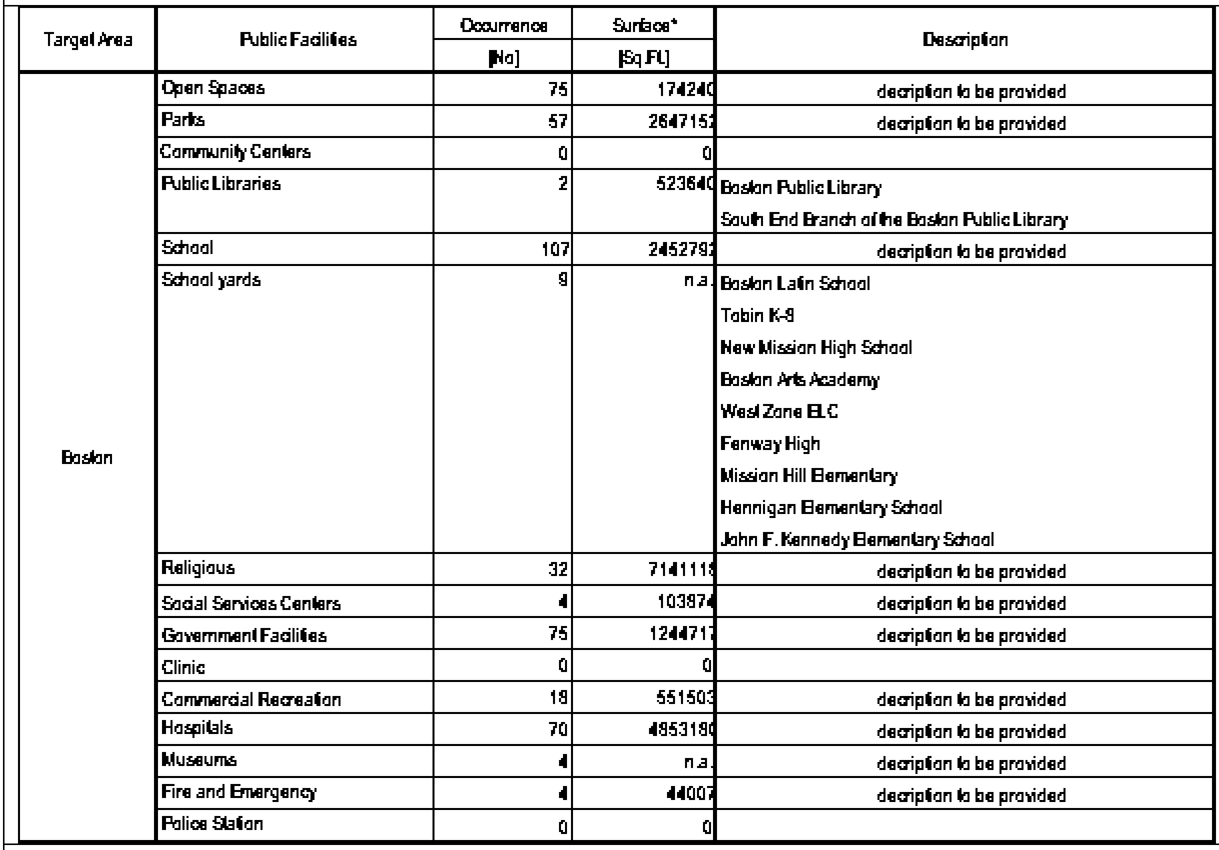
Target Area	Indicator	Variables	by Subway	by Bus	by Car
Target Area	On region	Distances to the closest International Airport [Km]	7,80	17,27	10,80
		Distances to the closest Port [Km]	4,78	9,09	5,50
		Distances to the closest Highway [Km]	n.r.***	n.r.***	3,40

Public Facilities by number and surface

Cambridge

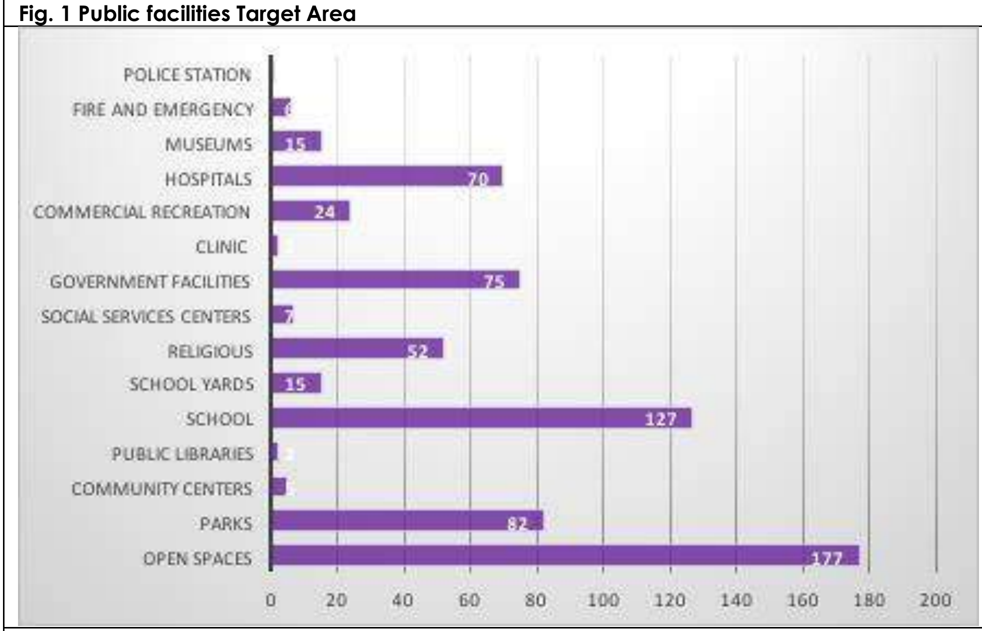


Boston



Target Area	Public Facilities	Occurrence [No]	Surface* [Sq Ft.]	Description
Boston	Open Spaces	75	174240	decription to be provided
	Parks	57	2647152	decription to be provided
	Community Centers	0	0	
	Public Libraries	2	523640	Boston Public Library South End Branch of the Boston Public Library
	School	107	2452792	decription to be provided
	School yards	9	n.a.	Boston Latin School Tobin K-8 New Mission High School Boston Arts Academy West Zone ELC Fenway High Mission Hill Elementary Hennigan Elementary School John F. Kennedy Elementary School
	Religious	32	7141118	decription to be provided
	Social Services Centers	4	103874	decription to be provided
	Government Facilities	75	1244717	decription to be provided
	Clinic	0	0	
	Commercial Recreation	18	551503	decription to be provided
	Hospitals	70	4953180	decription to be provided
	Museums	4	n.a.	decription to be provided
	Fire and Emergency	4	44007	decription to be provided
	Police Station	0	0	

Fig. 1 Public facilities Target Area



Comments: The Analysis highlight the high number of Schools, Governament facilities and open spaces in the area. According to Porter's definition; "Educational cluster is a group of geographically neighboring interconnected companies and organizations connected to them, working in a certain area and characterized by common activities and mutual reinforcement" (Porter 2008)[4]. It's strength consist in the opportunities that it create in the region, in terms of job creation and investment's attraction.

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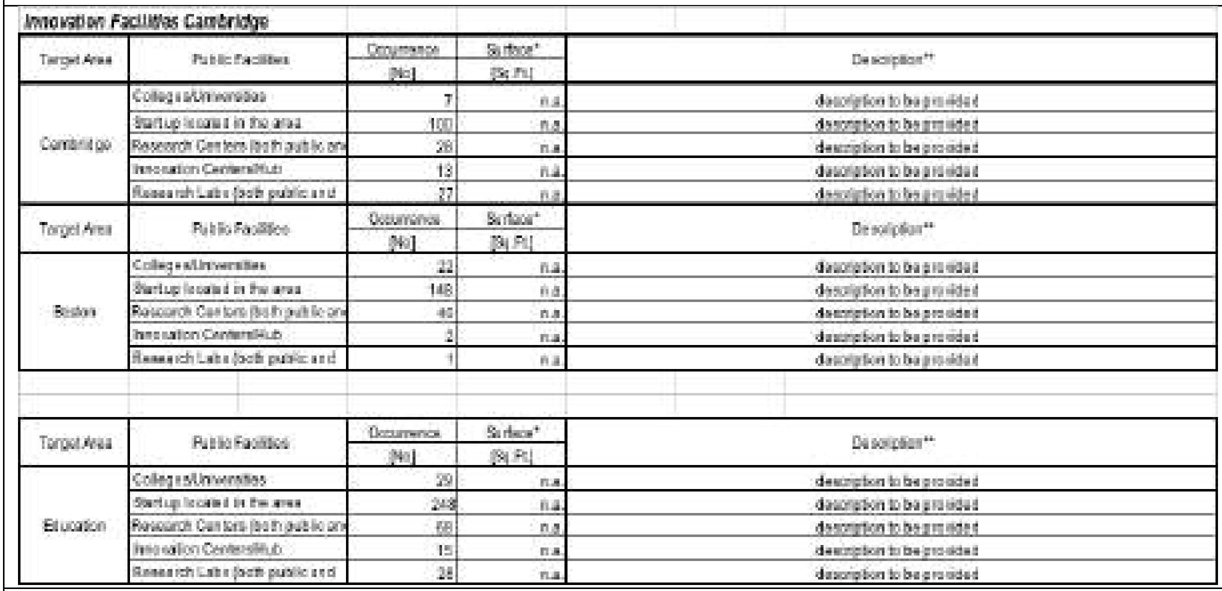
[4] Porter, M. (2008). Clusters and Competition: New Agendas for Companies, Government, and Institutions. Boston: Harvard Business School Press.

Innovation facilities



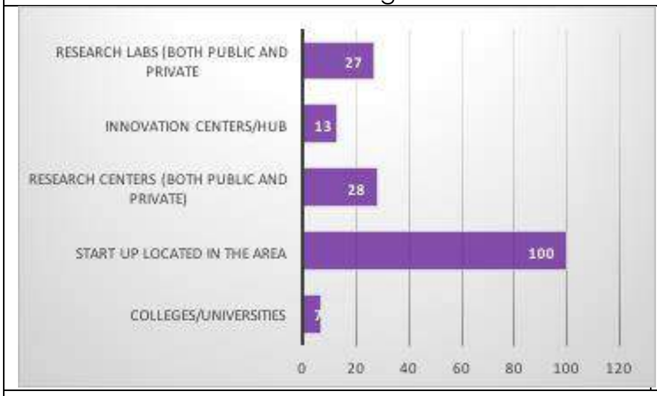
Innovation Facilities Cambridge

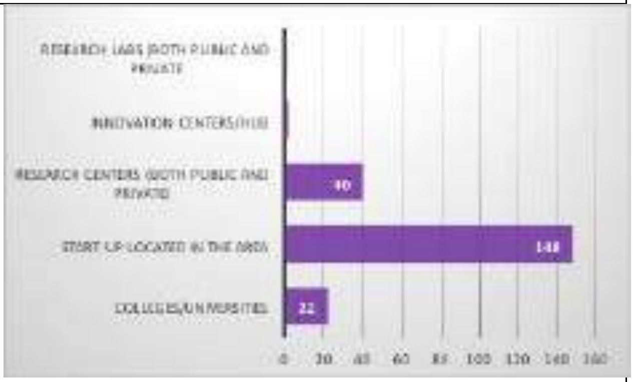
Target Area	Public Facilities	Occurrence [No]	Surface* [Sq Ft]	Description**
Cambridge	Colleges/Universities	7	n.a.	description to be provided
	Start up located in the area	100	n.a.	description to be provided
	Research Centers (both public an	28	n.a.	description to be provided
	Innovation Centers/Hub	13	n.a.	description to be provided
	Research Labs (both public and	27	n.a.	description to be provided

Target Area	Public Facilities	Occurrence [No]	Surface* [Sq Ft]	Description**
Boston	Colleges/Universities	22	n.a.	description to be provided
	Start up located in the area	148	n.a.	description to be provided
	Research Centers (both public an	40	n.a.	description to be provided
	Innovation Centers/Hub	2	n.a.	description to be provided
	Research Labs (both public and	1	n.a.	description to be provided

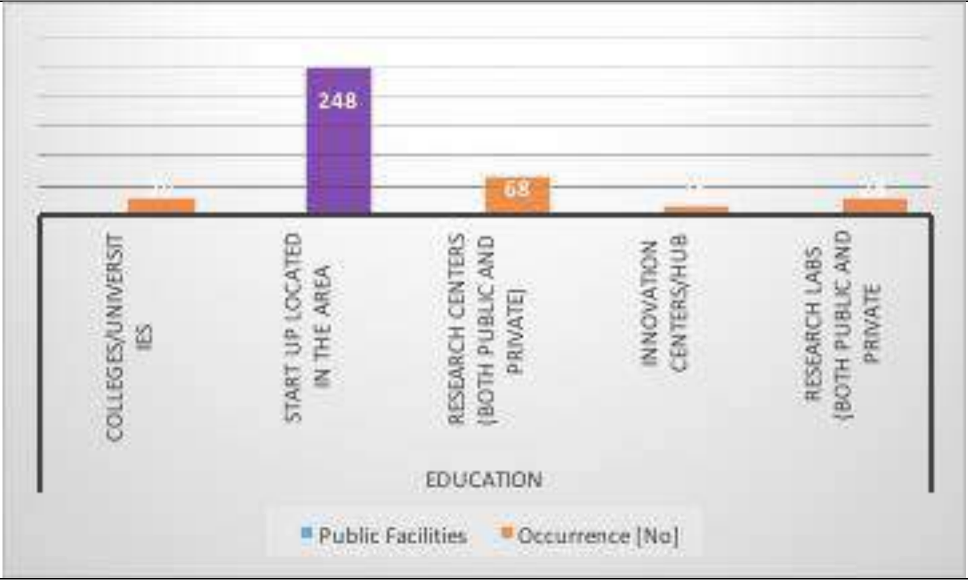
Target Area	Public Facilities	Occurrence [No]	Surface* [Sq Ft]	Description**
Education	Colleges/Universities	29	n.a.	description to be provided
	Start up located in the area	248	n.a.	description to be provided
	Research Centers (both public an	68	n.a.	description to be provided
	Innovation Centers/Hub	15	n.a.	description to be provided
	Research Labs (both public and	28	n.a.	description to be provided

Cambridge	Boston





Target Area



Comments:. The Graph shows the high number of innovation facilities 248 Start Up,68 Research Centers, 13 Innovation Hub located in the target area. The contribute of Educational istitute is evident, in particular emerges a cluster policy initiative the Greentown Labs. Green Town labs have access to on-site resources that include weekly office hours and seminars. Trainings from sponsors and partners on specific tools and resources; On-site public educational events.

Grentown Labs dedicates to the networking activities, it's one of the main activities of this Incubator, because it provide the links between start-ups and a strong net of partners and from this depends the success of Greentown Labs.
Greentown Labs to incubate starts-up and to develop training programs, need of several resources.
The cooperation among Greentown Labs, City of Somerville and some departments of Massachussests Government, provide the finding of the resources.
Greentown Labs is an advanced experience in clean tech energy and this aspect is important for the urban area in which it works, becouse this aspect provides to encrease the rank of Somerville, in those cities who invest in innovation. The same happen with Massachussests that is one of first states who invest in sustaiability, green energy and renewable resources; all these factors attract both private investments and public resources (federal funds).

In particular the City of Somerville facilitated Greentown Labs in part through a working capital loan that utilizes Community Development Block Grant Funds, part of a new initiative by the City to support innovative business activities and new employment opportunities. The loan contains requirements for new job creation and that not less than 51 percent of new job hires go to those who meet moderate- and low-income standards. Greentown Labs also agrees to use it best efforts to hire Somerville residents in all available job opportunities.

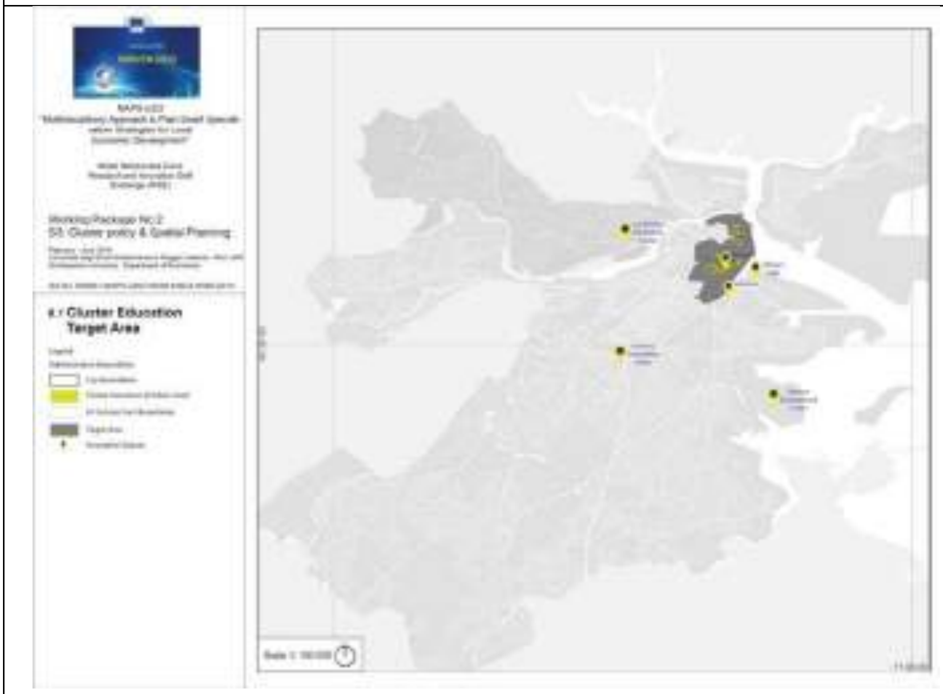
Cluster Case Study: Target Area Insurance

Carla Maione with Israa Hanafi Mahmoud

PART 1: Urban Regeneration

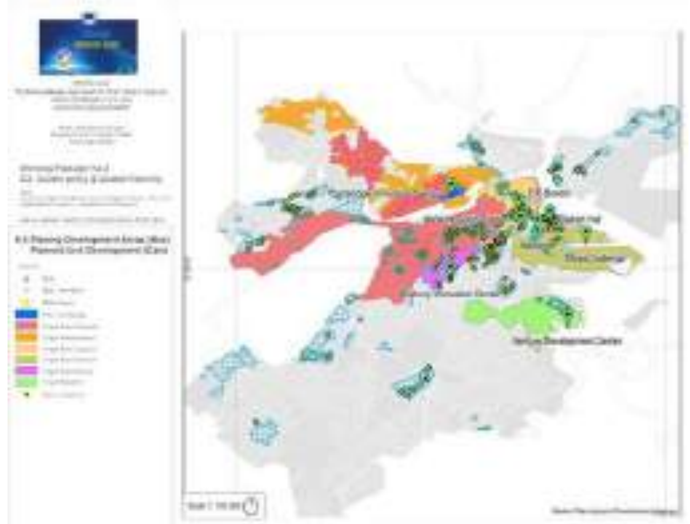
Target Area identification

Cluster Localisation



Cluster(s)	Insurance
City(ies)	Boston North-Eastern Boston
Policy Initiatives	We work, Venture Development Center (VDC)

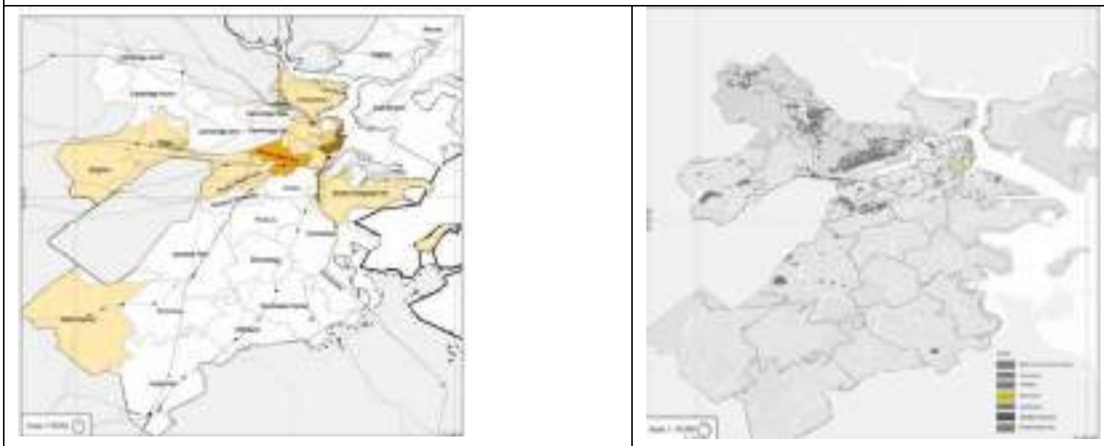
Planning initiative corrispondence

1.Downtown Crossing Economic Improvement Initiative, 2004-2011, Downtown Crossing.				
Census Tract	Boston	25025030300 25025030500 25025070101	Source:	For socio-demographic indicators, data have been collected by Census Tract (source: census.gov)

Target Area Description

The target Area is localised in the North – Eastern zone of the city of Boston, specifically in Zip codes 02109 and 02110. The target area is concentrated in the insurance cluster. The target area is known for both its offices and its retail. Actually the Business Improvement District has brought block parties, markets, and other events to historic Washington and Summer Street areas. Numerous hotels serve both tourists and business travelers. Historic theaters, including the Opera House, Modern, and Paramount, host a variety of productions along the southern end of Washington Street. Suffolk University, Emerson College, and Urban College are also major tenants of Downtown.

Fig.1: Spatial Concentration of Insurance Cluster over Boston and Cambridge (MA) – NAICS and Land Use association at the urban level per zip code- 2013.

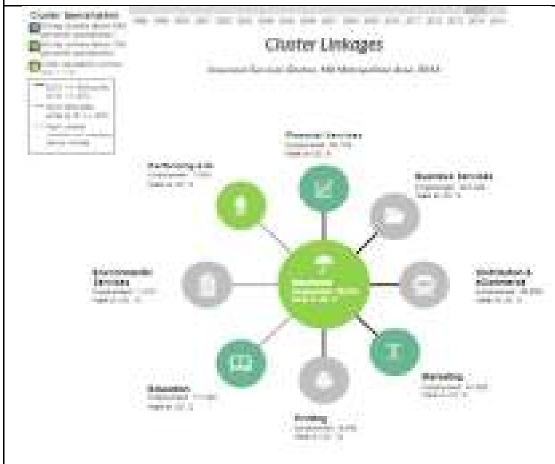


Cluster structure

Fig. 2 Insurance Cluster (Subcluster Occurrence per zipcode)

The cluster is mainly concentrated in the financial District of Boston MSA (zip codes 02109 – 02110), this might be due to the kind of related services that establishments provide. According to NAICS subdivisions the number of establishments of insurance carriers raised up for the year 2013 in respect to the start year of 2008 in both zip codes, this might be explained due to: the connection to the financial district zone, the proximity to the public transportation development in South station area (along the red line) – as shown in the Figure 1- and multiple regeneration projects occurrence.

Related Cluster



Comments:

According to Porter in the clustermapping website,the Insurence cluster is strongly connected to other clusters as a 'Support Cluster' such as:

1) Financial;
2) Business;
3) Marketing;
4) Educational Clusters.

The insurance cluster offers a variety of insurance related services, like health, financial, life, property and medical care insurances

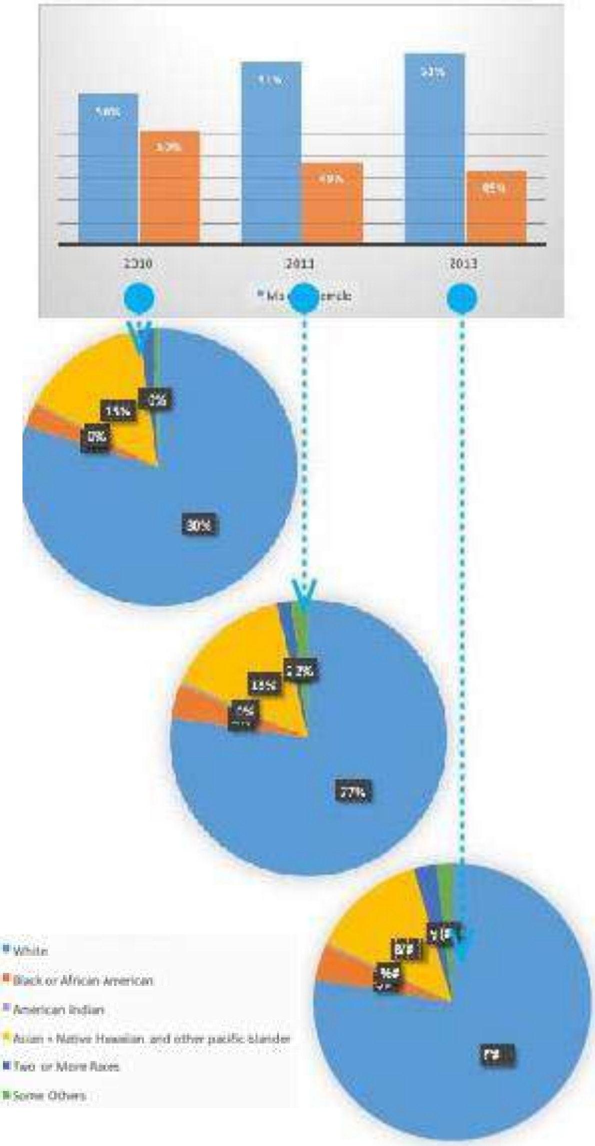
PART 2 Sociodemographic Analysis

Population By Sex and Race

Tab.1 Population By Sex and Race

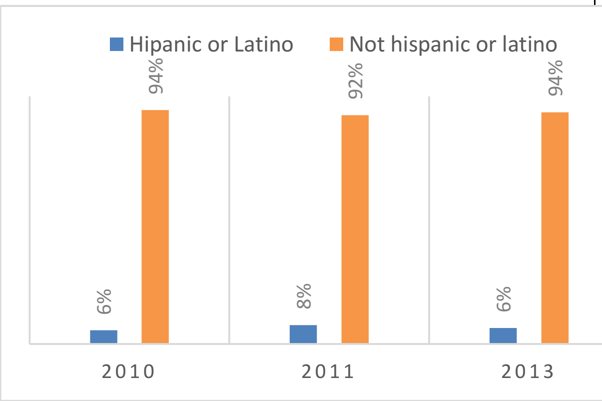
Population by Sex and Race						
	2010	2011	2013	2010	2011	2013
Population by Sex						
Total	11687	12549	13653			
Male	5891	6415	7007	50%	51%	51%
Female	5796	6134	6646	50%	49%	49%
Population by Race						
White	9329	9709	10601	80%	77%	78%
Black or African American	319	483	549	3%	4%	4%
American Indian	33	62	57	0%	0%	0%
Asian + Native Hawaiian and	1741	1833	1838	15%	15%	13%
Two or More Races	201	212	357	2%	2%	3%
Some Others	64	250	251	1%	2%	2%
Hipanic or Latino	648	959	876	6%	8%	6%
Not hispanic or latino	11039	11590	12777	94%	92%	94%

Fig. 1 Population By Sex and Race



Comments:
The target area Insurance is localised in downtown area, intersect Governament center and Chinatown.
Since the 1700s the Downtown has served as Boston's hub. The population is composed by 13653 people, 7007 male and 6646 female. The population have an high percentage of Caucasian people.
Since 2010 to 2013 the population decrease the cause can be the presence of financial district. Today the area is known for both its offices and its retail and in particular for the Financial District services.

Fig.2 Hispanic or Not Hispanic

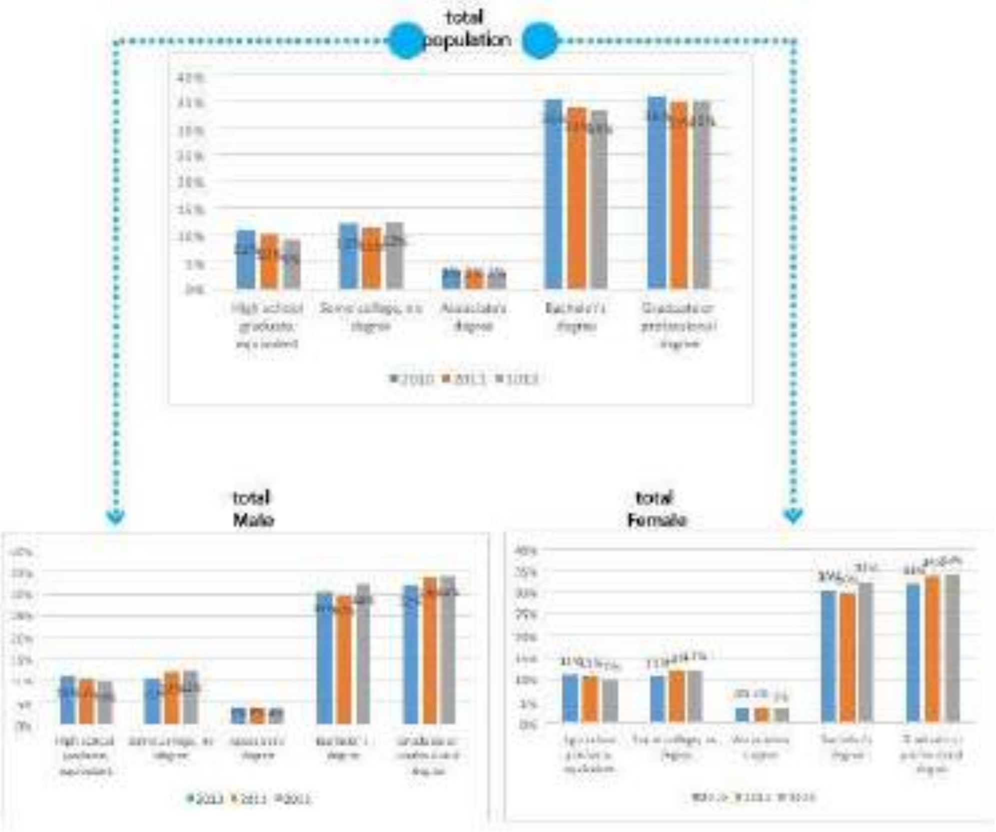


Educational Attainment by Sex and Degree

Tab. 2 Educational Attainment By Sex And Degree

	2010	2011	2013	2010	2011	2013
Total population	[illegible]	31739	[illegible]	1%	1%	1%
High school graduate or equivalent	[illegible]	[illegible]	[illegible]	6%	9%	9%
Some college, no degree	[illegible]	1732	1671	12%	13%	13%
Associate's degree	184	234	318	3%	3%	3%
Bachelor's degree	3740	[illegible]	4167	[illegible]	[illegible]	[illegible]
Graduate or professional degree	3636	2712	[illegible]	[illegible]	[illegible]	[illegible]
Total population Male	[illegible]	5970	[illegible]	[illegible]	[illegible]	52%
High school graduate or equivalent	351	[illegible]	557	6%	6%	6%
Some college, no degree	593	[illegible]	1095	[illegible]	13%	[illegible]
Associate's degree	45	42	52	1%	1%	1%
Bachelor's degree	[illegible]	2130	[illegible]	33%	36%	33%
Graduate or professional degree	[illegible]	1955	2101	34%	32%	32%
Total population Female	[illegible]	[illegible]	6154	[illegible]	[illegible]	[illegible]
High school graduate or equivalent	573	558	[illegible]	13%	13%	9%
Some college, no degree	919	[illegible]	[illegible]	[illegible]	22%	[illegible]
Associate's degree	139	152	234	6%	5%	4%
Bachelor's degree	[illegible]	1776	1966	[illegible]	[illegible]	33%
Graduate or professional degree	[illegible]	1777	2156	[illegible]	[illegible]	30%

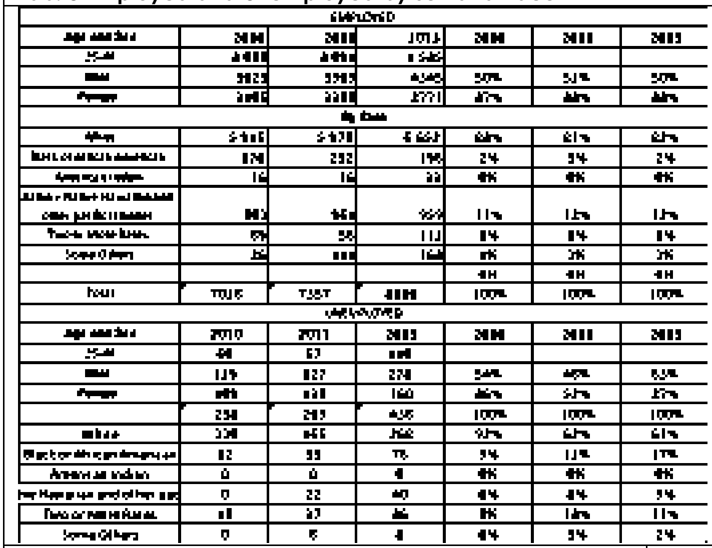
Fig 3 Educational ATTAINMENT by sex and Degree



Comments: Boston is a city with high level of educational attainment for the strong presence of educational program. From graph's analysis is evident as the 35% of people have completed a Bachelor Degree and the 35% have concluded a Graduate or Professional Program. The cause is strictly linked at the high number of Education Institute, research organisation and public schools in the area. Overall, unemployment rates decrease as educational attainment increases. It is highest for those who did not graduate from high school and lowest for those with a Bachelor's
degree or above.

Labor Market

Tab. 3 Employed and Unemployed by sex and Race



EMPLOYED						
Age and Sex	[illegible]	[illegible]	2012	[illegible]	[illegible]	[illegible]
25-64	[illegible]	[illegible]	[illegible]			
Male	[illegible]	[illegible]	[illegible]	50%	51%	50%
Female	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
By Race						
White	[illegible]	[illegible]	[illegible]	[illegible]	61%	[illegible]
Black or African American	[illegible]	232	[illegible]	2%	3%	2%
American Indian	16	16	22	0%	0%	0%
Asian + Native Hawaiian and other pacific islander	[illegible]	[illegible]	[illegible]	11%	12%	12%
Two or More Races	[illegible]	58	113	1%	1%	1%
Some Others	[illegible]	[illegible]	[illegible]	[illegible]	3%	3%
				[illegible]	[illegible]	[illegible]
Total	[illegible]	7357	[illegible]	100%	100%	100%
UNEMPLOYED						
Age and Sex	2010	2011	[illegible]	[illegible]	[illegible]	[illegible]
25-64	[illegible]	67	[illegible]			
Male	119	127	274	[illegible]	[illegible]	63%
Female	[illegible]	[illegible]	160	[illegible]	51%	37%
	238	[illegible]	435	100%	100%	100%
White	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	61%
Black or African American	12	33	75	5%	13%	17%
American Indian	0	0	4	0%	0%	0%
Asian + Native Hawaiian and other pacific islander	0	22	40	0%	[illegible]	9%
Two or More Races	[illegible]	27	[illegible]	[illegible]	[illegible]	11%
Some Others	0	5	4	0%	3%	2%

Fig. 1 Employment By Age and Sex

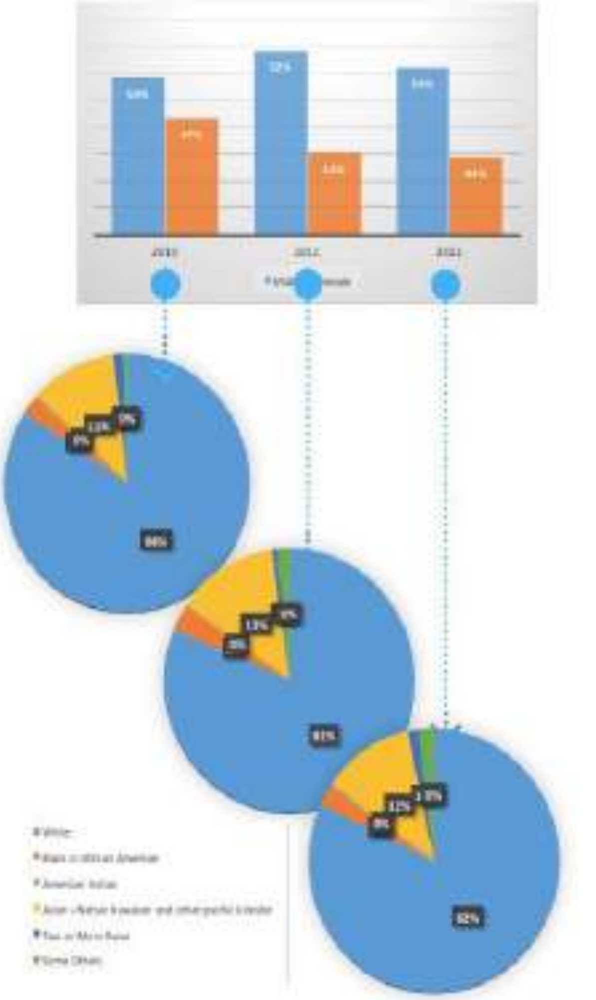


Fig. 2 Unemployment by Age and Sex

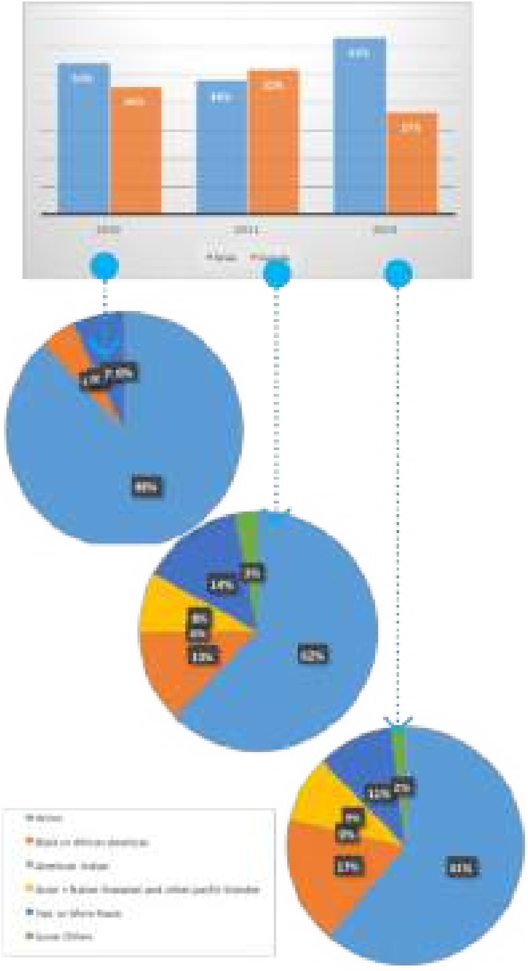
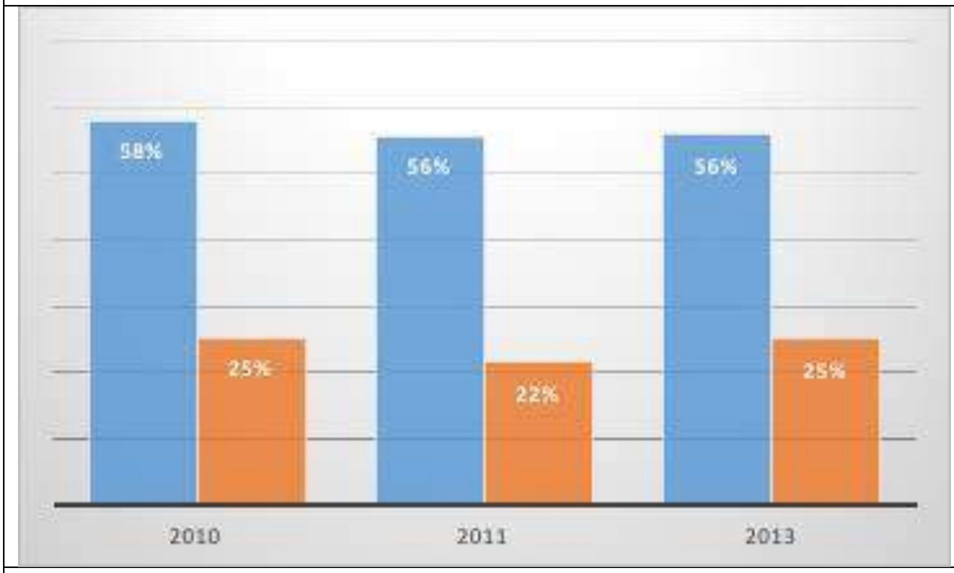


Fig. 3 Employed And Unemployed 25-44



Comments: There are 698,875 jobs in Boston: approximately 434,700 jobs (62.2%) are filled by workers who live outside the city and commute. The remaining jobs are filled by Boston residents. The proportion of Boston workers who live in Boston has remained roughly steady since 1990, at 39.4% in 1990, 35.2% in 2000, and 37.9% in 2010. Comparing graphs(employment and unemployment by sex and race) in the target area emerges that from 2011 to 2013 the level of employed for male decrease but increasing the employed for female. In the target area the high number of establishment for insurance produce job creation. Is evident the difference between employment 25-44 and unemployment since 2010-2013.

In Labor Force and Not in Labor force

Tab.4 In Labor force and Not in Labor force

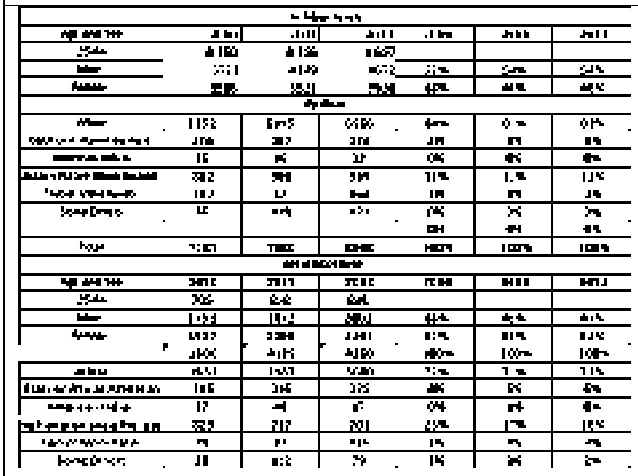


Fig. 1 In labor force By Age and Sex

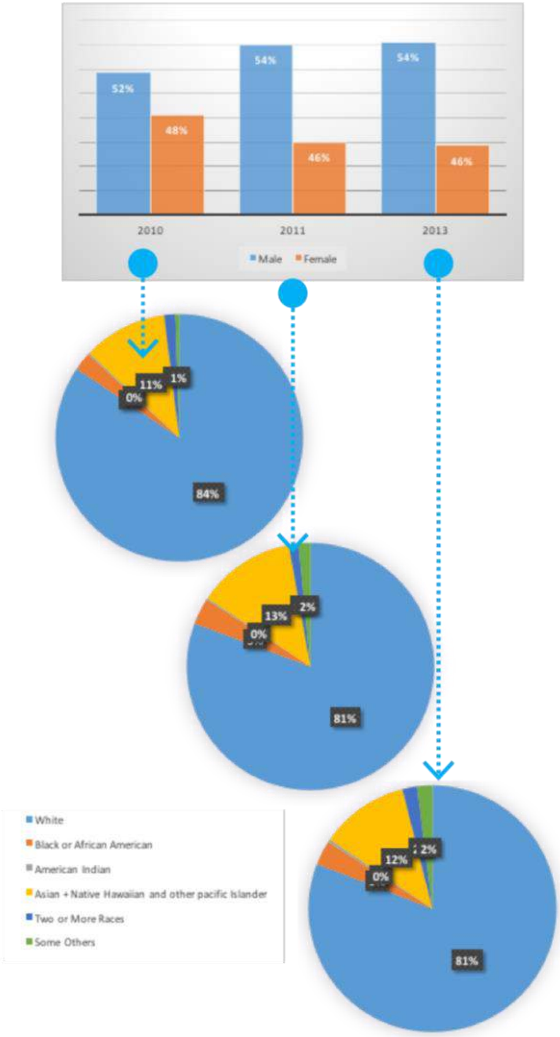


Fig. 2 Not in Labor force by Age and Sex

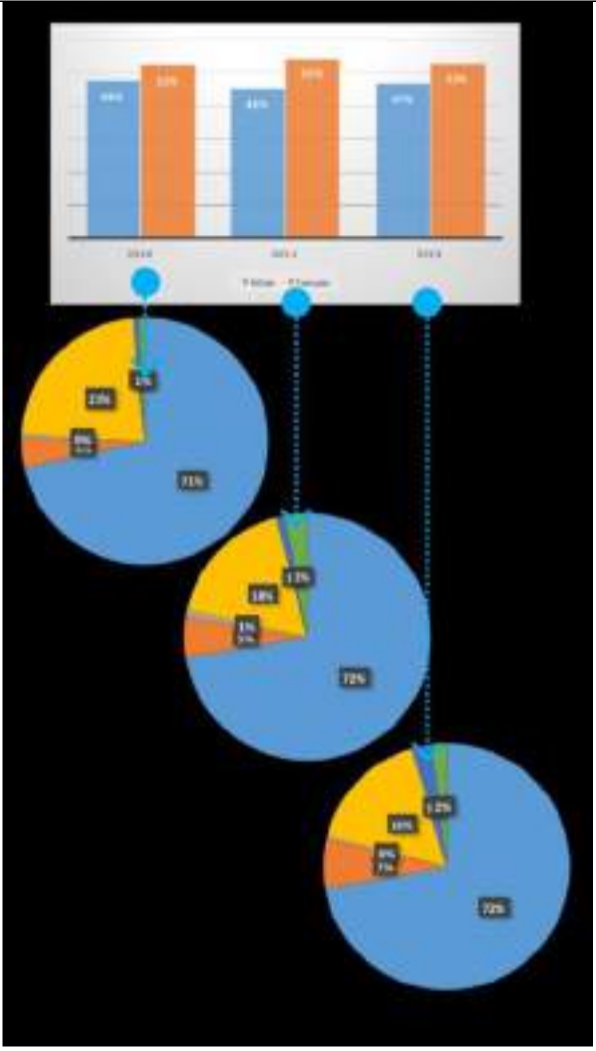
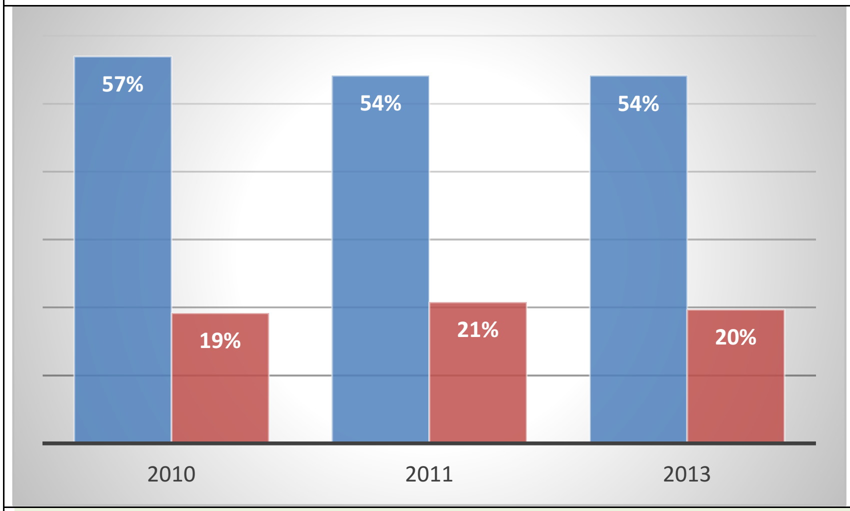


Fig. 3 In Labor Force and Not in Labor force 25-44



Comments: The knowledge and service sectors of the economy accounted for almost all job growth in Boston. In 2010 is evident a explosion in labor force 25-44 people, probably its caused by the new establishment and new busness localised in the area. More in particular in 2010 the increase in labor force 25-44 with respect to not in Labor force Is caused by the presence of Financial District.

Housing Stock

Tab. 1 Housing Stock

Housing Occupancy						
	2010	2011	2013	2010	2011	2013
Total housing units	7331	7661	8025			
Occupied Housing Units	6503	6635	7110	89%	87%	89%
Vacant Housing Units	828	1026	915	11%	13%	11%
Occupied Housing Tenure						
Owner-occupied housing units	43	28	48	1%	0%	1%
Renter-occupied housing units	46	107	82	1%	2%	1%
Vacant housing unit						
For rent	50	162	236	6%	16%	26%
Rented or sold not occupied	109	141	185	13%	14%	20%
For sale only	34	21	51	4%	2%	6%
For seasonal, recreational or occasional use	289	258	229	35%	25%	25%
all other vacants	346	444	214	42%	43%	23%

Fig. 1 Housing Occupancy

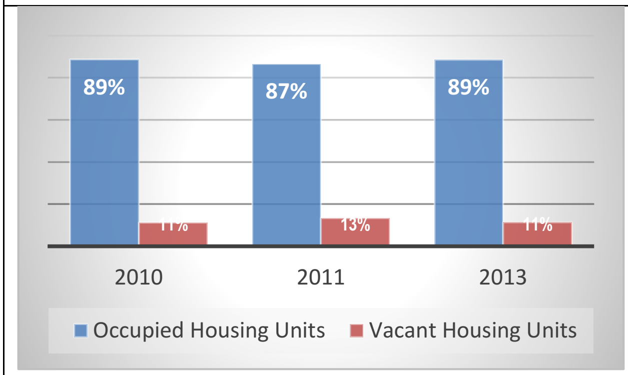


Fig. 2 Occupied Housing Tenure

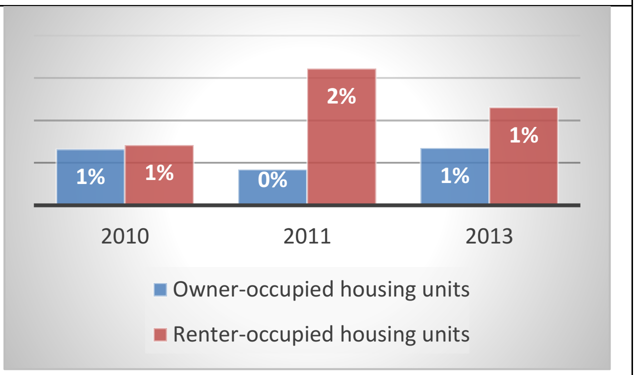
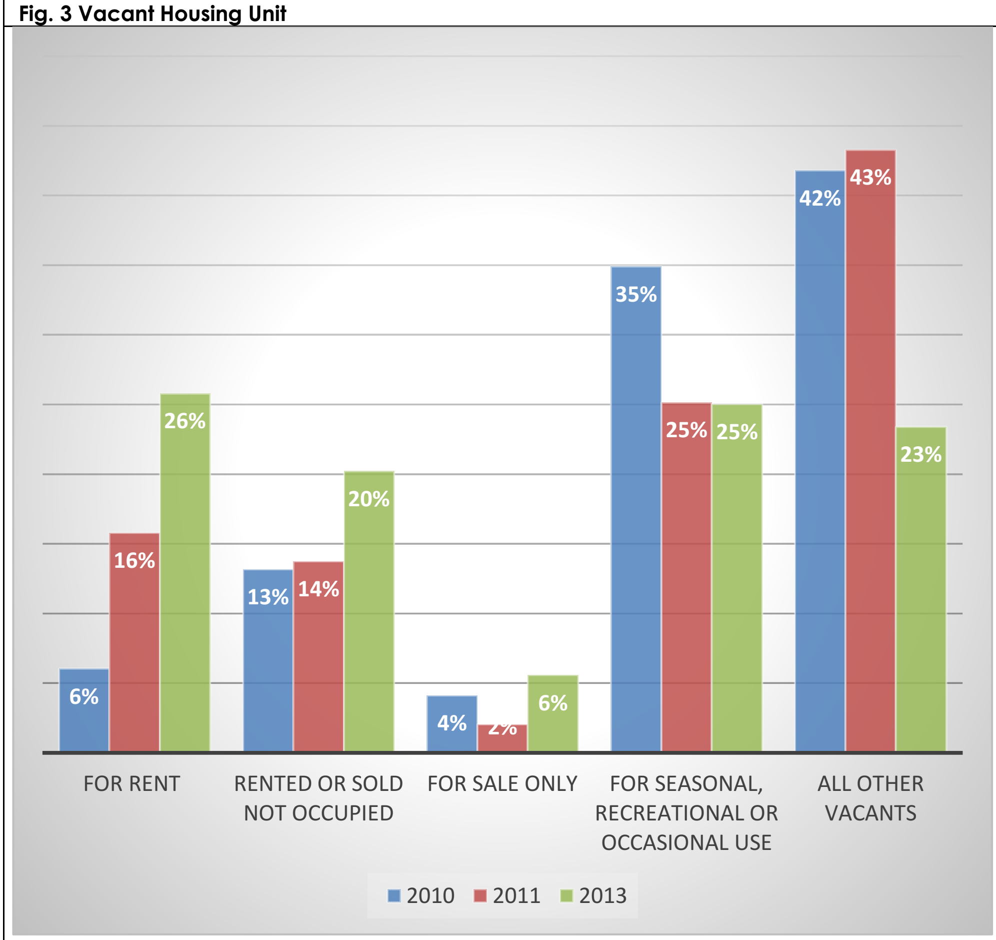


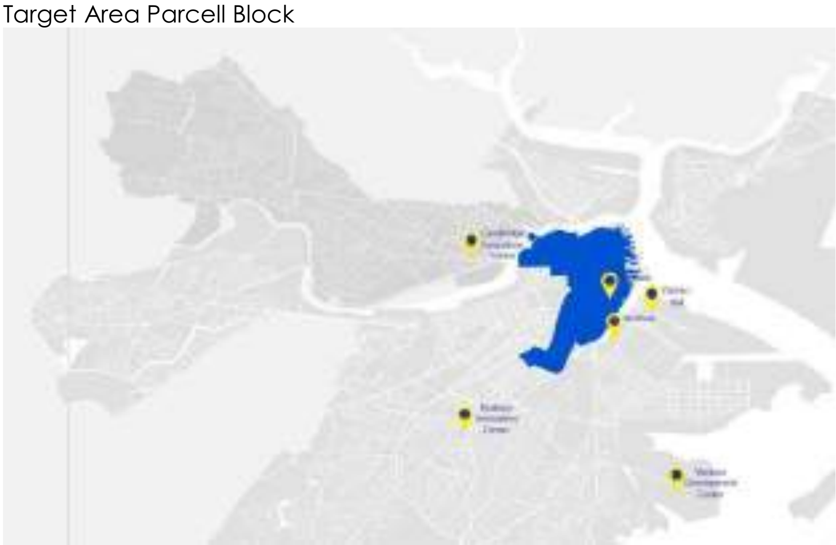
Fig. 3 Vacant Housing Unit



Comments: In 2013, there were 273,113 housing units in Boston, up 8.4% since 2000 in the target area the housing unit are 20800. Housing unit growth between 2000 and 2010 was the strongest decade since before 1950: Boston added 20,546 new units of housing, for a decade-long growth rate of 8.2%. Since 2010 to 2013 the housing unit in the target area preserve a costant growth. The graph analysys shows the high percentage of Occupied Housing unit the 89%. The vacant housing unit higlight the high percentage of housing unit for rented, a 25% for seasonal recreational but emerge an high number in 2011 all other vacants.

PART 3: Real Estate

Target Area Parcell Block



Property Type

Fig. 1 Property value per category

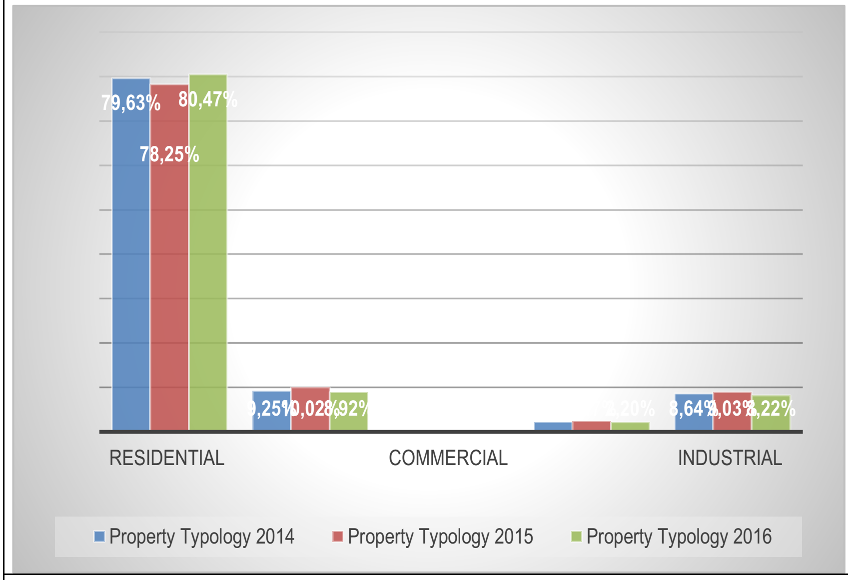
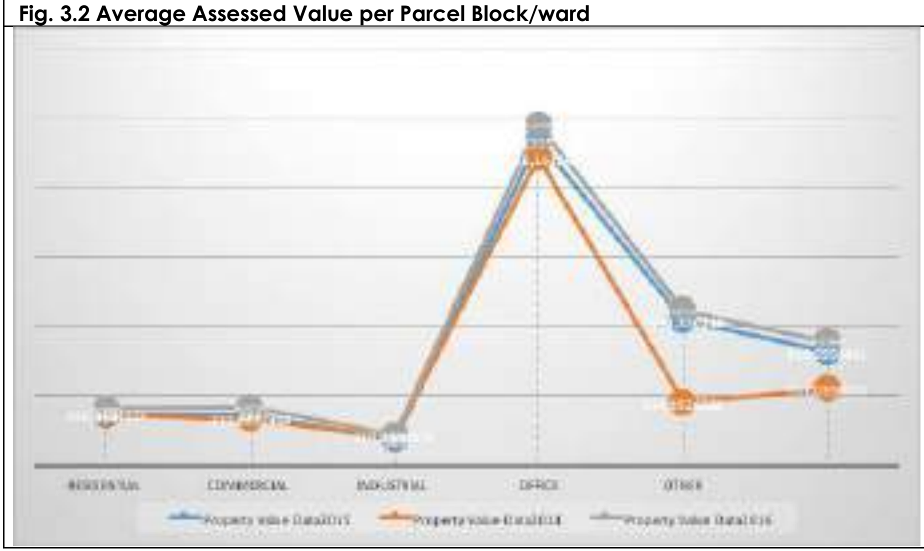
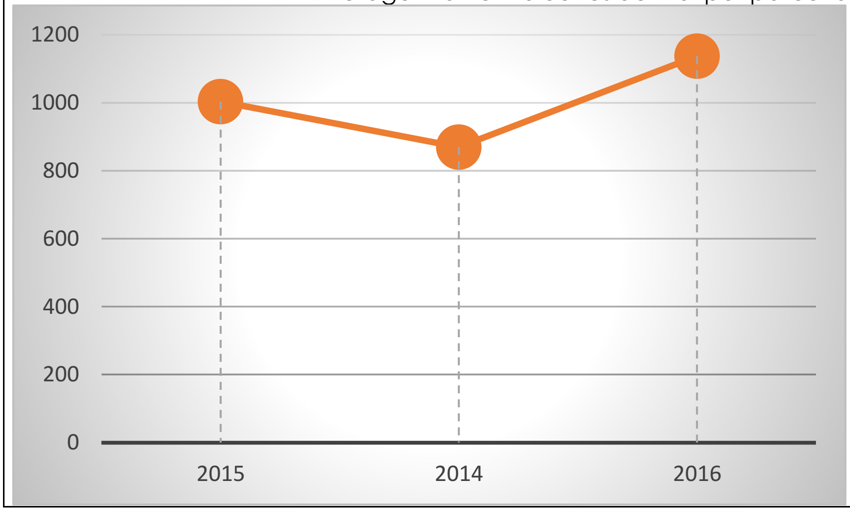


Fig. 3.2 Average Assessed Value per Parcel Block/ward



Comments: Excluding the recession, the housing market in Boston has remained strong(source: Boston Redevelopment authorities). In Boston the assessed value of residential properties in has grown faster than that of commercial properties since 2001. The total assessed value of residential properties was higher than the total assessed value of commercial properties in 2016. Infact the graph highlight the property value per category and in particular shows the total assessed value of office was higher than the total assessed value of residential and commercial.
Average Market Value per parcel block/ward

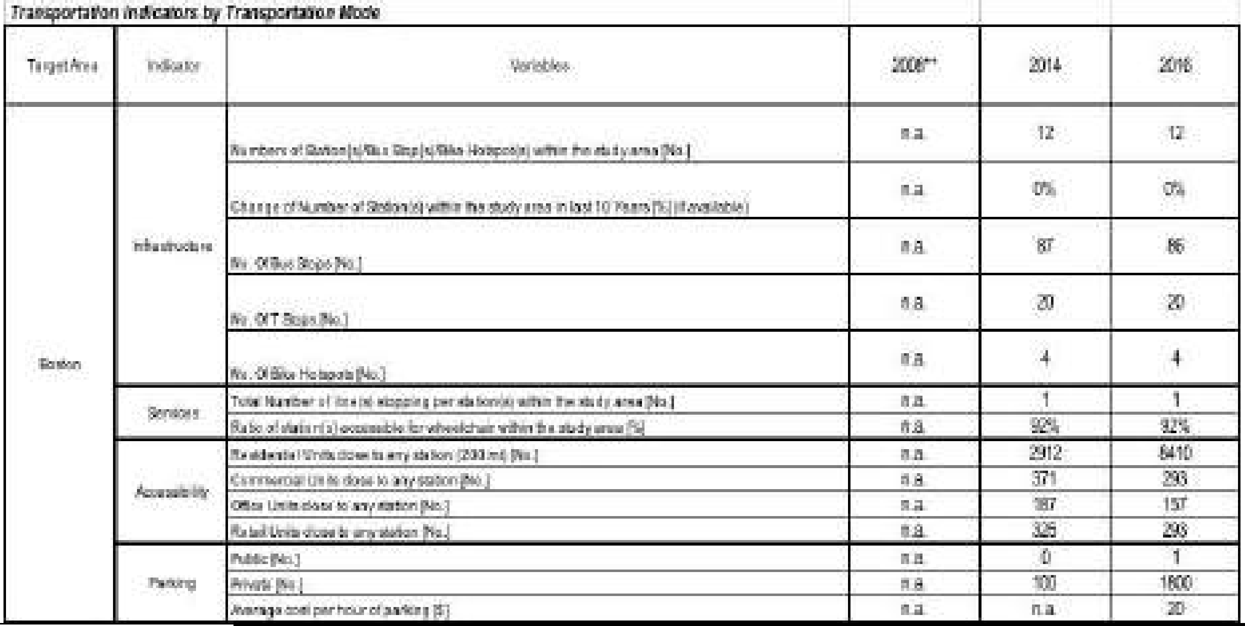
Average market value residential per parcel block/WARD



PART 4: Services

Trasportation and Infrastracture

Target area map with centroid spatial identification

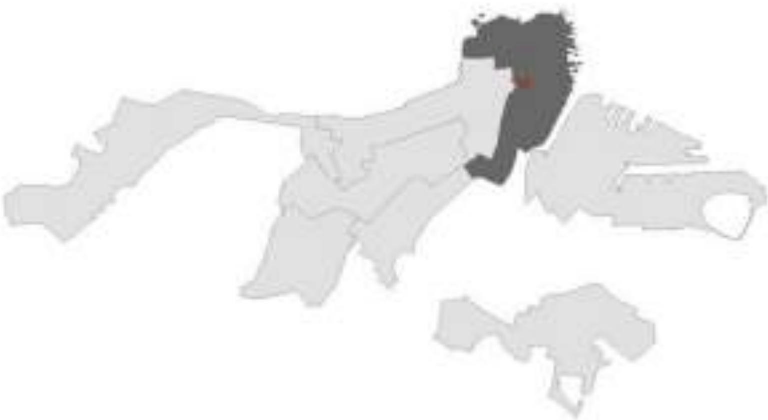


Transportation Indicators by Transportation Mode

Target Area	Indicator	Variables	2008**	2014	2016
Boston	Infrastructure	Numbers of Station(s)/Bus Stop(s)/Bike Hotspot(s) within the study area [No.]	n.a.	12	12
		Change of Number of Station(s) within the study area in last 10 Years [%] (if available)	n.a.	0%	0%
		No. Of Bus Stops [No.]	n.a.	87	86
		No. Of T Stops [No.]	n.a.	20	20
		No. Of Bike Hotspots [No.]	n.a.	4	4
	Services	Total Number of line(s) stopping per station(s) within the study area [No.]	n.a.	1	1
		Ratio of station(s) accessible for wheelchair within the study area [%]	n.a.	92%	92%
	Accessibility	Residential Units close to any station (200 m) [No.]	n.a.	2912	8410
		Commercial Units close to any station [No.]	n.a.	371	293
		Office Units close to any station [No.]	n.a.	187	157
		Retail Units close to any station [No.]	n.a.	325	293
	Parking	Public [No.]	n.a.	0	1
		Private [No.]	n.a.	100	1800
		Average cost per hour of parking [$]	n.a.	n.a.	20

	Centroid coordinates
Latitude	42,357043
Longitude	-71,060013

Target area map with centroid spatial identification



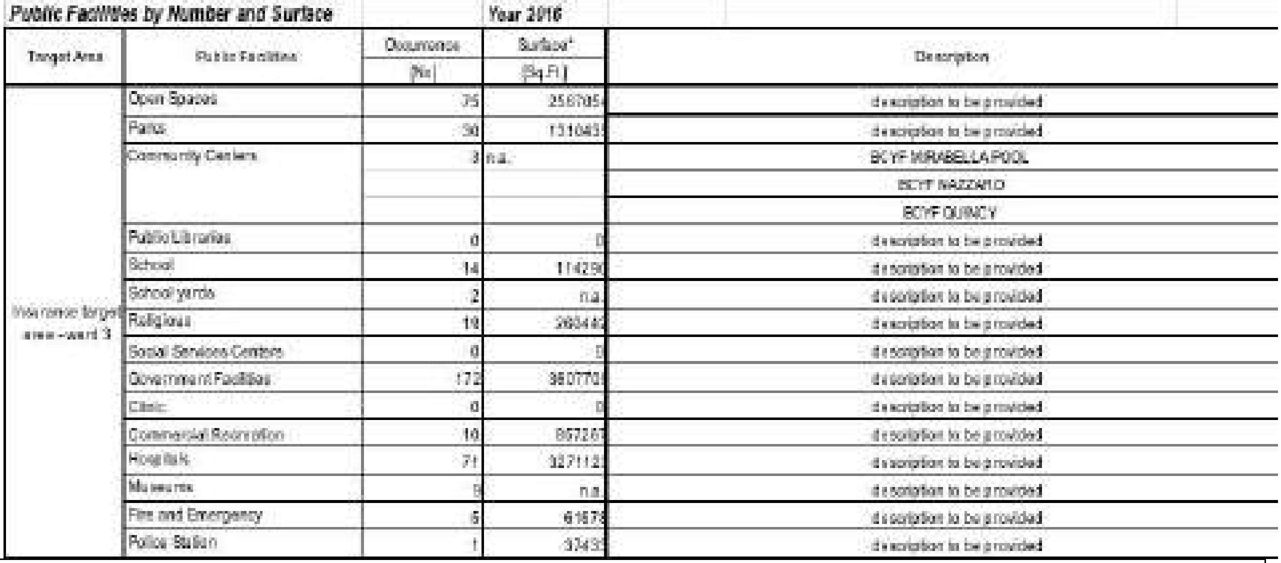
4.2 Target Area distance from the main Infrastructures

Target Area	Indicator	Variables	by Subway	by Bus	by Car
Target Area	Out region	Distances to the closest International Airport [Km]	3,01	7,84	6,30
		Distances to the closest Port [Km]	0,59	2,00	2,50
		Distances to the closest Highway [Km]	0,87	n.r.***	1,80

PART 5: Innovation Facilities

Public Facilities by Number and Surface

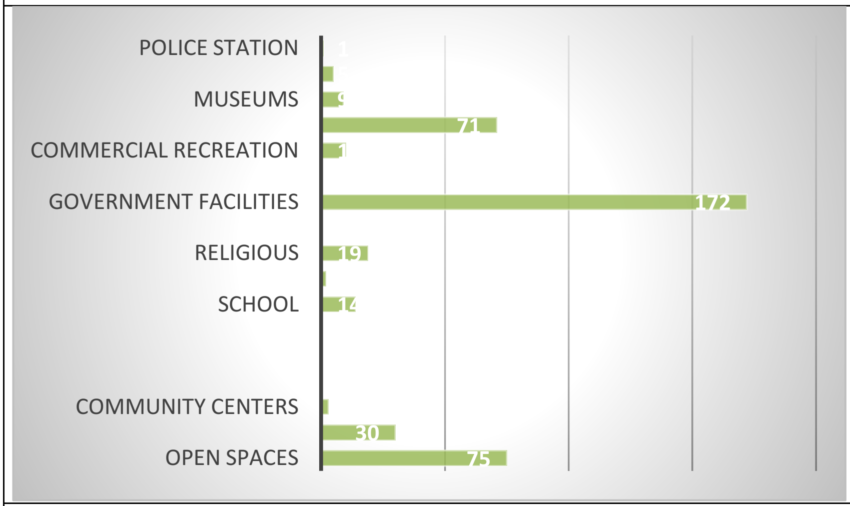
Tab.1 Public Facilities by Number and Surface *(Year 2016)*



Public Facilities by Number and Surface Year 2016

Target Area	Public Facilities	Occurrence [No.]	Surface* [Sq.Ft.]	Description
[illegible] target area - ward 3	Open Spaces	75	256705	description to be provided
	Parks	30	131043	description to be provided
	Community Centers	3	n.a.	BCYF MIRABELLA POOL
				BCYF NAZZARO
				BCYF QUINCY
	Public Libraries	0	0	description to be provided
	School	14	11429	description to be provided
	School yards	2	n.a.	description to be provided
	Religious	19	26044	description to be provided
	Social Services Centers	0	0	description to be provided
	Government Facilities	172	380770	description to be provided
	Clinic	0	0	description to be provided
	Commercial Recreation	10	85726	description to be provided
	Hospitals	71	327112	description to be provided
	Museums	9	n.a.	description to be provided
	Fire and Emergency	6	6167	description to be provided
	Police Station	1	3743	description to be provided

fig. 1 Public Facilities by number and surface

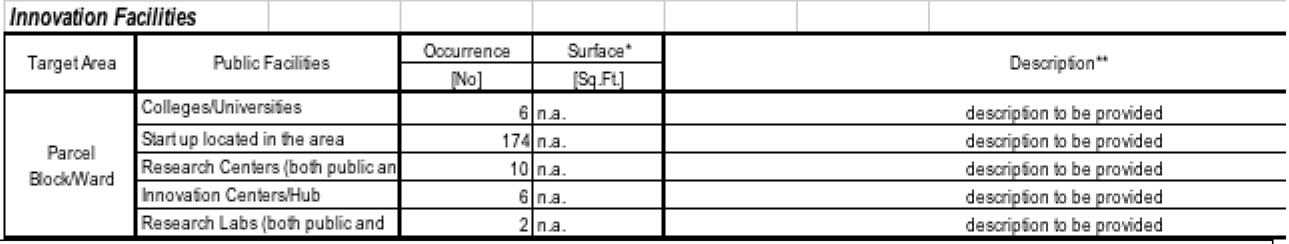


Comments: The Analysis highlight the high number of hospitals(71), Governament facilities(172) and open spaces(75) in the area. This data are higly relevant for to understand particular urban dynamics. In the target area is located the Venture Development Center, it is spatially and economically part of LIFE SCIENCE CORRIDOR localised on the red line extensions and connecting 5 cities between (Somerville, Cambridge, Boston, Quincy and Braintree). The corridor benefits from a knowledge spillover, advances in academic sciences fields, innovative research and proximity to major research hospitals and strategic presence of venture capital resources.

.

Innovation facilities

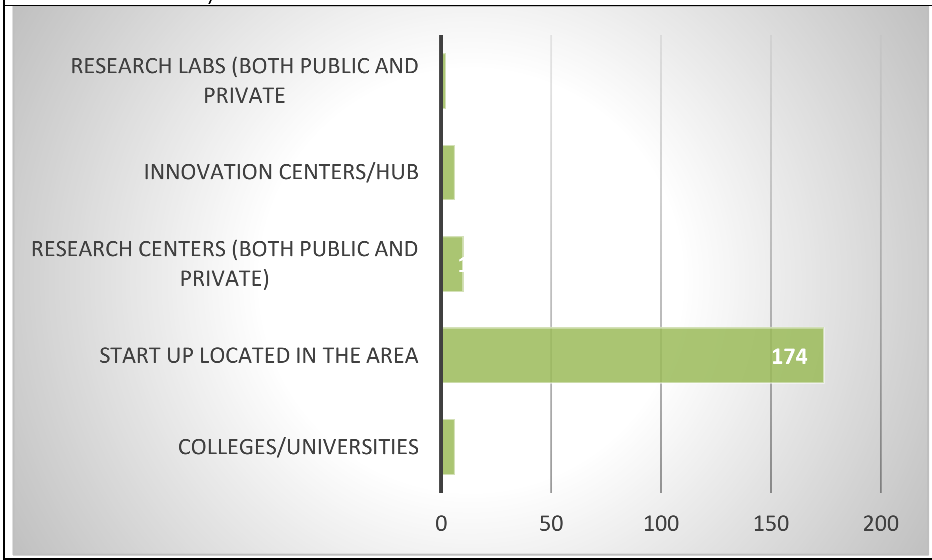
Tab. 1 Innovation facilities



Innovation Facilities

Target Area	Public Facilities	Occurrence [No]	Surface* [Sq.Ft.]	Description**
Parcel Block/Ward	Colleges/Universities	6	n.a.	description to be provided
	Start up located in the area	174	n.a.	description to be provided
	Research Centers (both public an	10	n.a.	description to be provided
	Innovation Centers/Hub	6	n.a.	description to be provided
	Research Labs (both public and	2	n.a.	description to be provided

Innovation ecosystem

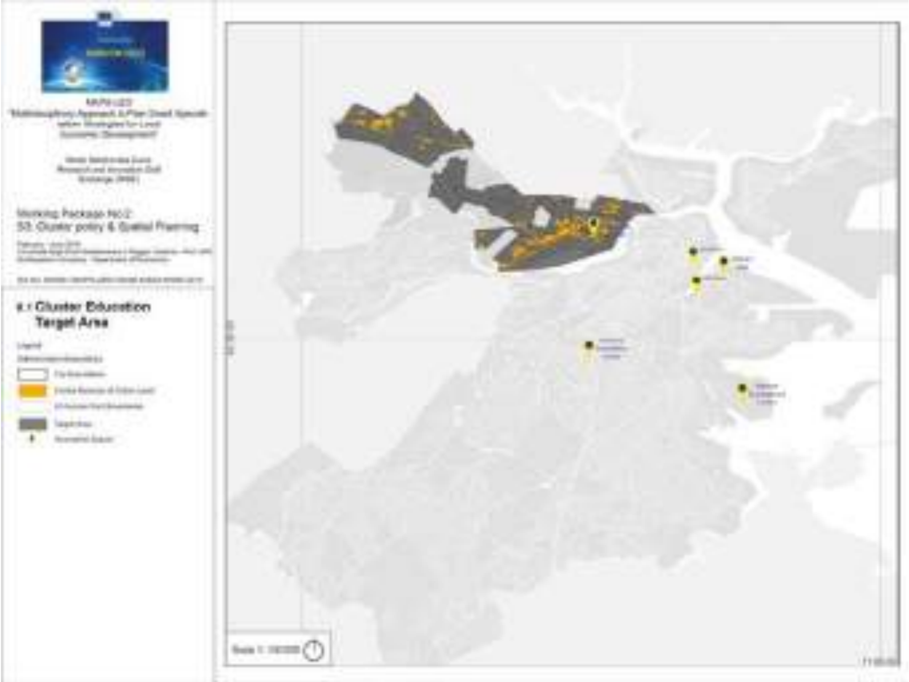
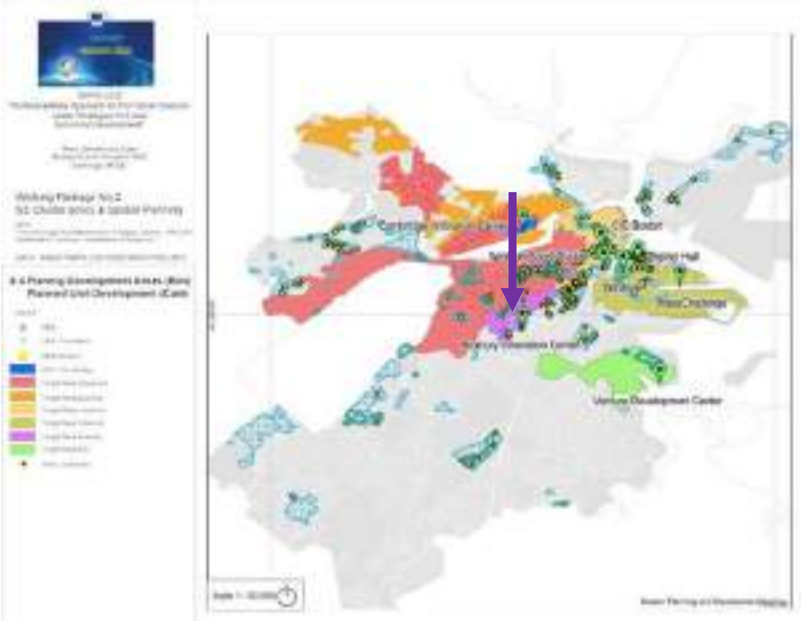


Comments: The Graph shows the high number of innovation. In the target area are localised 174 sturtup and 20 research center and 6 college uiversities. In particular emerges the role of Venture Development Centre (VDC), it's a non-profit organization spatially localized in University of Massachusetts (Zip Code 02125). Mainly identified as a **business incubator**, it delivers the needed support to start-ups companies to turn their visions and ideas into reality by providing physical laboratories, financial aids and the eco-environment for entrepreneurs to inspire and innovate.

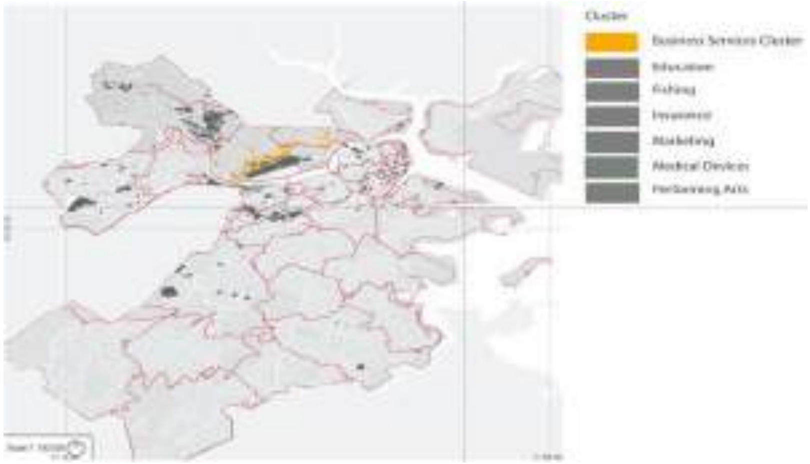
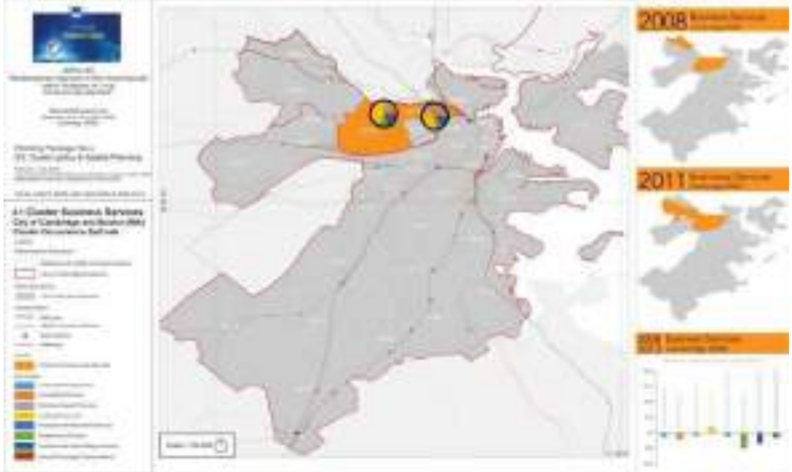
Cluster Case Study: Target Area Business services

Carla Maione with Giuseppe Pronestì, Cesare Cascella

PART 1: Urban Regeneration

Target Area identification	
Cluster Localisation	
	
Cluster(s)	Business Services
City(ies)	Cambridge
Policy Initiatives	Civic Innovation Center Cambridge
Planning initiative corrispondence	
1.Eastern Cambridge Planning Study And Eastern Cambridge Rezoning (Ecaps), 2001, East Cambridge; 2. Eastern Cambridge/Kendall Square Open Space Study, 2016, Area East Cambridge; 3. Kendall Square Central Square (K2-C2) Plan, 2011-2015,Mit; 4. Ecodistricts - Kendall Square Eco District Pilot (****),2011-2015, Mit.	
Census Tract	25017352101, 25017352102, 25017352300, 25017352400, 5017352600,25017352700, 25017352800, 25017352900, 25017353700, 25017353800, 25017354000, 25017354100, 25017354600,25017354700, 25017354800,25017354900 ,25017355000

Source:	For socio-demographic indicators, data have been collected by Census Tract (source: census.gov)

<table>
<tr><td colspan="2">Target Area Description</td></tr>
<tr><td>The target area localised in Cambridge, is classified as Business Service, one of the best performing cluster for the studied area and, according to the definition provided by Porter, embeds a set of eight sub-clusters: corporate headquarters, consulting services, business support services, computer services, employment placement services, engineering services, architectural and drafting services and ground passenger transportation. The afore mentioned sub-clusters are themselves composed by thirty-three industries.</td>
<td>
</td></tr>
<tr><td colspan="2">Cluster Structure</td></tr>
<tr><td rowspan="3">In order to bring the analysis up to a more detailed level, it rises the urge for studying the spatial configuration of the cluster at the urban level. In view of this, the second study stage tackled the interpretation of BSC spatial occurrence at the city level towards mapping the localization of the cluster by zip code (Figure). Specifically, zip codes featured by the presence of at least one establishment per sub-cluster have been highlighted. The map reveals that the BSC does not occur in Boston, as opposite it strongly concentrates in the city of Cambridge. More in detail just two zip codes (02139 and 02141) feature the BSC, which spatially distribute within the core of Cambridge. The occurrence of the BSC in Cambridge should not surprise if one considers that in the same city also occur the Marketing and the Education cluster which are among the strongest linked cluster (BRC>= 95th percentile and RI>= 20%)[5] with respect to the BSC.
According To Porter the clusters that are most related to this cluster in the target area are :
Insurance Biopharma Education Marketing Performing arts Fishing</td>
<td>
</td></tr>
<tr><td>Related cluster</td></tr>
<tr><td>
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</table>

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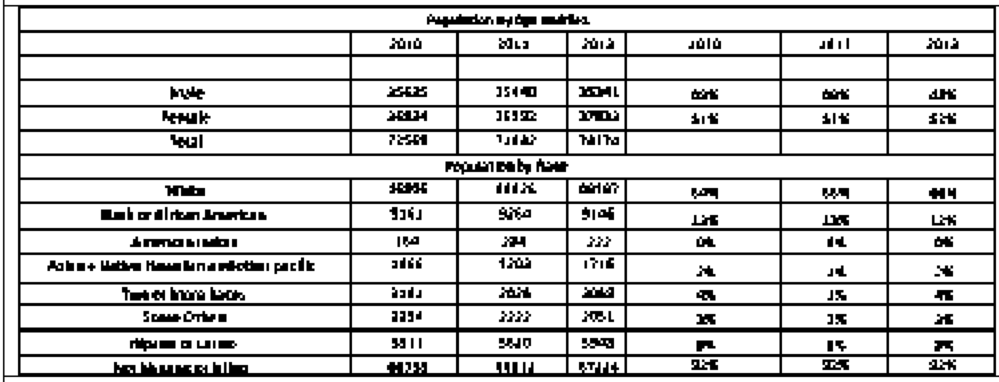
[5] USA Cluster Mapping

PART 2: Sociodemographic Analysis

Population By Sex and Race

Tab.1 Population By Sex and Race



[illegible]						
	2010	2011	2013	2010	2011	2013
Male	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Female	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]			
Population by Race						
White	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Black or African American	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
American Indian	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Asian + Native Hawaiian and other pacific	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Two or More Races	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Some Other Race	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hispanic or Latino	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Not Hispanic or Latino	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Fig. 1.Population by Sex and Race

Comments: The Target Area localised in East Cambridge is composed by a high percentage of Caucasian Community, in particular IRISH, ITALIAN, FRENCH, ENGLAND.

The central part of the target area is one of the oldest residential neighborhoods in Cambridge, has a major commercial and transit center at Lechmere Square, with a longstanding neighborhood retail strip to the west along Cambridge Street. The southern part of the target area, a former industrial area adjacent to the Massachusetts Institute of Technology, it now serves as home to many offices and research labs, as well as several large apartment buildings. Kendall Square is the major commercial and transit center in the southern section. The graphs shows the high percentage of female category the 52% with respect to the 48% of male.

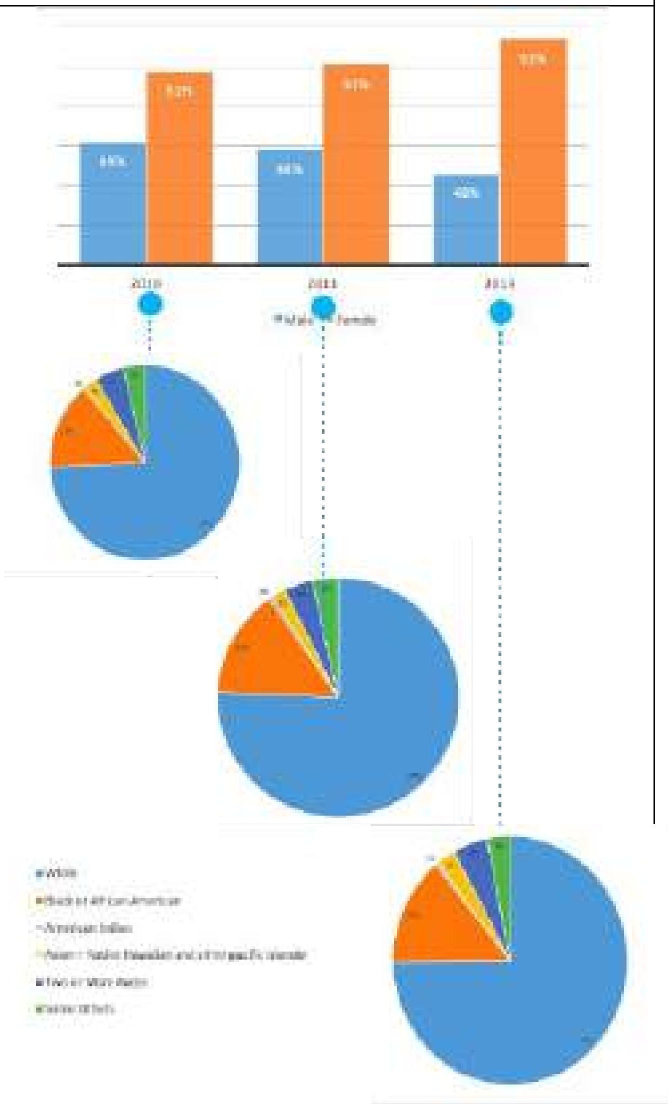
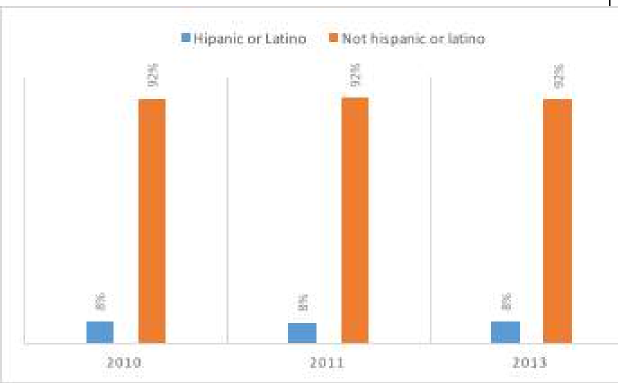
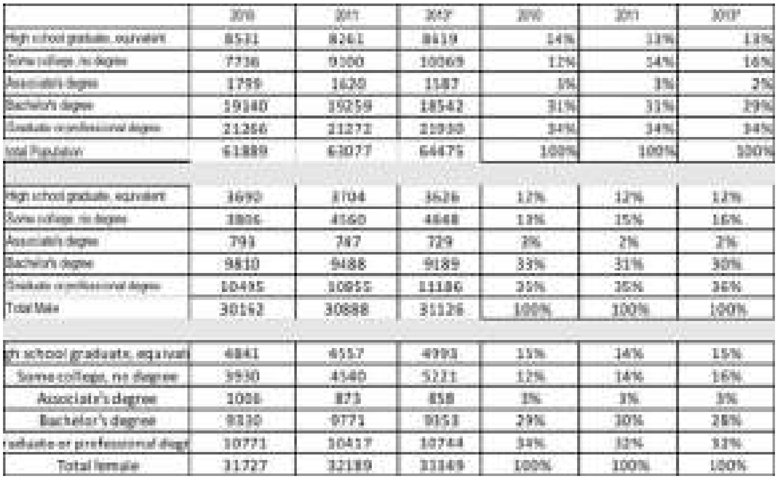


Fig.3 Hispanic or Not Hispanic



Educational Attainment by Sex and Degree

Tab. 1 Educational Attainment



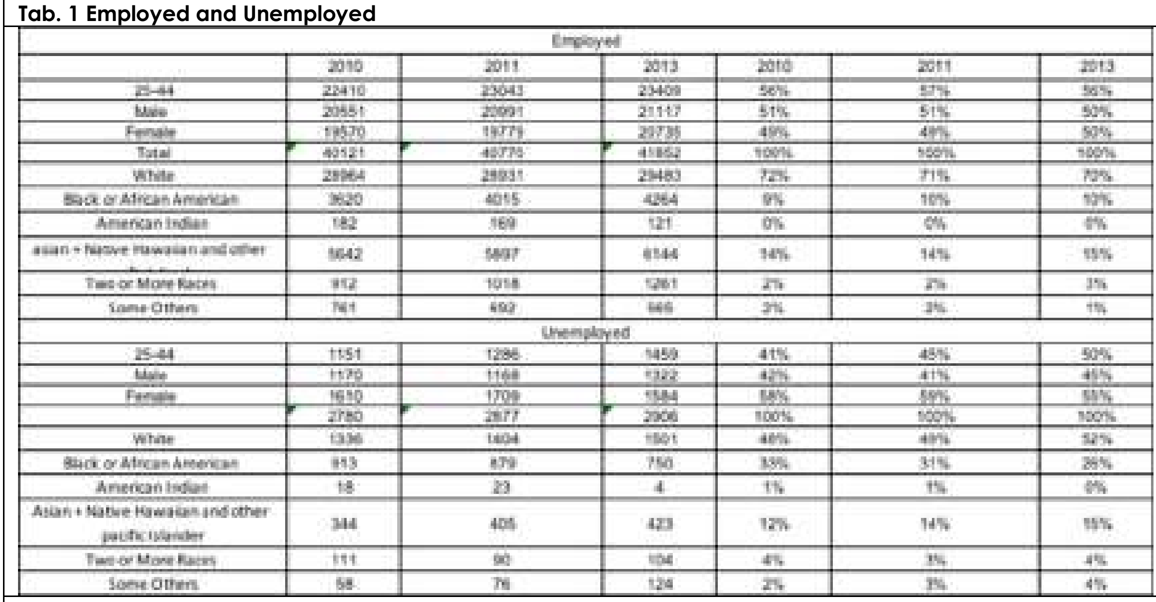
	2010	2011	2012*	2010	2011	2012*
High school graduate, equivalent	8531	8261	8419	14%	13%	13%
Some college, no degree	7736	9300	10069	12%	14%	16%
Associate's degree	1799	1620	1587	3%	3%	2%
Bachelor's degree	19140	19259	18542	31%	31%	29%
Graduate or professional degree	21266	21272	21930	34%	34%	34%
Total Population	61889	63077	64475	100%	100%	100%
High school graduate, equivalent	3690	3704	3626	12%	12%	12%
Some college, no degree	3806	4560	4648	13%	15%	16%
Associate's degree	793	747	729	3%	2%	2%
Bachelor's degree	9810	9488	9189	33%	31%	30%
Graduate or professional degree	10495	10855	11186	35%	35%	36%
Total Male	30162	30888	31126	100%	100%	100%
gh school graduate, equival	4841	4557	4993	15%	14%	15%
Some college, no degree	3930	4540	5221	12%	14%	16%
Associate's degree	1006	873	858	3%	3%	3%
Bachelor's degree	9330	9771	9353	29%	30%	28%
raduate or professional degr	10771	10417	10744	34%	32%	32%
Total female	31727	32189	33349	100%	100%	100%

Fig. 1 Educational Attainment- Total population

Comments: Cambridge has one of the largest proportions of percent of people with a Bachelors Degree or higher at 75% of the total. Indeed, from Graph analysis is evident as the 35% of people have completed a Bachelor Degree and the 35% have concluded a Graduate or Professional Program. The cause is strictly linked at the high number of Education Institute, research organisation and public schools in the area. The educational institutions are the city's biggest employers today. Harvard and MIT together employ about 20,000(census, 2015). Overall, unemployment rates decrease as educational attainment increases. It is highest for those who did not graduate from high school and lowest for those with a Bachelor's degree or above.

Labour Market

Tab. 1 Employed and Unemployed



Employed						
	2010	2011	2013	2010	2011	2013
25-44	22410	23043	23409	56%	57%	56%
Male	20551	20991	21117	51%	51%	50%
Female	19570	19779	20735	49%	49%	50%
Total	40121	40770	41852	100%	100%	100%
White	28964	28931	29483	72%	71%	70%
Black or African American	3620	4015	4264	9%	10%	10%
American Indian	182	169	121	0%	0%	0%
asian + Native Hawaiian and other	5642	5697	6144	14%	14%	15%
Two or More Races	912	1018	1261	2%	2%	3%
Some Others	761	692	666	2%	2%	1%
Unemployed						
25-44	1151	1286	1459	41%	45%	50%
Male	1170	1168	1322	42%	41%	45%
Female	1610	1709	1584	58%	59%	55%
	2780	2877	2906	100%	100%	100%
White	1336	1404	1501	48%	49%	52%
Black or African American	813	879	750	29%	31%	26%
American Indian	18	23	4	1%	1%	0%
Asian + Native Hawaiian and other pacific islander	344	405	423	12%	14%	15%
Two or More Races	111	90	104	4%	3%	4%
Some Others	58	76	124	2%	3%	4%

Fig. 1 Employment By Sex and Race

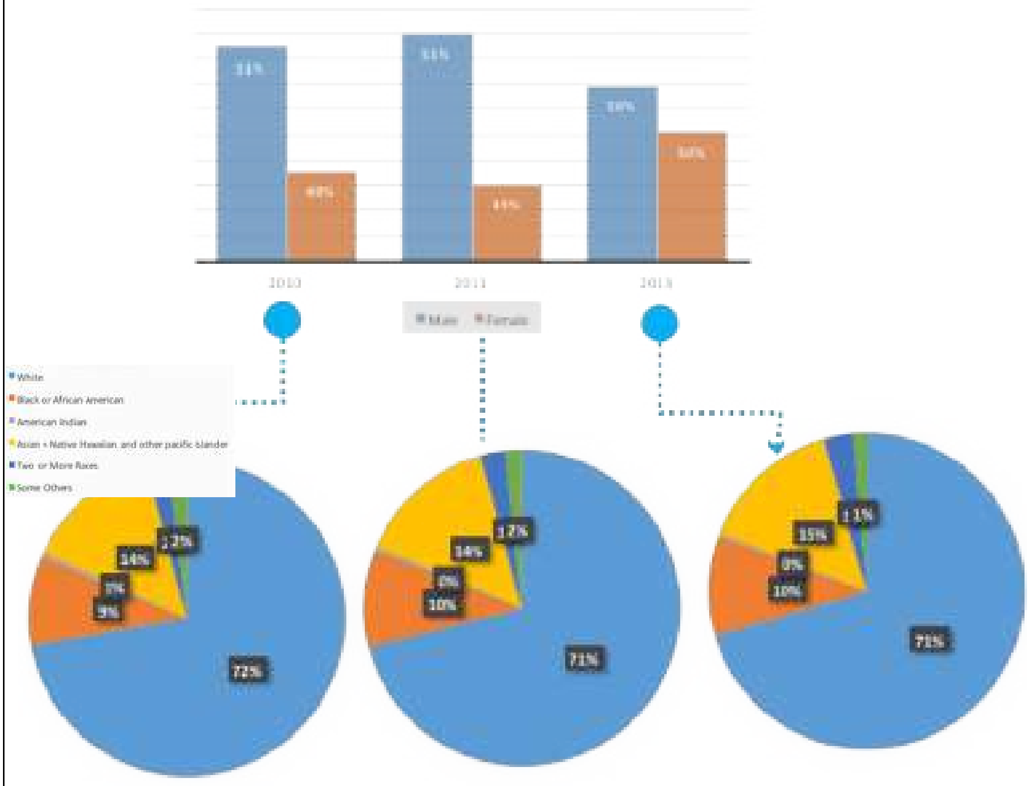


Fig. 2 Unemployment By Age and Race

Comments: According to American Community Survey Cambridge has high unemployment rate. Infact Cambridge has one of the largest proportions of not in labor force at 31%.
The Target Area throught the graph analysis shows the high level of Employment 25-44 with respect to the 45% of unemployed.

Comments: The graph shows the difference between employed and unemployed 25-44. In particular, in the time period 2010-2013 is evident the growth of unemployment 25-44 from 41% to 50%.

In labor force and Not in labor force

Tab. 1 In Labor force and Not in Labor force

In Labor force						
	2010	2011	2013	2010	2011	2013
25-44	23869	24570	25077	36%	36%	36%
Male	22018	22407	22652	33%	33%	32%
Female	21255	21540	22366	32%	31%	32%
Total	67142	68517	70095	100%	100%	100%
White	28964	28931	29483	43%	42%	42%
Black or Africa	3620	4015	4264	5%	6%	6%
American India	182	169	121	0%	0%	0%
asian + Native	5642	5897	6144	8%	9%	9%
Two or More Ra	912	1018	1261	1%	1%	2%
Some Others	761	692	565	1%	1%	1%
Not in Labor force						
25-44	1151	1286	1459	41%	45%	50%
Male	1170	1168	1322	42%	41%	45%
Female	1610	1709	1584	58%	59%	55%
	2780	2877	2906	100%	100%	100%
White	1336	1404	1501	48%	49%	52%
Black or Africa	913	879	750	33%	31%	26%
American India	18	23	4	1%	1%	0%
Asian + Native	344	405	423	12%	14%	15%
Two or More Ra	111	90	104	4%	3%	4%
Some Others	58	76	124	2%	3%	4%

Fig. 1 In labor force By Age and Sex

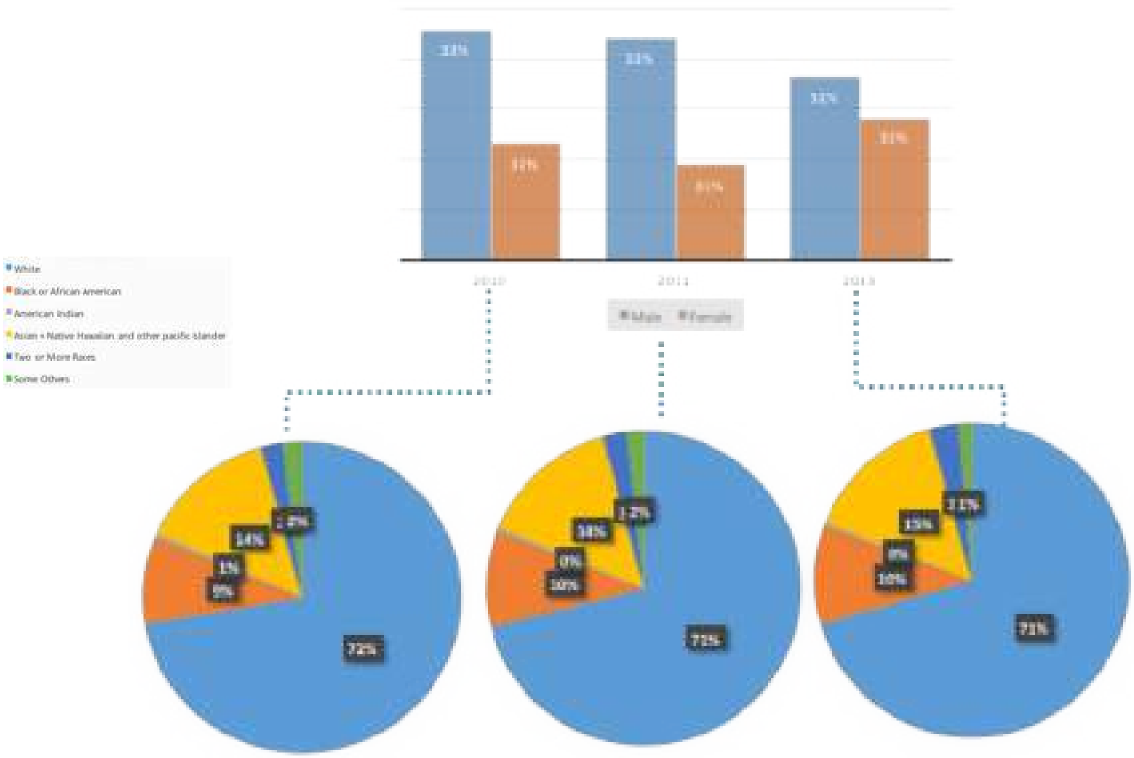
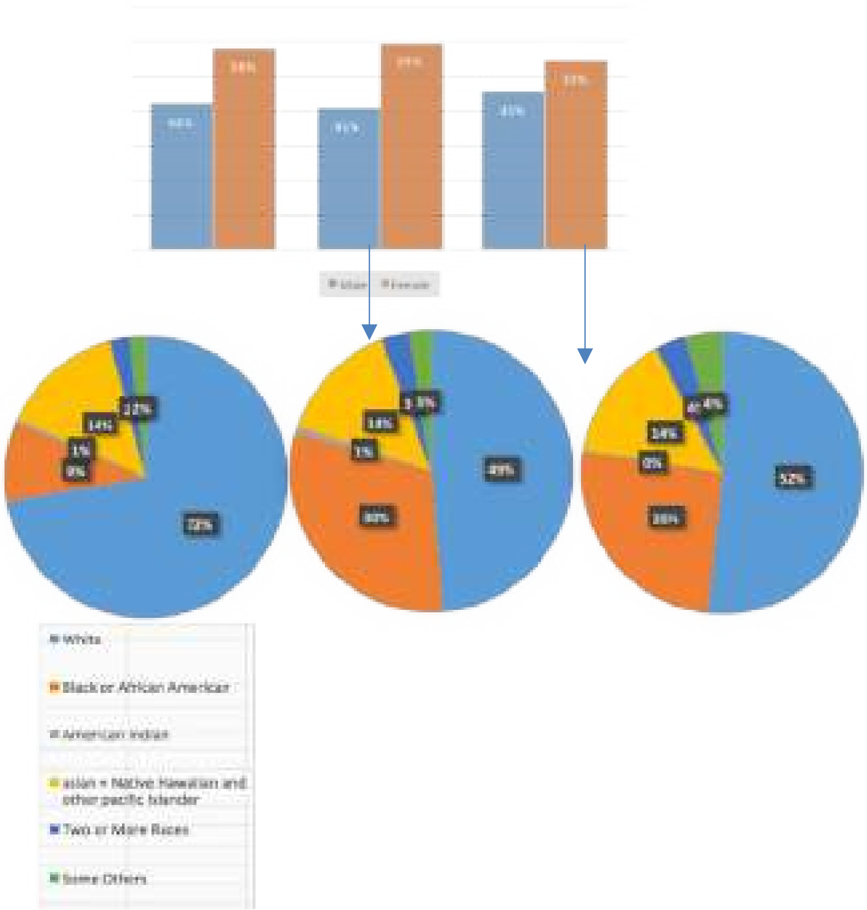
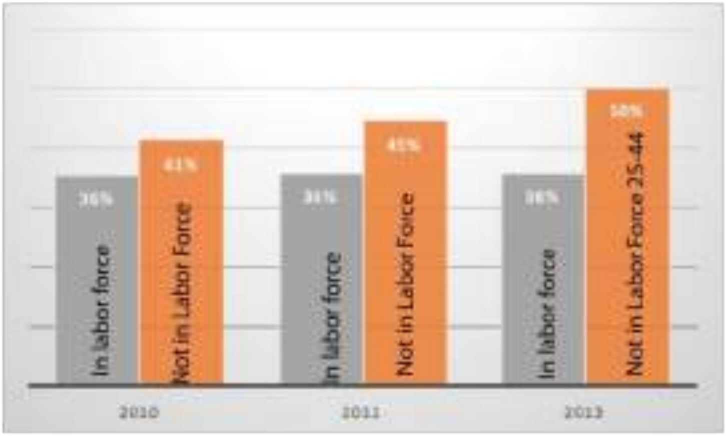


Fig. 2 Not in Labor force by Race



Comments: From Graph's analysis The Not in Labor force 25-44 is very High percentage with respect to the Labor force.

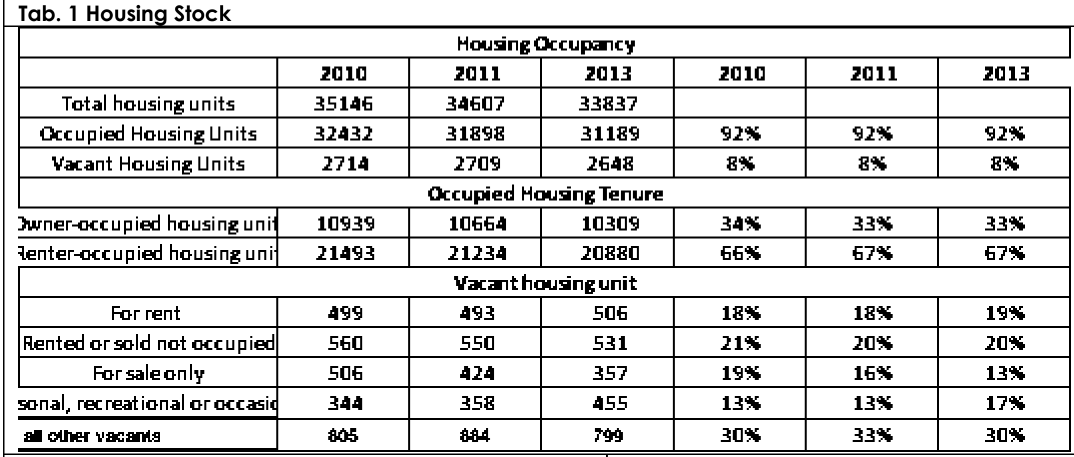
Fig. 3 in labor force and Not in labor force (25-44)



Comments: In 2013 the Not in Labor force 25-44 increasing, in this sense the intervention of public governament spur for new public policy based on concentrantion and expansion of innovation. The strategy of City of Cambridge is actively enhancing social and economic development by exploiting the potential of innovation. As a matter of fact, over the past years, different innovation initiatives have been implemented to generate urban transformation processes able to trigger the territorial growth

Housing Stock

Tab. 1 Housing Stock



Housing Occupancy						
	2010	2011	2013	2010	2011	2013
Total housing units	35146	34607	33837			
Occupied Housing Units	32432	31898	31189	92%	92%	92%
Vacant Housing Units	2714	2709	2648	8%	8%	8%
Occupied Housing Tenure						
wner-occupied housing uni	10939	10664	10309	34%	33%	33%
enter-occupied housing uni	21493	21234	20880	66%	67%	67%
Vacant housing unit						
For rent	499	493	506	18%	18%	19%
Rented or sold not occupied	560	550	531	21%	20%	20%
For sale only	506	424	357	19%	16%	13%
sonal, recreational or occasi	344	358	455	13%	13%	17%
all other vacants	805	884	799	30%	33%	30%

Fig. 1 Housing Occupancy

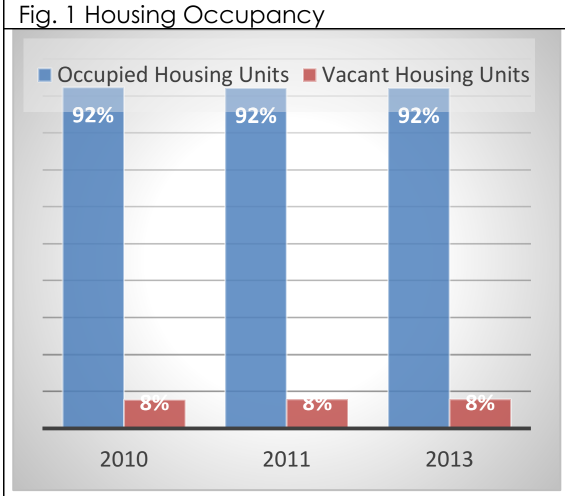
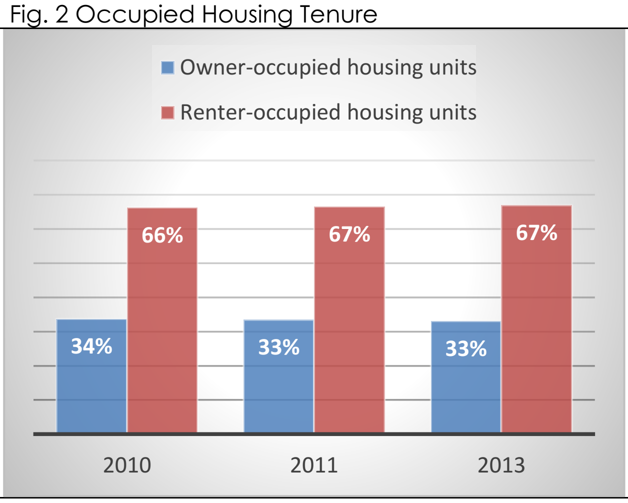
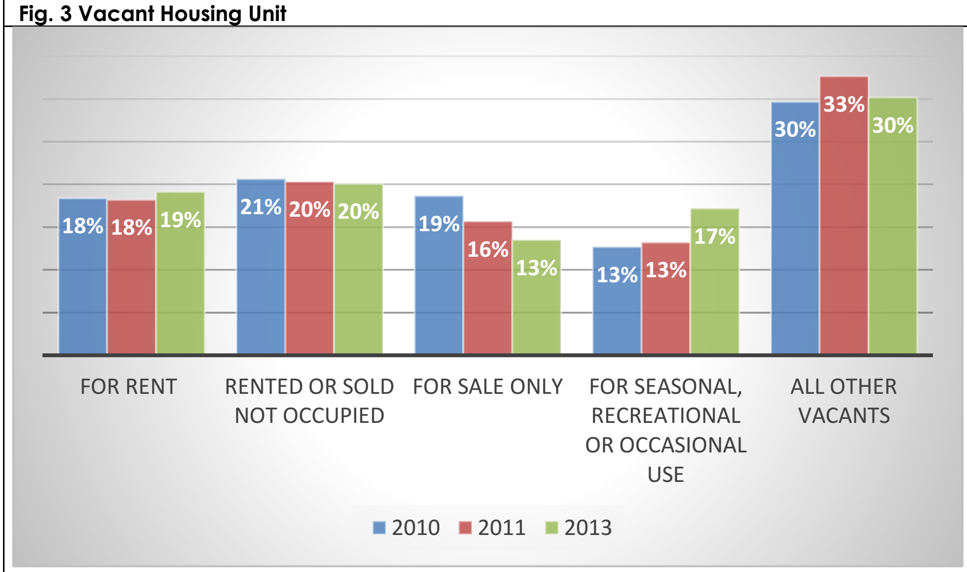


Fig. 2 Occupied Housing Tenure



Comments: In the target area the total housing unit are 33837,since 2010-2013 is evident a reducing in total housing unit . According to American Survey the Housing unit growth between 2000 and 2010 was the strongest decade since before 1950: Boston and Cambridge added new units of housing, for a decade-long growth rate of 8.2%. Since 2010 to 2013 the housing unit in the target area preserve a costant growth. The graph analysys shows the high percentage of Occupied Housing unit the 92% since 2010 to 2013.

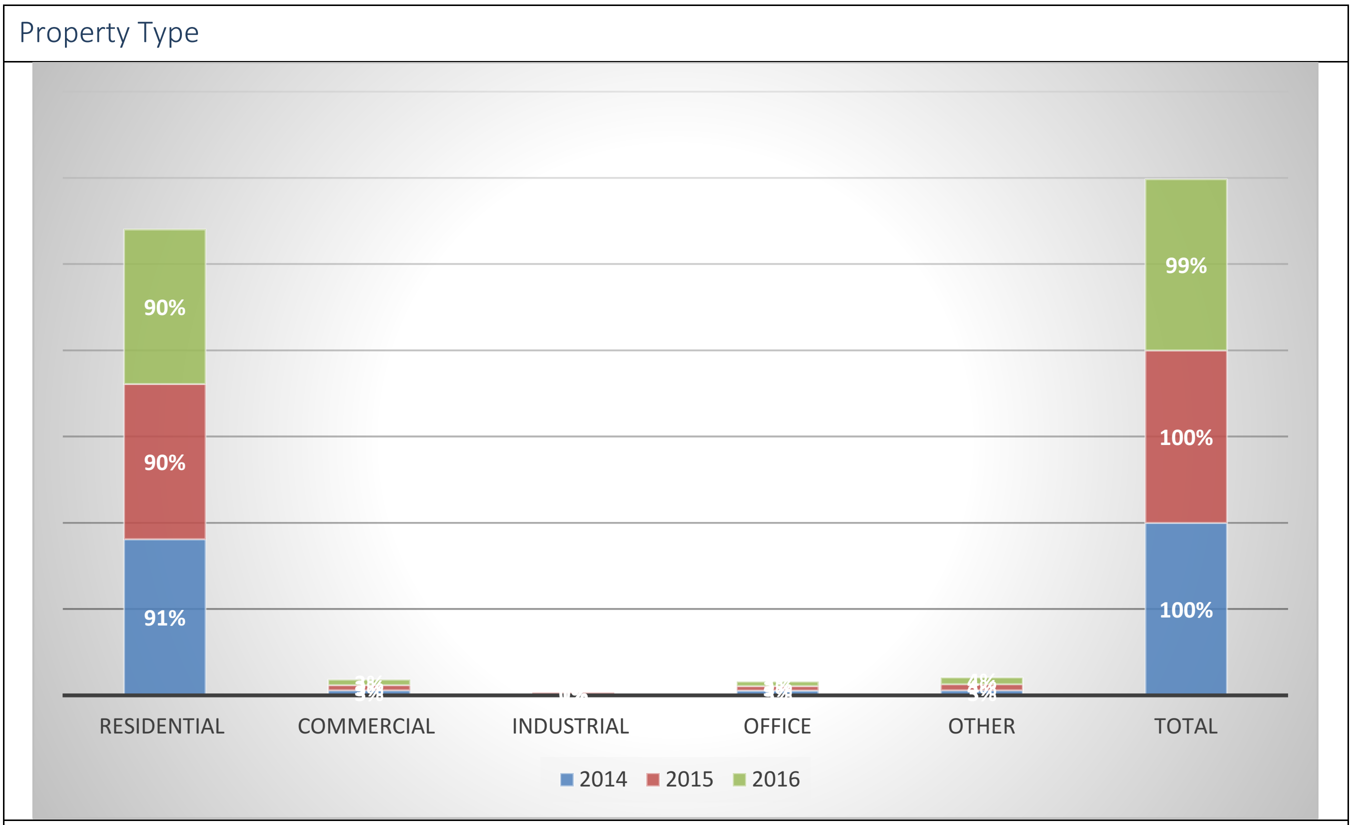
Fig. 3 Vacant Housing Unit



Comments: The vacant housing unit higlight the high percentage of housing unit for rented,The 19% for rent, a 33 % in 2011 for all other vacants,A 17% for seasonal,recreational or occasional use.

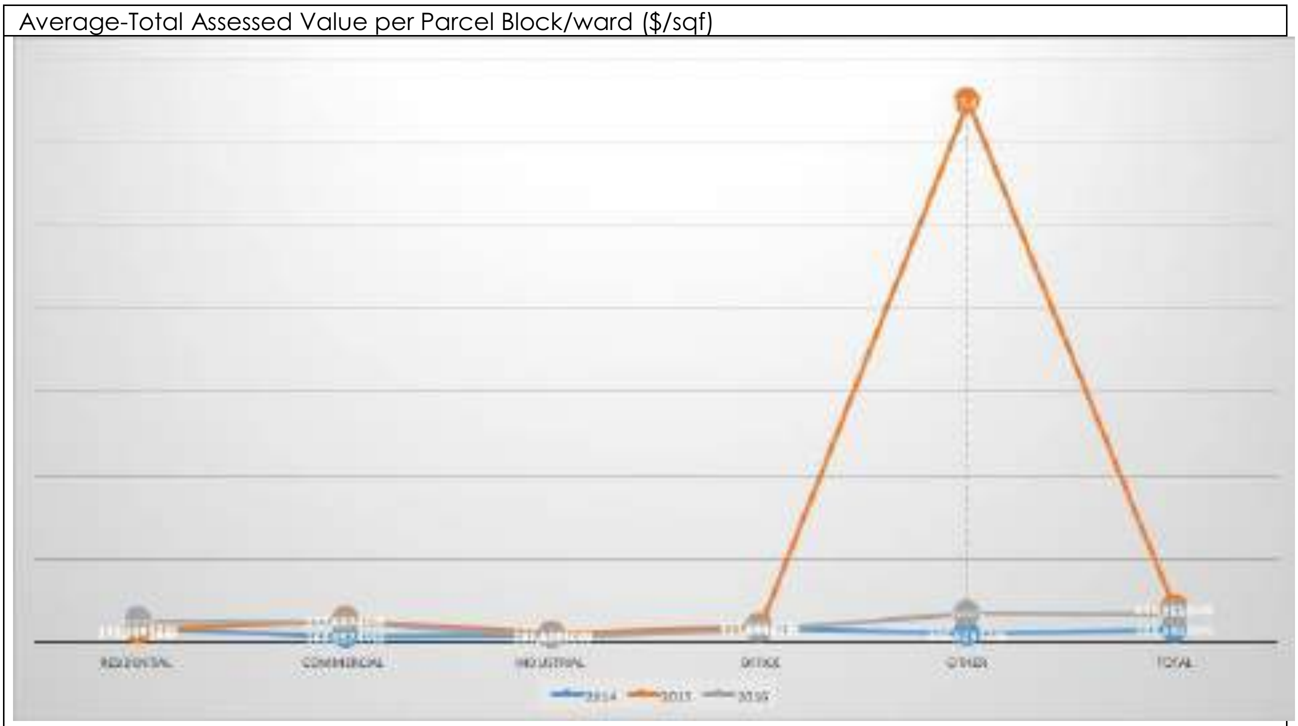
PART 3: Real Estate

Target Area Parcell Block



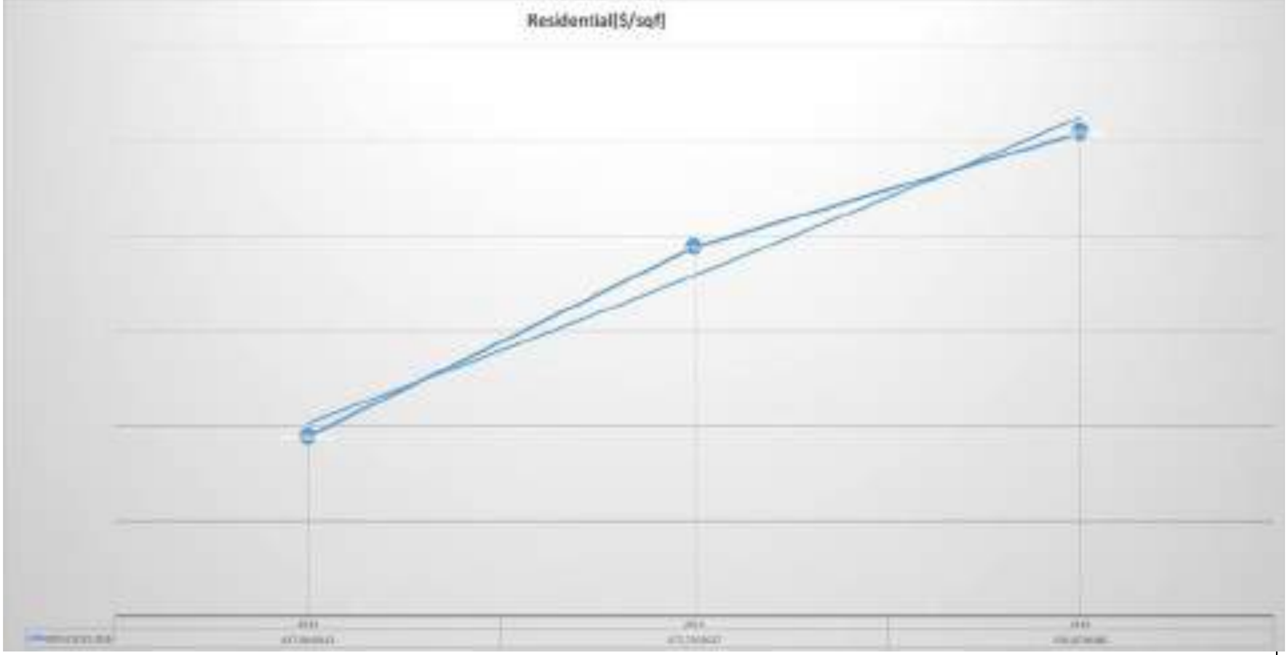
Comments: the property type in Cambridge shows an high percentage in residential.

Average-Total Assessed Value per Parcel Block/ward ($/sqf)



Comments: Excluding the recession, the housing market in Boston has remained strong(source: Boston Redevelopment authorities). In Boston the assessed value of residential properties in has grown faster than that of commercial properties since 2001. The total assessed value of residential properties was higher than the total assessed value of commercial properties in 2016. Infact the graph highlight the property value per category and in particular shows the total assessed value of Other prosperities was higher than the total assessed value of residential and commercial.

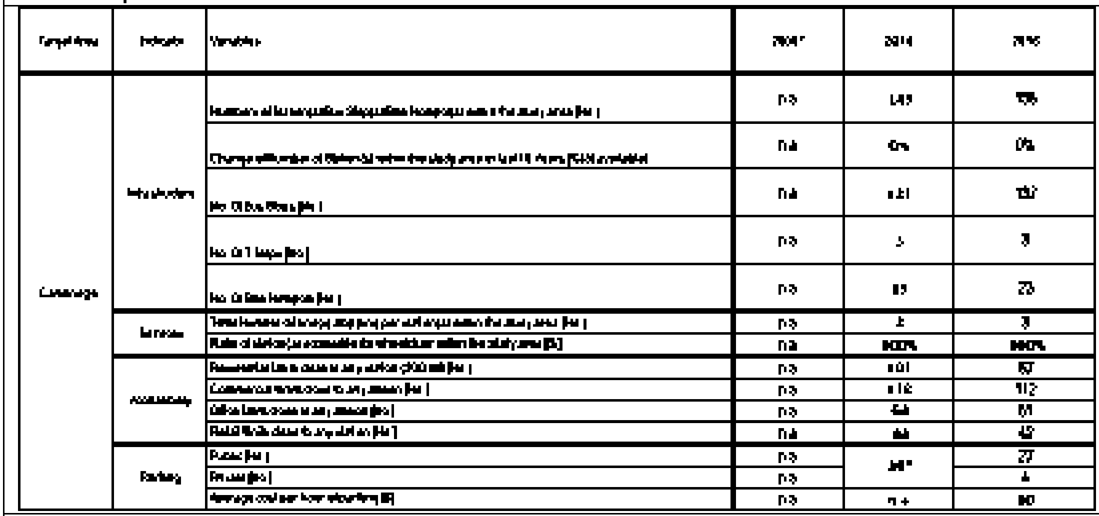
3.3 Average Market Value per parcel block/ward Residential($/sqf)



Comments: The average market value Per Residential($/SQF) increasing in 2011.

Trasportation and Infrastructure

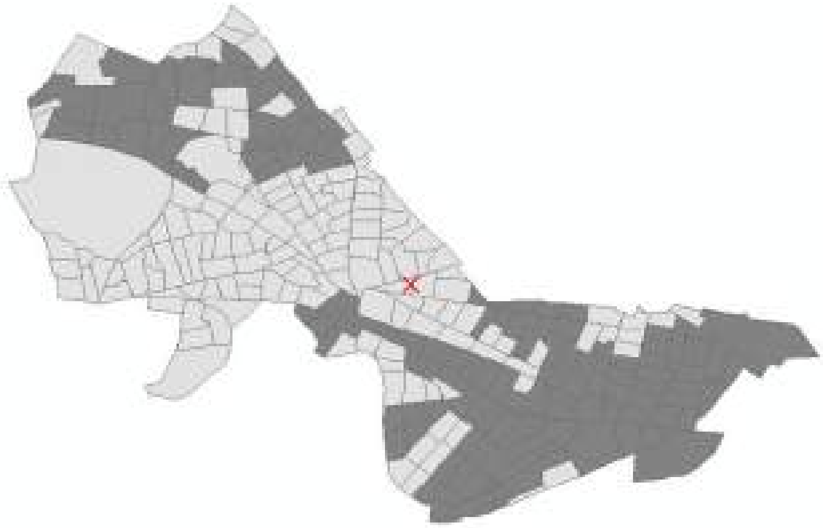
Tab. 1 trasportation services



[illegible]	[illegible]	[illegible]	[illegible]	2014	[illegible]
Coverage	[illegible]	[illegible]	n.a	[illegible]	[illegible]
		[illegible]	n.a	0%	0%
		[illegible]	n.a	[illegible]	[illegible]
		[illegible]	n.a	[illegible]	3
		[illegible]	n.a	[illegible]	[illegible]
	[illegible]	[illegible]	n.a	[illegible]	3
		[illegible]	n.a	100%	100%
	[illegible]	[illegible]	n.a	[illegible]	[illegible]
		[illegible]	n.a	[illegible]	112
		[illegible]	n.a	[illegible]	[illegible]
		[illegible]	n.a	[illegible]	[illegible]
	Parking	[illegible]	n.a	[illegible]	27
		[illegible]	n.a		4
		[illegible]	n.a	[illegible]	[illegible]

Comments:*According to the property assesment data for the year 2014, the differentiation between public and private parking is not achievable. The state use code to identify parking are 336 (parking garages) 337(parking lots).

4.1 Target area map with centroid spatial identification



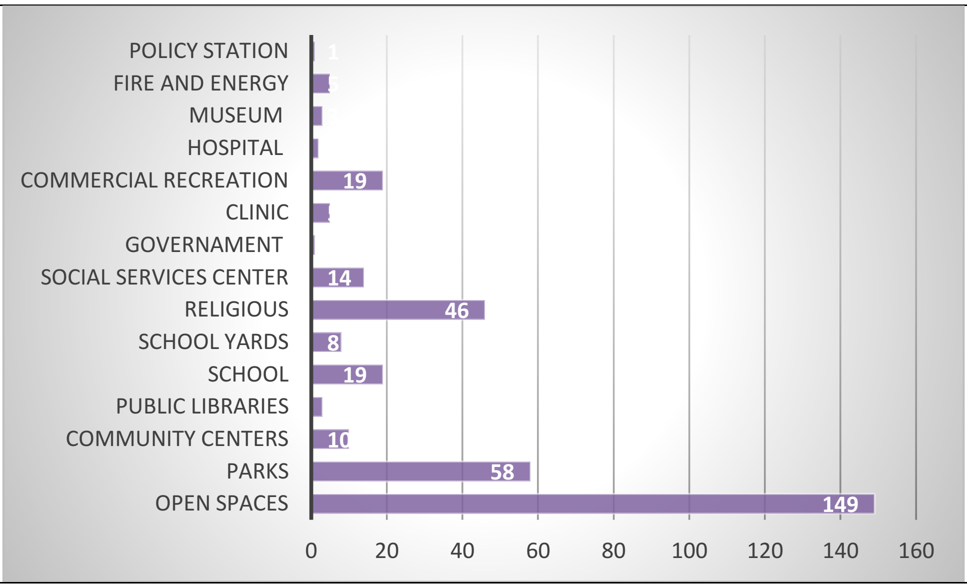
Centroide Coordinates	
Latitude	42,376244
Longitude	-71,112594

4.2 Target Area distance from the main Infrastructures

Target Area	Indicator	Variables	By Subway	By Bus	by Car
Target Area	Out region	Distances to the closest International Airport [Km]	2,91	15,65	10,10
		Distances to the closest Port [Km]	7,90	5,00	5,10
		Distances to the closest Highway [Km]	n.r.***	1,26	1,50

PART 5: Innovation Facilities

Public facilities

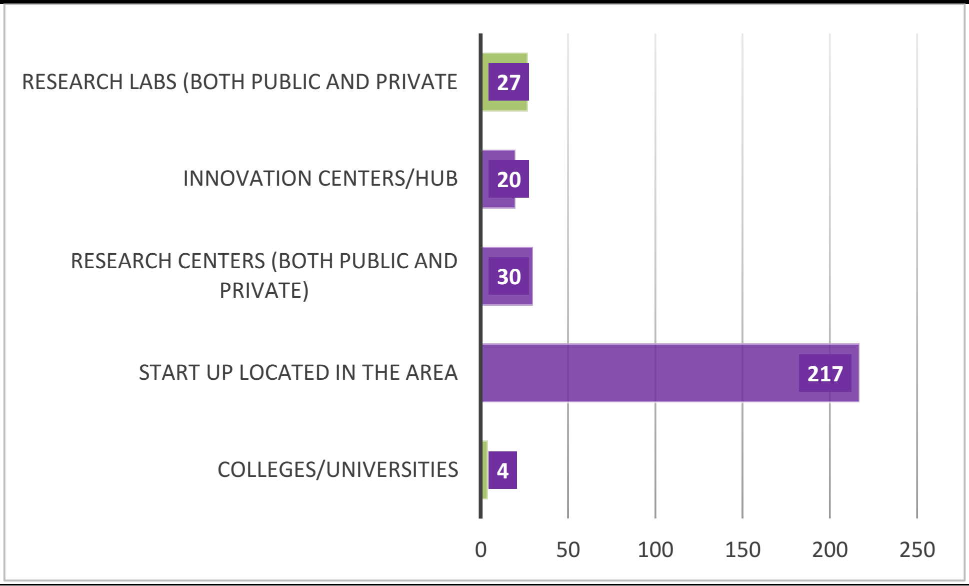


Comments: From Graph's analysis emerging the high number of public facilities in the area, more in particular 149 unit of open space, 58 Parks, 46 building religious. This data are very relevant because is evident the role of community in urban development project.

5.2 Innovation facilities

Innovation Facilities

Target Area	Public Facilities	Occurrence [No]	Surface* [Sq.Ft.]	Description**
Parcel Block/Ward	Colleges/Universities	4	n.a.	description to be provided
	Start up located in the area	217	n.a.	description to be provided
	Research Centers (both public an	30	n.a.	description to be provided
	Innovation Centers/Hub	20	n.a.	description to be provided
	Research Labs (both public and	27	n.a.	description to be provided



Comments: From graph is evident the high number of start up, research center and innovation the cause can be the presence of the Educational istitution(Mit-Harward). The high concentration of innovation facilities rapresent the engime of development process for local economic development. It is possible to argue that knowledge dynamics and innovation may find in cities a fertile ground in designing mix and tailored policies, derived from the nature of urban regeneration policy frame. In the target area, the knowledge dynamics in activating the concentration of innovation generate spillover effects, which supported by urban planning tools allow the expansion of innovation. In the target area are located 217 start up, 30 research center, 27 research labs, 20 innovation hub. In this sense have an important role the Cambridge Innovation Center Cambridge. CIC intends to nourish this context by housing professionals/entrepreneurs who run innovative businesses and therefore sustain the demand for business services.

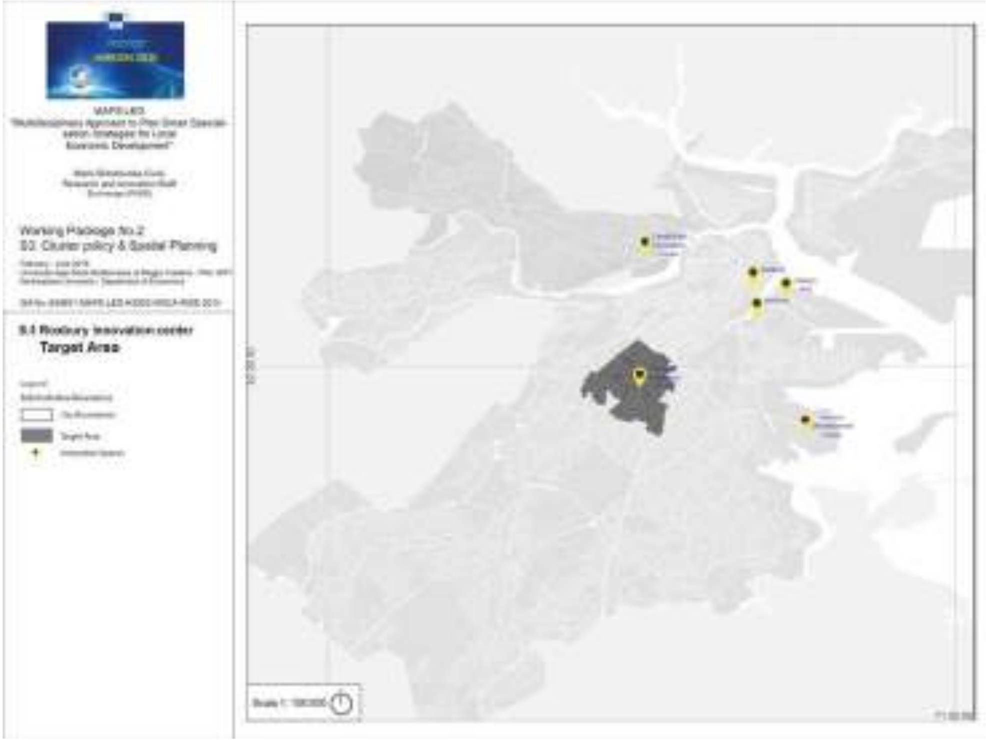
More in particular the CIC could be intended as a micro-cluster inside the bigger one, which enable knowledge transfer among entrepreneurial actors from a network-based perspective. Such as at the broader urban level organizations and firms network among themselves aiming to achieve growth and competitiveness,as within the CIC spaces, coworkers tend to create communitarian relationships towards engaging different forms of negotiable collaboration. These preliminary insights seem to suggest that the CIC model could be replicated not only because of its profitably but also because of its potential function in the entrepreneurial discovery process.

Cluster Case Study: Target Area Roxubury

Carla Maione with Cesare Cascella, Giuseppe Pronestì

Target Area identification

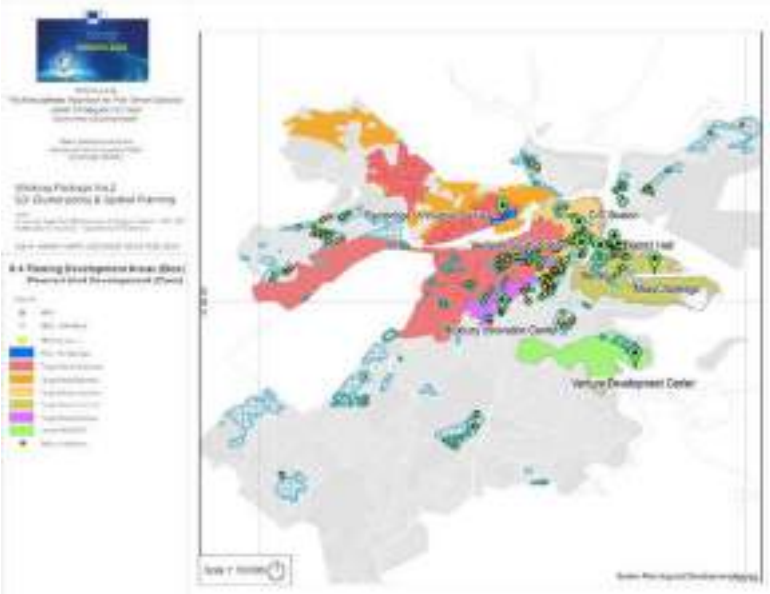
Target Area Maps



Cluster Localisation

Cluster(s)	Business and Education
City(ies)	Boston
Policy Initiatives	Roxbury Innovation Center

Planning initiatives corrispondence

1.Dudley Square Transportation & Air Quality Study, 2001 Roxbury; 2.Dudly square Vision, 2011 Roxbury; 3.Dudly Square Masterplan, 2016, Roxbury.	
Census Tract	25025080300 25025080401 25025080500

	25025080601 25025081400 25025081700 25025081800
Source:	For socio-demographic indicators, data have been collected by Census Tract (source: census.gov)

Target Area Description

The City of Boston is actively enhancing social and economic development by exploiting the potential of innovation. As a matter of fact, over the past years, different innovation initiatives have been implemented to generate urban transformation processes able to trigger the territorial growth. In 2010, for instance, the City of Boston and the Boston Redevelopment Authority have promoted the renovation of a former industrial, underutilized area close to the city center, namely the Seaport District area, lunching the so-called *Boston Innovation District* initiative aimed at creating "an ecosystem of innovation and entrepreneurship" (Rodriguez et al., 2015, p. 6).

The Public entity supported the project by implementing infrastructures and creating a gathering spot to attract the community of innovators, including both consolidated and emerging companies. The redeveloped area has attracted over 4,000 new jobs and 200 new companies (City of Boston, 2013), catalysing investments and new partnerships that boosted the transformation of the area.

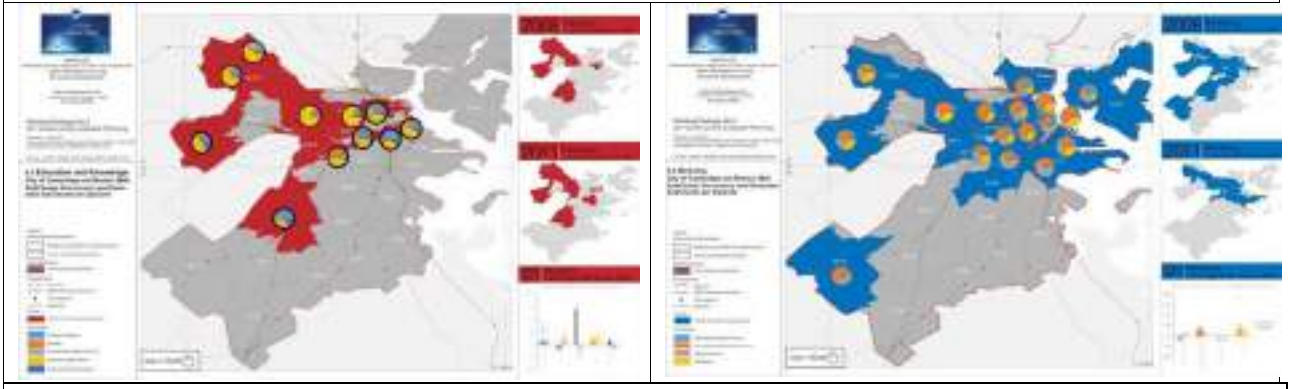
"Building on the successes and lessons learned from the Seaport Innovation District" (City of Boston, 2015, para. 1), the City explored the possibility to push the innovation dynamics spurring the development of deprived neighborhoods. For this purpose, it launched the Neighborhood Innovation District initiative to "help create new jobs, support existing business owners and well-established businesses, and encourage new investment" (City of Boston, 2015, para. 6). The pilot project of the Neighborhood Innovation District has been launched in 2014, focused on the neighborhood of Roxbury, located just 3 miles South West from downtown Boston.

Roxbury is the geographic heart of Boston, enclosing the center point of the city. Once a farming town on the outskirts of Boston, Roxbury began its transformation from agricultural, to industrial, to residential uses in the early nineteenth century. In the early twentieth century, waves immigrants came to Roxbury, and in the 1940s and 1950s African Americans began to migrate from the American south, making Roxbury a center of Black culture.

Cluster Structure

The spatial configuration and spatialisation of cluster at urban level highlight in Roxbury Target area the cluster Education and cluster Marketing and design.

Fig. 1 Cluster Education-Cluster occurrence per zipcode



Related cluster

Based on maps-led Cluster spatialisation at urban level I evident that the cluster more related in the target area are:

1) Education
2) Busness
3) Marketing
4) Performing Arts

PART 2: Sociodemographic analysis

Population By Sex and Race

Comments: Target area represent one of the most densely populated neighborhoods of the city. In particular the graph shows Roxbury is a multiethnic area, representing the nucleus of the Afro-American community in Boston. In 2013 The population is composed by the 55% of black or African American, 15% for some others and the 22% white people.

Today Roxbury is home to a diverse community which includes African American, Hispanic, and Asian families, along with young professionals. The median household income ranged from $18,000 to $44,000 between 2009 and 2013, compared to the $53,601 of the city average (Hartman & Zhu, 2013).

Roxbury's population grew by 16.8% from 2000 to 2010.

Tab.1 Population By Sex and Race

Population by Sex and Race						
	2010	2011	2013	2010	2011	2013
Population by Sex						
Male	9910	8674	9354	46%	45%	45%
Female	11657	10695	11413	54%	55%	55%
Total	21567	19369	20767	100%	100%	100%
Population by Race						
White	5008	3618	4663	23%	19%	22%
Black or African American	11886	11482	10882	55%	59%	52%
American Indian	165	30	51	1%	0%	0%
ative Hawaiian and other pacific	114	206	174	1%	1%	1%
Two or More Races	1155	953	895	5%	5%	4%
Some Others	3140	2773	3655	15%	14%	18%
Hipanic or Latino	5668	5016	6143	26%	26%	30%
Not hispanic or latino	15899	14353	14624	74%	74%	70%

Fig.3 Hispanic or Not Hispanic

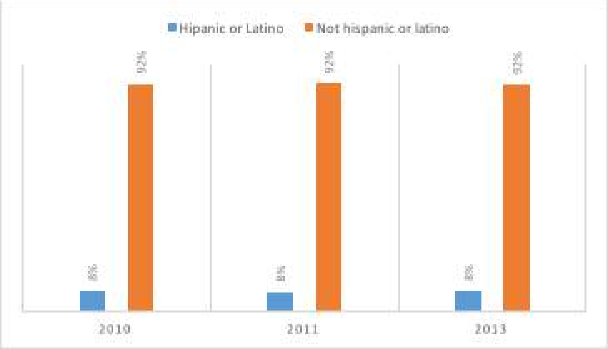
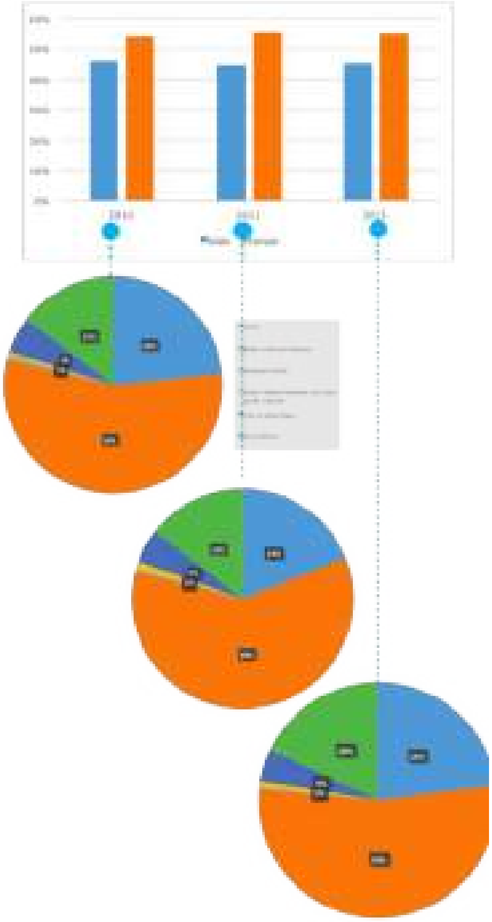
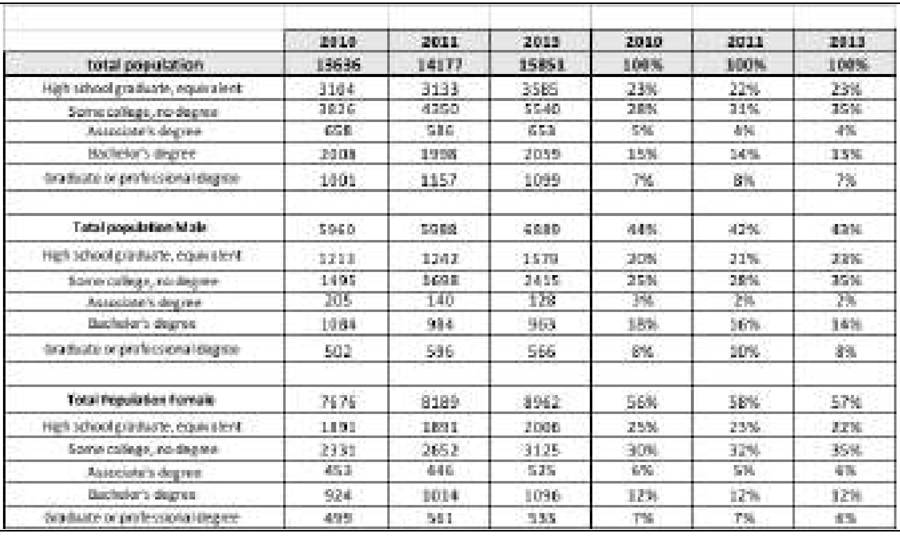


Fig. 2 Population by Sex and Race



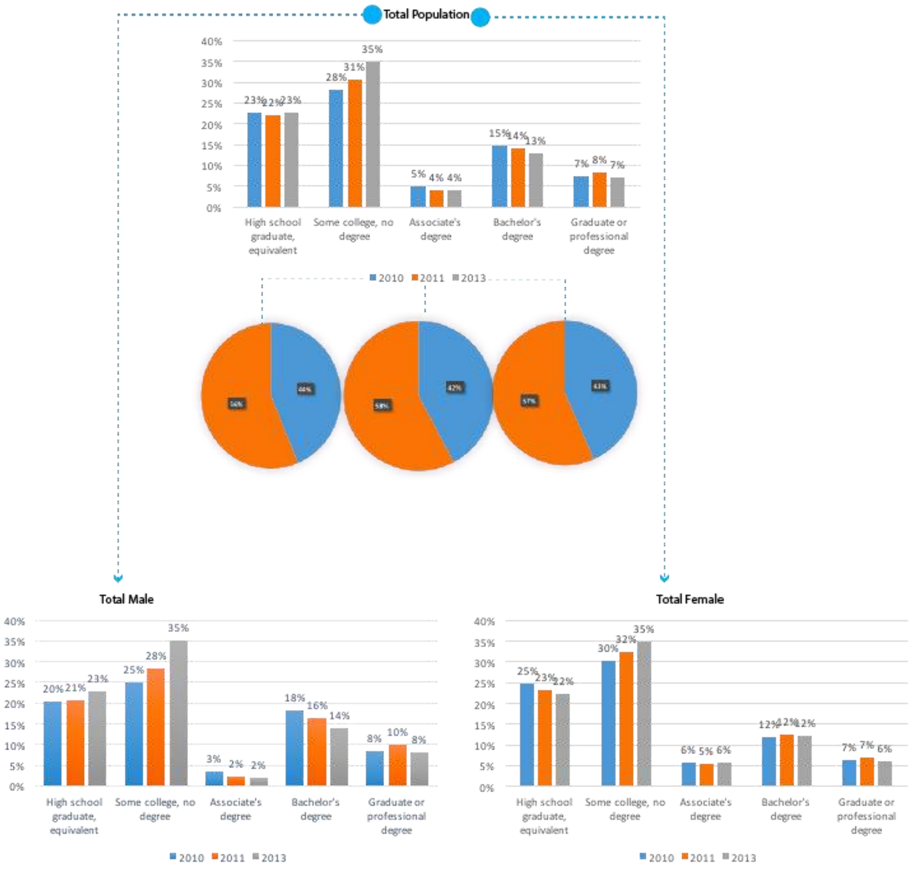
Educational Attainment by Sex and Degree

Tab. 1 Educational Attainment Population by Sex and Degree



	2010	2011	2013	2010	2011	2013
total population	13636	14177	15851	100%	100%	100%
High school graduate, equivalent	3164	3133	3585	23%	22%	23%
Some college, no degree	3826	4350	5540	28%	31%	35%
Associate's degree	658	586	653	5%	4%	4%
Bachelor's degree	2008	1998	2059	15%	14%	13%
Graduate or professional degree	1001	1157	1099	7%	8%	7%
Total population Male	5960	5988	6880	44%	42%	43%
High school graduate, equivalent	1273	1242	1579	20%	21%	23%
Some college, no degree	1495	1698	2415	25%	28%	35%
Associate's degree	205	140	128	3%	2%	2%
Bachelor's degree	1084	984	963	18%	16%	14%
Graduate or professional degree	502	596	566	8%	10%	8%
Total Population Female	7676	8189	8962	56%	58%	57%
High school graduate, equivalent	1891	1891	2006	25%	23%	22%
Some college, no degree	2331	2652	3125	30%	32%	35%
Associate's degree	453	446	525	6%	5%	6%
Bachelor's degree	924	1014	1096	12%	12%	12%
Graduate or professional degree	499	561	533	7%	7%	6%

Fig. 1 Educational Attainment Total population



Comments: The graph shows as during the three years analysed the level of some college or degree is growing until to arrive at the 36% for male and 34% female. Is evident the 35% of people that have finished some college or degree. The cause can be the presence in the target area of the Roxbury Community College and the John D. O'Bryant School of Mathematics and Science are two well-known educational institutions.

Labour Market

Tab. 1 Employed and Unemployed

Employed						
Age and Sex	2010	2011	2013	2010	2011	2013
25-44	3512	3347	3375	46%	43%	41%
Male	3651	3517	3851	48%	45%	46%
Female	4033	4296	4481	52%	55%	54%
Total	7684	7813	8332	1	1	1
White	2045	1972	2238	27%	25%	27%
Black or African American	4160	4276	4136	54%	55%	50%
American Indian	42	37	21	1%	0%	0%
Asian + Native Hawaiian and	339	399	427	4%	5%	5%
Two or More Races	191	266	262	2%	3%	3%
Some Others	907	863	1248	12%	11%	15%

Unemployed						
Age and Sex	2010	2011	2013	2010	2011	2013
25-44	457	509	692	36%	38%	43%
Male	488	443	605	39%	33%	38%
Female	778	892	1008	61%	67%	62%
Total	1266	1335	1613			
White	103	151	303	8%	11%	19%
Black or African American	895	951	1008	71%	71%	62%
American Indian	26	27	23	2%	2%	1%
Asian + Native Hawaiian and	24	17	0	2%	1%	0%
Two or More Races	0	22	15	0%	2%	1%
Some Others	218	167	264	17%	13%	16%

Fig. 1 Employment By Sex and Race

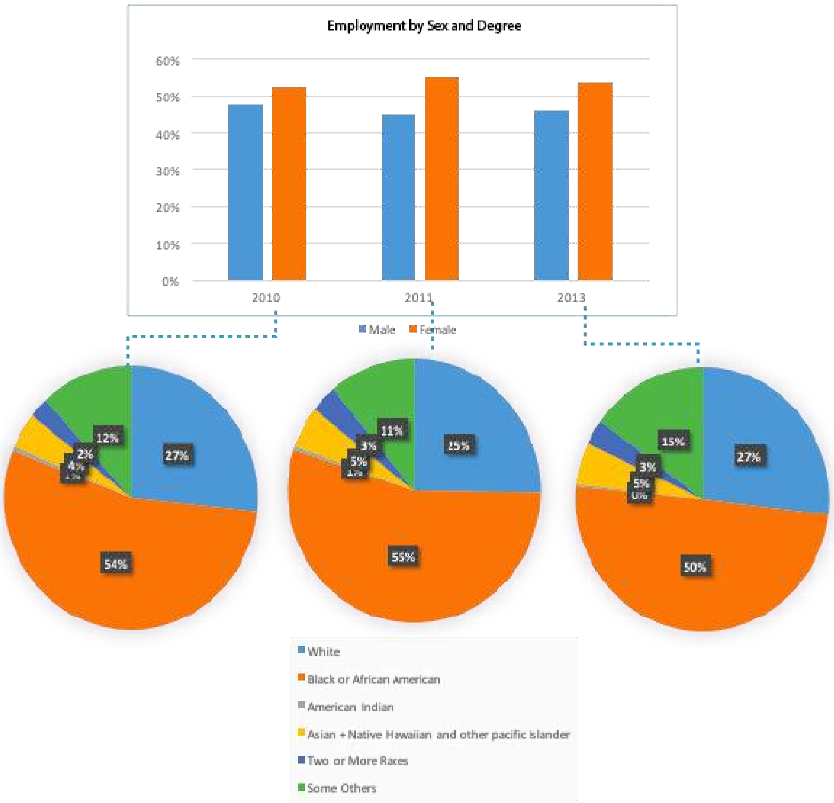
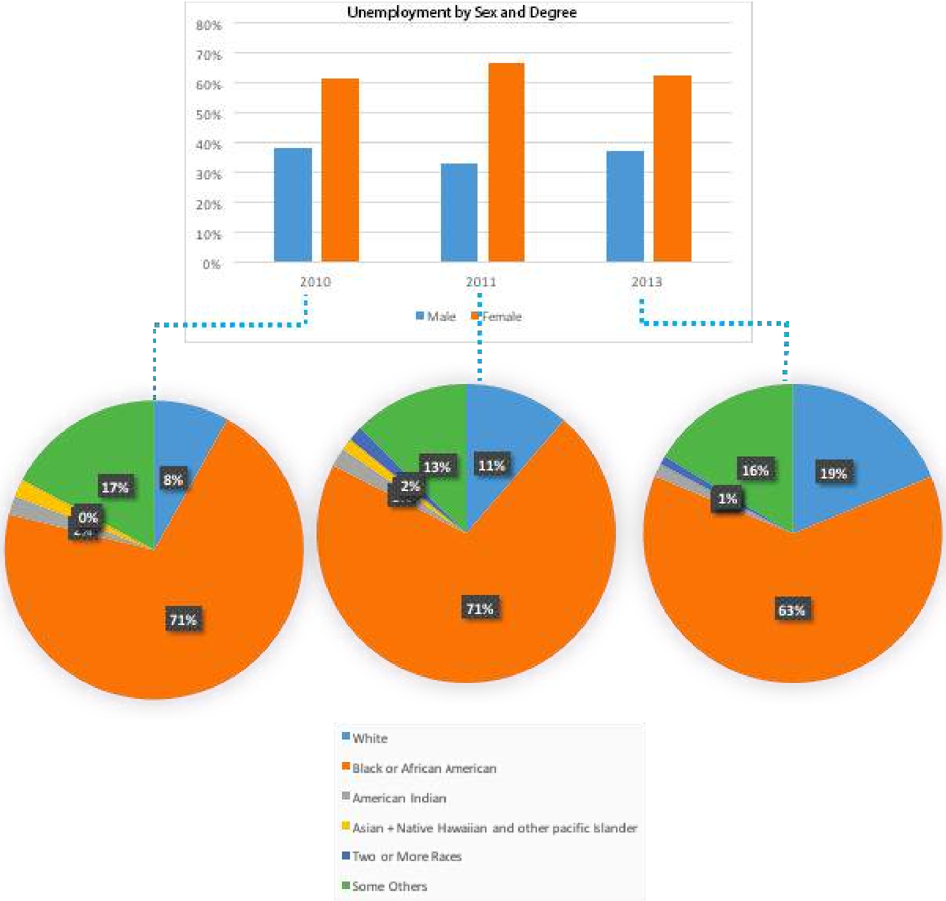
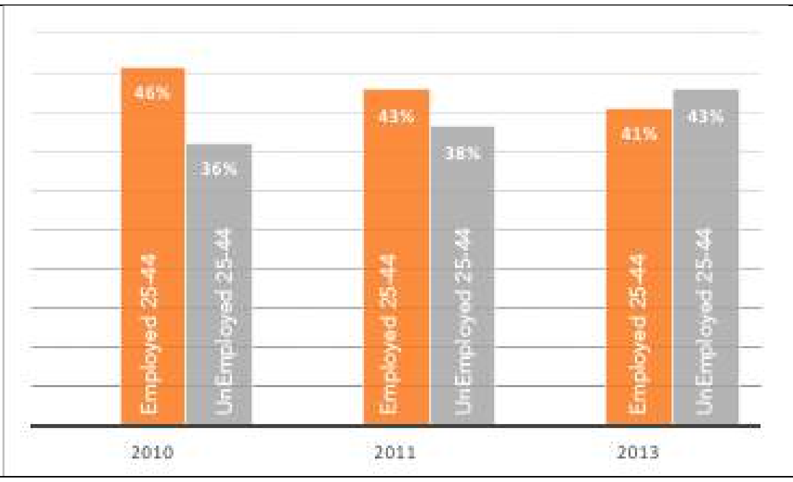


Fig. 2 Unemployment By Sex and Race



Employed and Unemployed Comparation (25-44)



Comments: There are 698,875 jobs in Boston: approximately 434,700 jobs (62.2%) are filled by workers who live outside the city and commute. The remaining jobs are filled by Boston residents. The proportion of Boston workers who live in Boston has remained roughly steady since 1990, at 39.4% in 1990, 35.2% in 2000, and 37.9% in 2010. Comparing graphs(employment and unemployment by sex and race) in the target area emerges that from 2010to 2013 the level of employed for male decrease but increasing the employed for female. Is evident an costant growth about the employed. Since 2010 to 2013, from graph is clear the employed 25-44 decreasing from 46% but also increasing the unemployed from 36% to 41%. The cause can be linked to the new educational and training activities.

Tab.1 In Labor force and Not in Labor force

In labor force						
Age and Sex	2010	2011	2013	2010	2011	2013
25-44	3969	3856	4067	44%	42%	41%
Male	4139	3960	4456	46%	43%	45%
Female	4811	5188	5489	54%	57%	55%
Total	8950	9148	9945	1	1	1
White	2148	2123	2541	24%	23%	26%
Black or African	5055	5227	5144	56%	57%	52%
American Indiar	68	64	44	1%	1%	0%
Asian + Native H	363	416	427	4%	5%	4%
Two or More Ra	191	288	277	2%	3%	3%
Some Others	1125	1030	1512	13%	11%	15%

Not in Labor force						
Age and Sex	2010	2011	2013	2010	2011	2013
25-44	758	852	758	15%	15%	11%
Male	2097	2314	2781	40%	41%	42%
Female	3098	3328	3831	60%	59%	58%
Total	5195	5642	6612	100%	100%	100%
White	854	992	1596	16%	18%	24%
Black or African	3420	3444	3426	66%	61%	52%
American Indiar	18	16	7	0%	0%	0%
Asian + Native H	262	300	397	5%	5%	6%
Two or More Ra	251	262	387	5%	5%	6%
Some Others	390	628	799	8%	11%	12%

Fig. 1 In labor force By Sex and Race

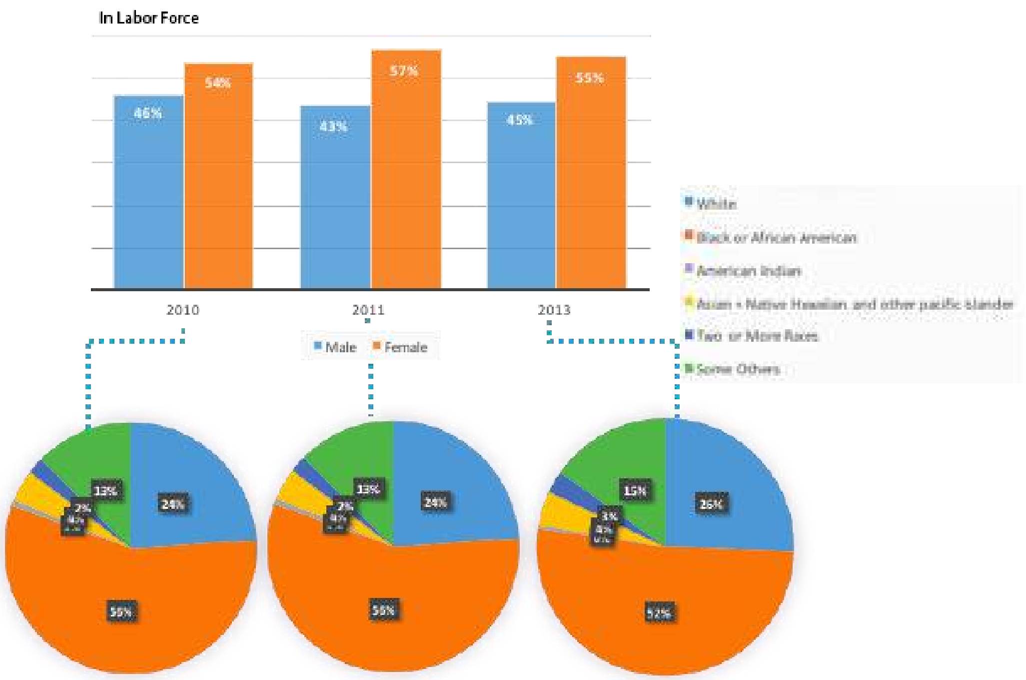


Fig. 2 Not in Labor force by Sex and Race

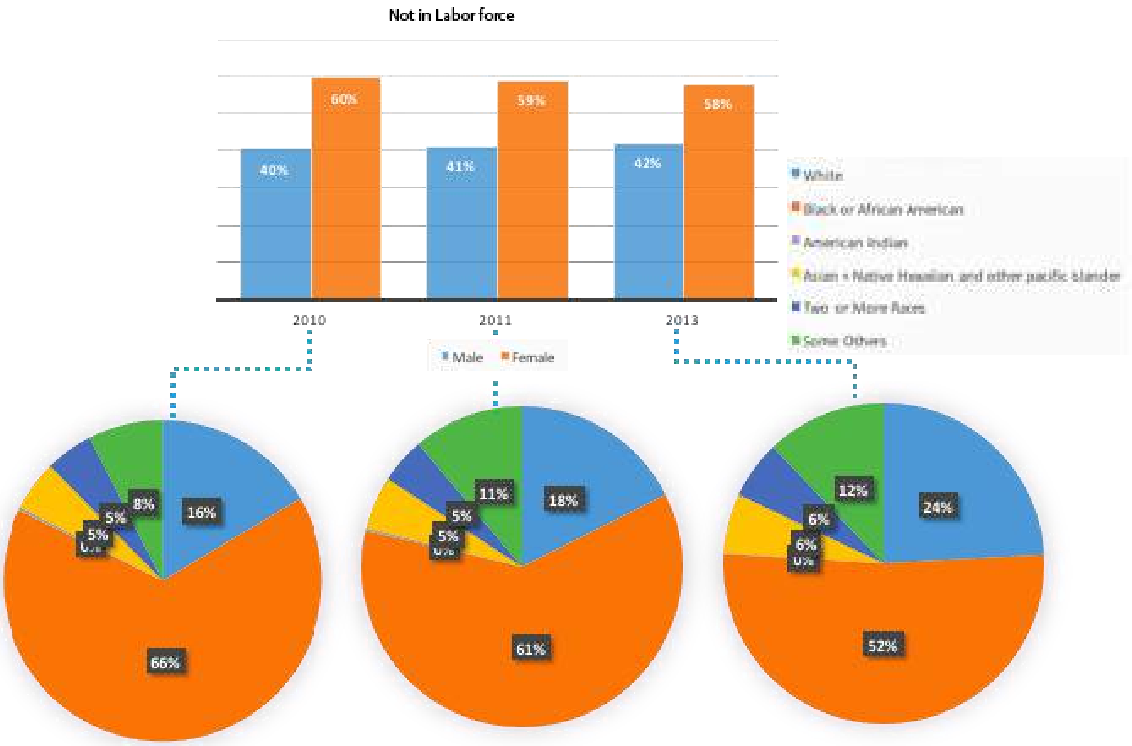
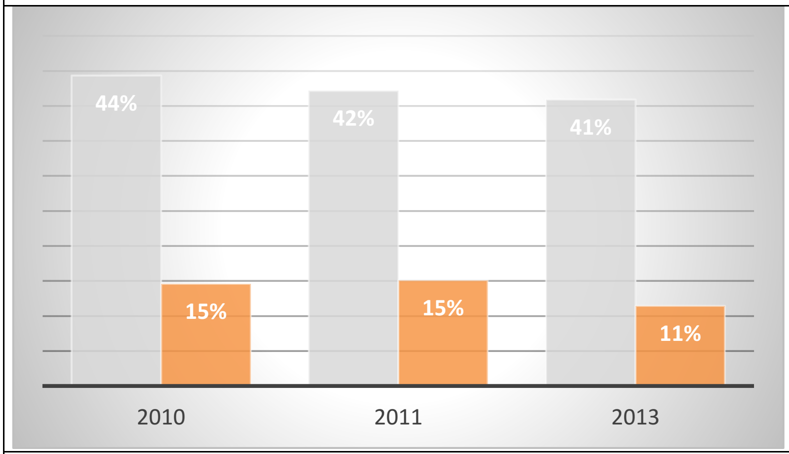


Fig. 3 In labor force and Not in Labor force 25-44



Comments: The majority of the Boston resident labor force is between the ages of 25 and 44.Comparing graphs(in labor force by sex and race) in the target area emerges from 2010to 2013 an costant growth about the in labor force and not in labor force.. Since 2010-2013 from Graph's analysis in Labor force 25-44 decrease from 44%to 41%, not in Labor force 25-44 is very low percentage in respect to in labor force.

Housing Stock

Tab. 1 Housing Stock

Housing Occupancy						
	2010	2011	2013	2010	2011	2013
Total housing units	8696	8875	9028			
Occupied Housing Units	7614	7804	8015	88%	88%	89%
Vacant Housing Units	1082	1071	1013	12%	12%	11%
Occupied Housing Tenure						
Owner-occupied housing units	1734	1616	1332	23%	21%	17%
Renter-occupied housing units	5880	6188	6683	77%	79%	83%
Vacant housing unit						
For rent	563	562	517	52%	52%	51%
Rented or sold not occupied	152	146	188	14%	14%	19%
For sale only	57	31	0	5%	3%	0%
For seasonal, recreational or occasio	28	0	16	3%	0%	2%
all other vacants	282	332	292	26%	31%	29%

Fig. 1 Housing Occupancy

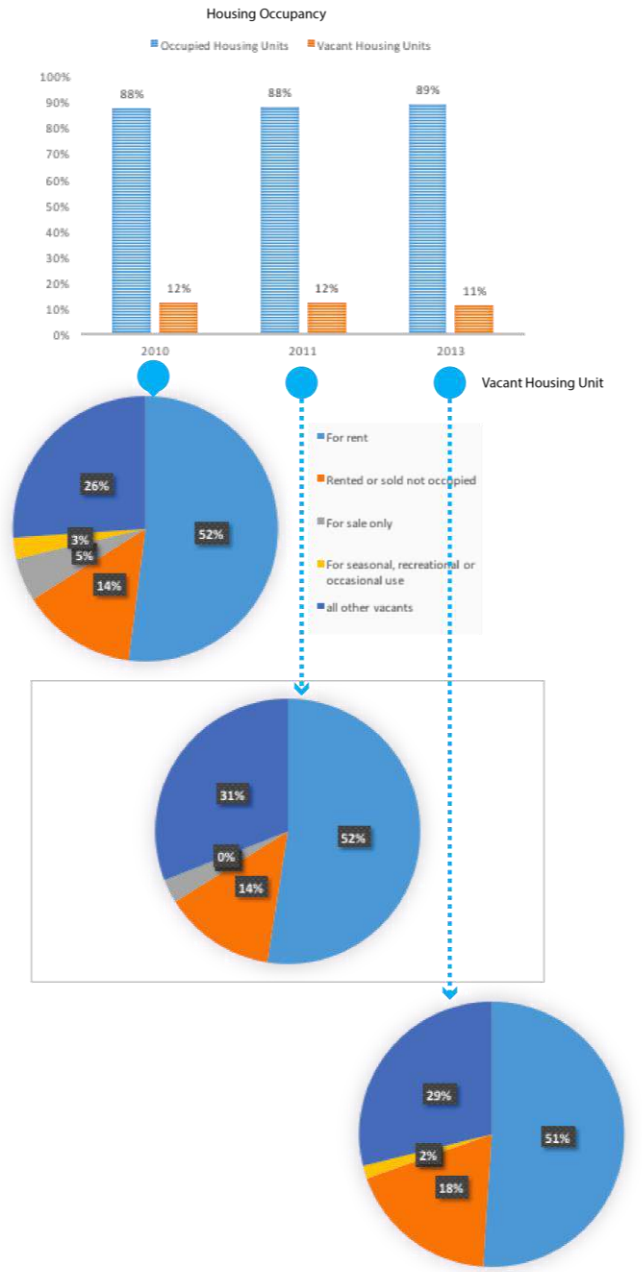
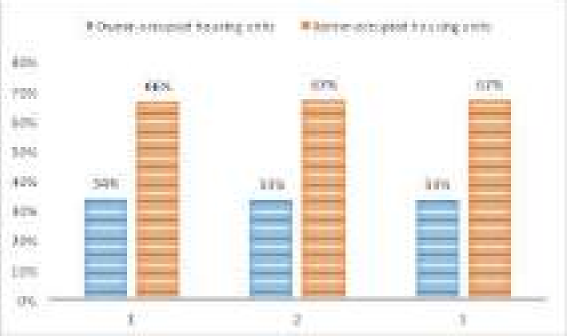


Fig. 2 Occupied housing tenure



Comments: in the target area the housing unit are9028. Housing unit growth between 2000 and 2010 was the strongest decade since before 1950: Boston added 20,546 new units of housing, for a decade-long growth rate of 8.2%. Since 2010 to 2013 the housing unit in the target area preserve a costant growth. The graph analysys shows the high percentage of Occupied Housing unit the 88% in 2010 until to the 89% in 2013. The vacant housing unit higlight the high percentage of housing unit for rented, a 23% for seasonal recreational but emerge an high number in 2011 all other vacants.

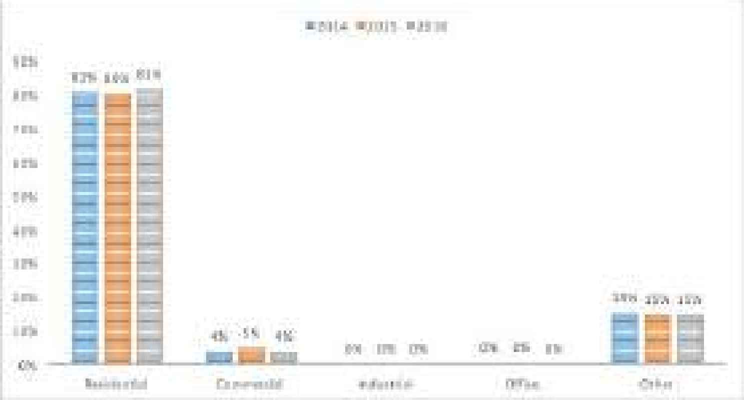
PART 3: Real Estate

Target Area Parcell Block

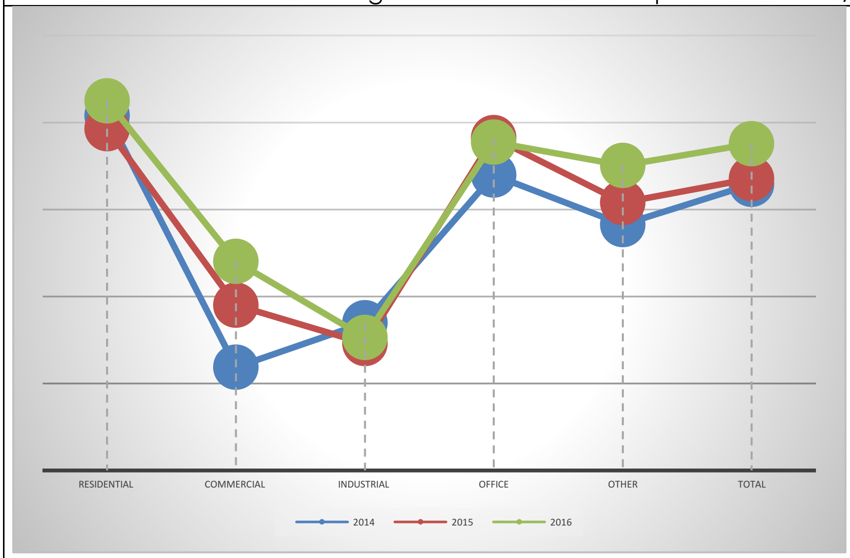
Property Type

Tab. 1 Property Type

	2014	2015	2016
Residential	81%	80%	81%
Commercial	4%	5%	4%
Industrial	0%	0%	0%
Office	0%	0%	0%
Other	15%	15%	15%
TOTAL	100%	100%	100%

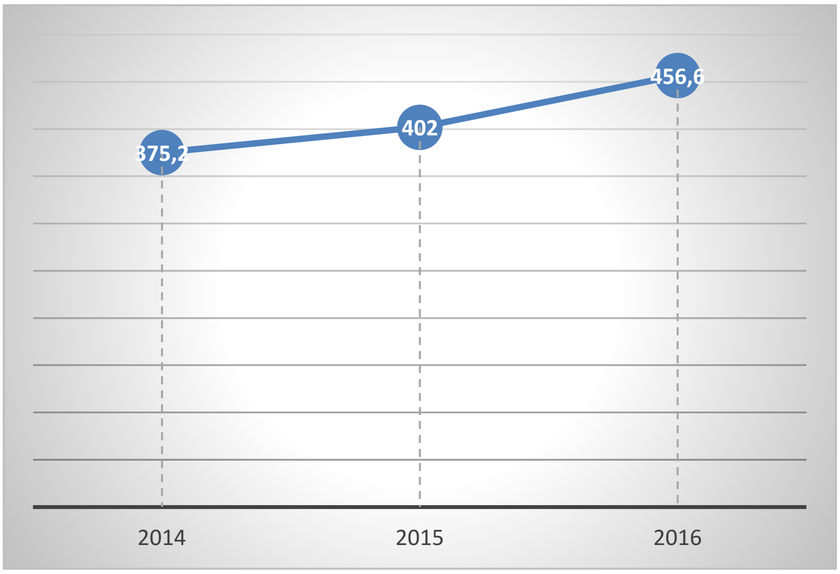


Average-Total Assessed Value per Parcel Block/ward ($/sqf)



Comments: Excluding the recession, the housing market in Boston has remained strong(source: Boston Redevelopment authorities). In Boston the assessed value of residential properties in has grown faster than that of commercial properties since 2001. The total assessed value of residential properties was higher than the total assessed value of commercial properties in 2016. Infact the graph highlight the property value per category and in particular shows the total assessed value of Office prosperities was higher than the total assessed value of residential and commercial.

Average Market Value per parcel block/ward Residential($/sqf)



PART 4: Services

Trasportation and Infrastructure

Target area	Category	Variables	2008**	2014	2016
Boston	Infrastructure	Number of Subway/Bus Stops/Bike hub(s) within the study area [No.]	n.a	0	0
		Change of Number of Bus stop(s) within the study area in last 10 years [%](if available)	n.a	0%	0%
		No. Of Bus Stops [No.]	n.a	73	68
		No. Of T Stops [No.]	n.a	4	4
		No. Of Bike hubs/stops [No.]	n.a	0	0
	Services	Total Number of line(s) stopping per station(s) within the study area [No.]	n.a.	0	0
		Ratio of station(s) accessible for wheelchair within the study area [%]	n.a	0%	0%
	Accessibility	Residential Units close to any station (200 mt) [No.]	n.a	81	2544
		Commercial Units close to any station [No.]	n.a	11	5
		Office Units close to any station [No.]	n.a	0	0
		Retail Units close to any station [No.]	n.a	7	4
	Parking	Public [No.]	n.a	1	1
		Private [No.]	n.a.	21	128
		Average cost per hour of parking [$]	n.a	n.a	12

Comments:
*According to the property assesment data for the year 2014, the differentiation between public and private parking is not achievable. The state use code to identify parking are 336 (parking garages) 337(parking lots).

Target area map with centroid spatial identification

Centroide Coordinates	
Latitude	42,3762448
Longitude	--71,0852044

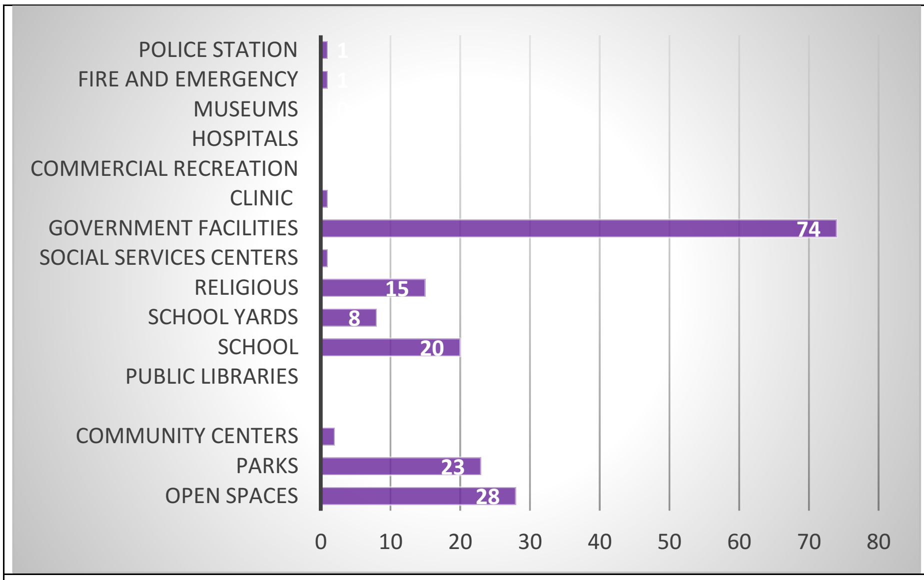
Target Area distance from the main Infrastructures

Target Area	Indicator	Variables	by Subway	by Bus	by Car
Target Area	[illegible]	Distances to the closest International Airport [Km]	6,55	11,24	10,20
		Distances to the closest Port [Km]	4,10	6,80	4,20
		Distances to the closest Highway [Km]	n.r.***	n.r.***	4,40

PART 5 :Innovation facilities

Public Facilities by number and surface

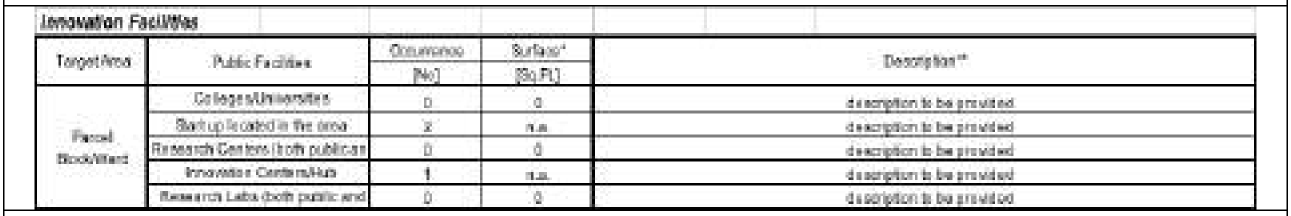
Public Facilities by Number and Surface		Year 2016		
Target Area	Public Facilities	Occurrence [No]	Surface* [Sq.Ft.]	Description
Roxbury Target Area / Ward 9	Open Spaces	28	398500	description to be provided
	Parks	23	1520474	description to be provided
	Community Centers	2	n.a.	description to be provided description to be provided
	Public Libraries	0	0	description to be provided
	School	20	1634494	description to be provided
	School yards	8	n.a.	description to be provided
	Religious	15	100979	description to be provided
	Social Services Centers	1	21498	description to be provided
	Government Facilities	74	449725	description to be provided
	Clinic	1	73640	description to be provided
	Commercial Recreation	0	0	description to be provided
	Hospitals	0	0	description to be provided
	Museums	0	0	description to be provided
	Fire and Emergency	1	14100	description to be provided
	Police Station	1	194000	description to be provided



Comments: From Graph's analysis emerging the high number of public facilities in the area, more in particular 74 government facilities,23 parks and 28 open space, 15 building religious. This data are very relevant because is evident the role of community in urban development project.

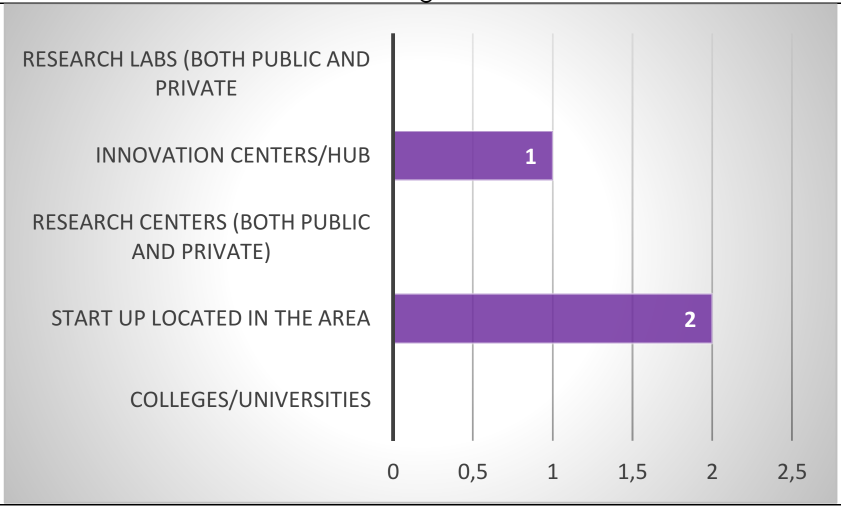
The cause can be that knowledge dynamics in activating the concentration of innovation generate spillover effects, which supported by urban planning tools allow the expansion of innovation. The Public entity supported the project by implementing infrastructures and creating a gathering spot to attract the community of innovators, including both consolidated and emerging companies.

Innovation facilities


Innovation Facilities

Target Area	Public Facilities	Occurrence [No]	Surface* [Sq.Ft.]	Description**
Parcel Block/Ward	Colleges/Universities	0	0	description to be provided
	Start up located in the area	2	n.a.	description to be provided
	Research Centers (both public an	0	0	description to be provided
	Innovation Centers/Hub	1	n.a.	description to be provided
	Research Labs (both public and	0	0	description to be provided

Fig. 1 Occurrence of Innovation Facilities



Comments: The graph shows the occurrence of innovation facilities. More in particular 2 sturt up located in the area in the last period. One corresponding to the Roxbury Innovation Center, is a civic innovation space, providing business services, work spaces, networking opportunities and education programs to the local community.

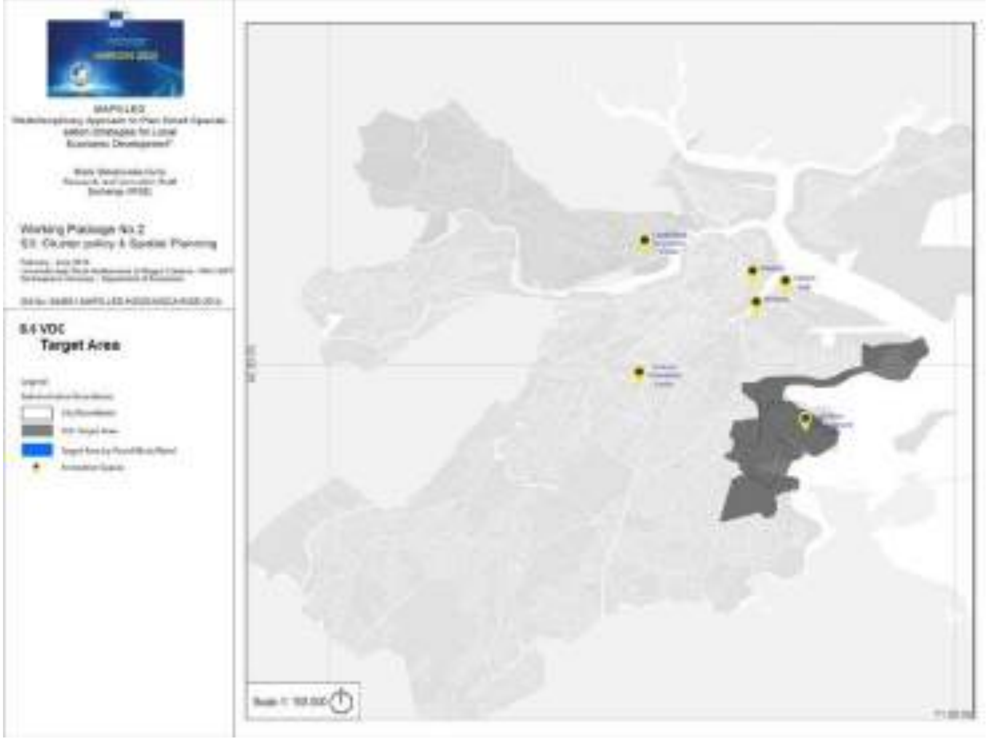
This physical facility, located in the hearth of the Dudley Square, will represent "a catalyst for economic development" and will lift "the entire community", as stated by the Mayor Walsh (City of Boston, 2015, para. 2).The Roxbury Innovation Center is a civic innovation center that supports local economic development by encouraging innovation and entrepreneurship. It is located within the iconic architecture of the Municipal Bolling Building which hosts the Boston Public Schools headquartersand is located in Dudley Square (Roxbury). The challenge of the RIC as a pilot project of the Neighborhood Innovation Initiative consist of bringing the future economy in every neighborhood, not only the wealthiest ones. In fact, Roxbury is affected by high level

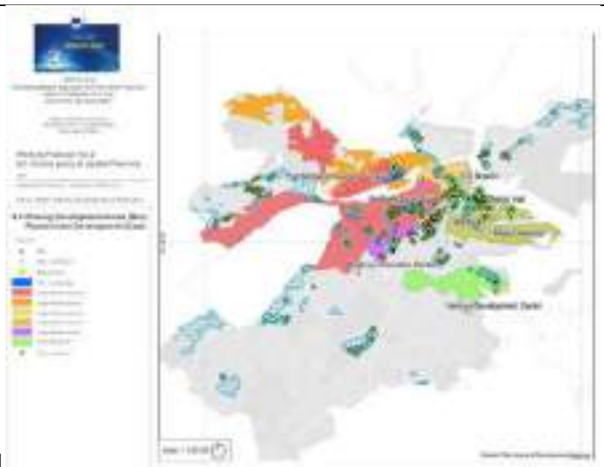
of unemployment and segregation compared to the Boston area. For this reason, this center is more social- and educational-oriented compared to the other two venues run by VCF. While encouraging and supporting local entrepreneurship to promote an inclusive economic development, VCF at RIC isalso focused on avoiding displacement and maximizing community benefits. The goal is to create an environment for people to learn about startup, entrepreneurship, innovation skills, help them to start a new business. Train local community to let them participate to the new economy.
As it is the case of the DH, RIC is positioned as a platform: a local space that is available for groups to provide programming that supports innovators, entrepreneurs, and business founders.
The physical capital provided by RIC consists of: the Think Space (a large multi-purpose event space), the Learn Lab (medium-sized for classes and workshops), the Team Room (a small room for meetings of 4/8 people). In addiction to those renting spaces, RIC is equipped with a digital fabrication laboratory containing tools such as a laser cutter and 3D printer. As part of and supported by the Fab Lab network, RIC makes this facility available to the local community.

Cluster Case Study:
Target area: Venture Development Center Boston

Carla Maione with Israa Hanafi Mahmoud

PART 1: Urban Regeneration

Target Area identification
Cluster Localisation


Cluster(s)	Educational cluster Insurance cluster
City(ies)	Boston
Policy Initiatives	Venture Development Center
Planning initiative corrispondence	
.1.Columbia Point Master Plan, 2001,Dorchester; 2.Glover's Corner Study Area, 2017,Dorchester; 3.Dorchester Avenue, 2017, Dorchester	 1
Census Tract	25025981201 25025081700

	25025081400 25025080601 25025080500 25025080401
Source:	For socio-demographic indicators, data have been collected by Census Tract (source: census.gov)

Target Area Description

The target area is localized in Dorchester, its considered a Boston's largest and most populous neighborhood. The core of the target area is represented by Venture Development Centre (VDC).

VDC is a non-profit organization spatially localized in University of Massachusetts (Zip Code 02125) and in particular in the business district, Mainly identified as a business incubator, it delivers the needed support to start-ups companies to turn their visions and ideas into reality by providing physical laboratories, financial aids and the eco-environment for entrepreneurs to inspire and innovate.

Venture Development Centre is a managed incubator for early-stage business, university, and student entrepreneurs. The Venture Development Center is spatially and economically part of LIFE SCIENCE CORRIDOR located on the red line extensions and connecting 5 cities between (Somerville, Cambridge, Boston, Quincy and Braintree). This life sciences corridor benefits from a knowledge spillover, advances in academic sciences fields, innovative research and proximity to major research hospitals and strategic presence of venture capital resources. Being Part of a green campus initiative, entrepreneurs in residence, employers and Staff members of the VDC commute responsibly and Consciously for reducing CO2 in the environment. However, they are not provided a car parking lot inside the university. Venture Development center is mainly focused on biotechnology, Pharmaceuticals, Educational and life-science Start-up companies; a majority of incubated companies10 such as (SQZ)11 or (EnVolv) are mainly specialized in engineering, biopharma, life sciences and chemicals.

Cluster Structure

Fig. 1 Educational cluster
Subcluster occurrence per Zipcode

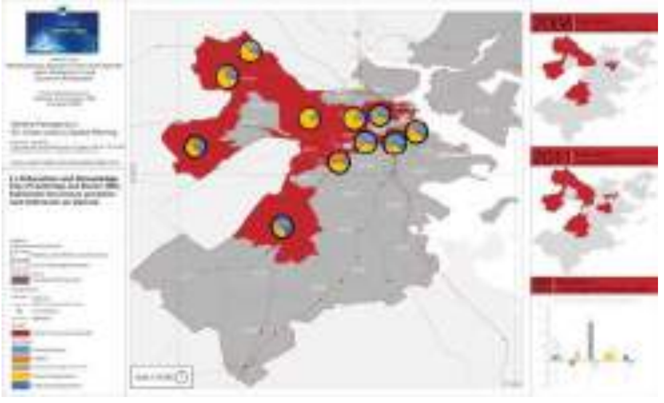
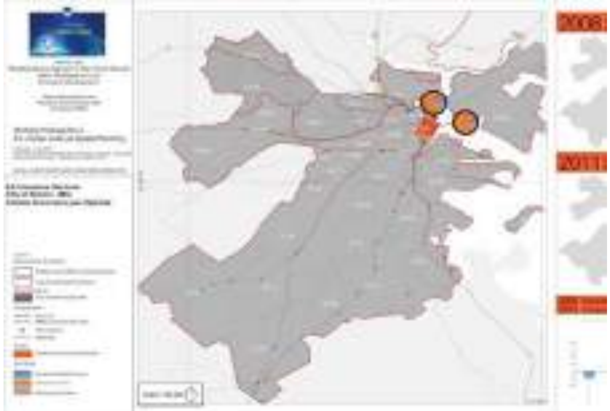
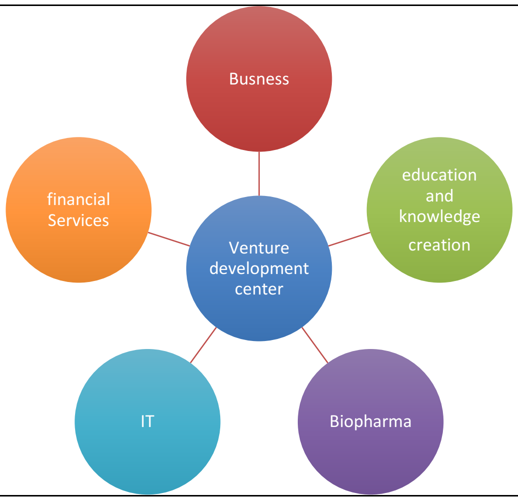


Fig. 2 Insurance Cluster
Subcluster Occurrence per Zipcode



Related cluster



Based on maps-led Cluster spatialisation at urban level I evident that the cluster more related in the target area are:

1) Education
2) Busness
3) Marketing
4) It
5)

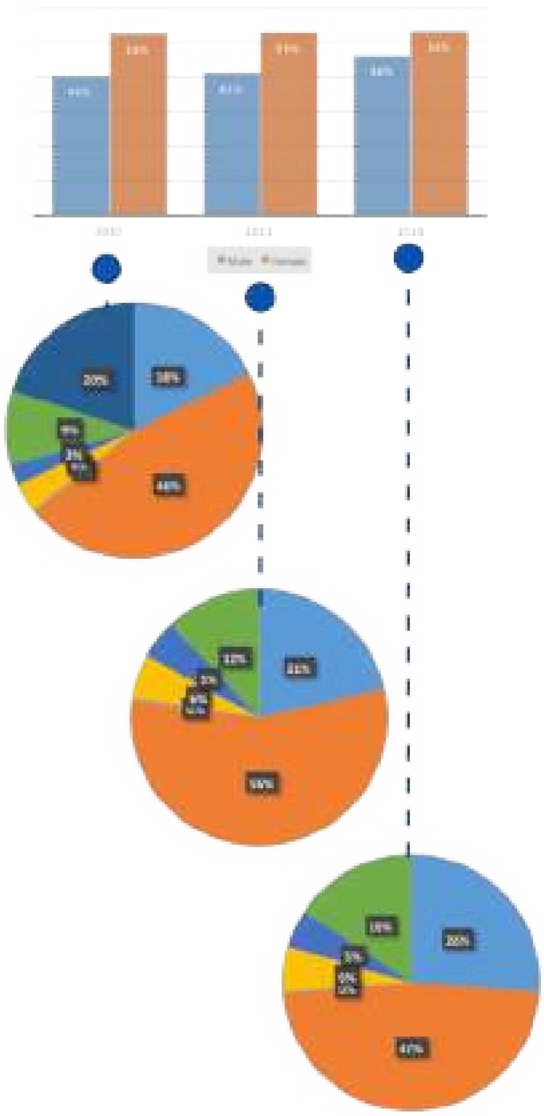
PART 2: Sociodemographic Analysis

Population By Sex and Race

Tab.1 Population By Sex and Race

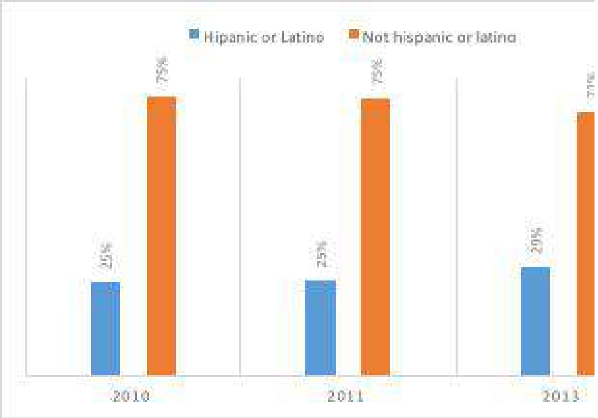
Population by Sex and Race	2010	2011	2013	2010	2011	2013
Population by Sex						
	13897	14835	15684	100%	100%	100%
Male	5644	6114	7291	41%	41%	46%
Female	7332	7876	8393	53%	53%	54%
Population by Race						
White	3070	3176	4106	22%	21%	26%
Black or African American	8059	8261	7440	58%	56%	47%
American Indian	44	58	35	0%	0%	0%
Asian + Native Hawaiian and other pacific	644	820	895	5%	6%	6%
Two or More Races	457	724	753	3%	5%	5%
Some Others	1623	1796	2455	12%	12%	16%
Hipanic or Latino	3471	3769	4570	25%	25%	29%
Not hispanic or latino	10426	11066	11114	75%	75%	71%

Fig. 1 Population by Sex and Race



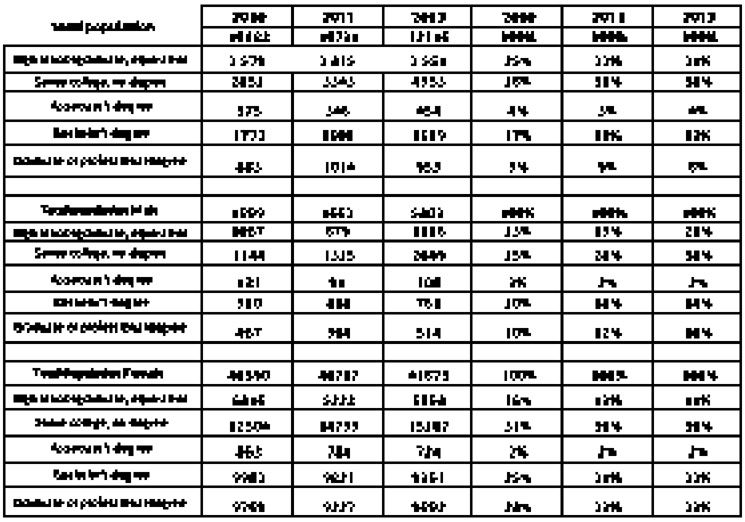
Comments:
The target area is localised in the largest and most populous neighborhood composed by the high percentage of female residents. In 2013 the graph shows an increase of 52% of females residents in respect to the 48% of males residents. This sections of Dorchester have distinct ethnic, racial, and socioeconomic compositions. From graph analysis emerges an high percentage of Black or African America, probably for the high concentration of Cape Verdean residents that living in the area.

Fig. 2 Hispanic or Not Hispanic



Educational Attainment by Sex and Degree

Tab. 1 Educational Attainment



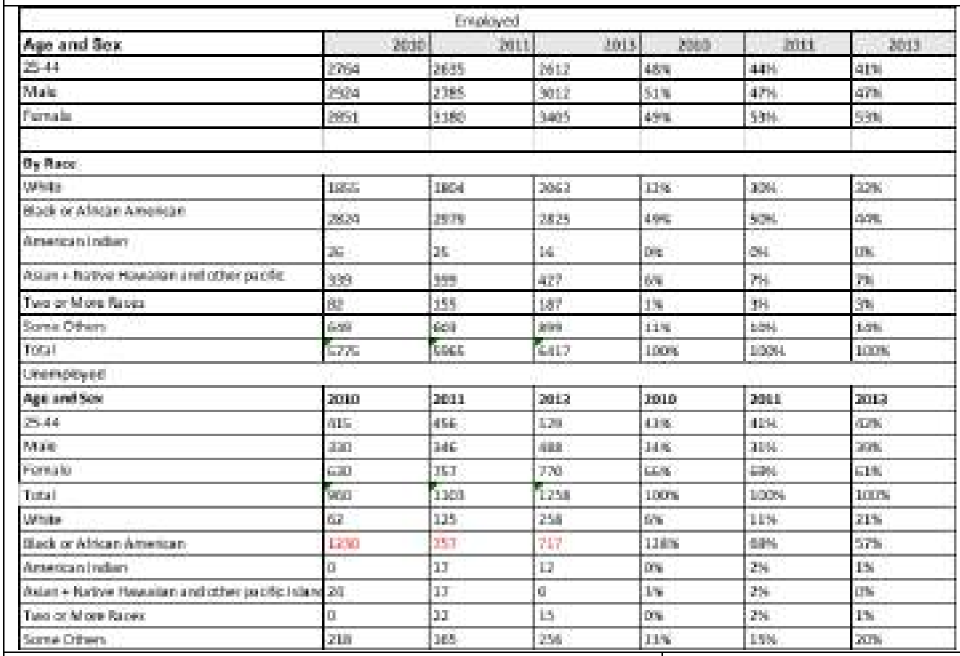
Total population	2010	2011	2012	2010	2011	2012
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	33%	[illegible]
Some college, no degree	2851	3345	4955	[illegible]	31%	38%
Associate's degree	575	546	[illegible]	4%	3%	4%
Bachelor's degree	1773	[illegible]	[illegible]	17%	11%	13%
Graduate or professional degree	[illegible]	1014	[illegible]	9%	9%	9%
Total Population Male	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	13%	[illegible]	[illegible]
Some college, no degree	1144	1315	[illegible]	15%	24%	38%
Associate's degree	121	[illegible]	108	[illegible]	2%	2%
Bachelor's degree	310	[illegible]	[illegible]	10%	[illegible]	[illegible]
Graduate or professional degree	[illegible]	[illegible]	514	10%	12%	[illegible]
Total Population Female	[illegible]	[illegible]	[illegible]	100%	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	16%	[illegible]	[illegible]
Some college, no degree	[illegible]	[illegible]	[illegible]	31%	[illegible]	[illegible]
Associate's degree	[illegible]	[illegible]	[illegible]	2%	2%	2%
Bachelor's degree	[illegible]	[illegible]	[illegible]	25%	[illegible]	[illegible]
Graduate or professional degree	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Fig. 1 Educational Attainment Total Population

Comments:From graph's analysis is evident as the 38% of people have completed a Some college or Degree, the 13% have finished a Bachelors's degree and an the 9% have concluded a Graduate or Professional Program. the cause May be for the high number of public schools and parochial schools presents in the area that stimulates the scholarisation program's.

Labour Market

Tab. 1 Employed and Unemployed



Employed						
Age and Sex	2010	2011	2013	2010	2011	2013
25-44	2764	2635	2612	48%	44%	41%
Male	2924	2785	3012	51%	47%	47%
Female	2851	3180	3405	49%	53%	53%
By Race						
White	1855	1804	2062	32%	30%	32%
Black or African American	2829	2979	2825	49%	50%	44%
American Indian	26	25	14	0%	0%	0%
Asian + Native Hawaiian and other pacific	339	399	427	6%	7%	7%
Two or More Races	82	155	187	1%	3%	3%
Some Others	649	603	899	11%	10%	14%
Total	5775	5965	6417	100%	100%	100%
Unemployed						
Age and Sex	**2010**	**2011**	**2013**	**2010**	**2011**	**2013**
25-44	815	456	529	43%	41%	42%
Male	330	346	488	34%	31%	39%
Female	630	757	770	66%	69%	61%
Total	960	1103	1258	100%	100%	100%
White	62	125	258	6%	11%	21%
Black or African American	1230	757	717	128%	69%	57%
American Indian	0	17	12	0%	2%	1%
Asian + Native Hawaiian and other pacific island	20	17	0	1%	2%	0%
Two or More Races	0	22	15	0%	2%	1%
Some Others	218	165	256	23%	15%	20%

1.3.1 Employed

1.3.2 Unemployed

Fig. 1 Employment By Sex and Race

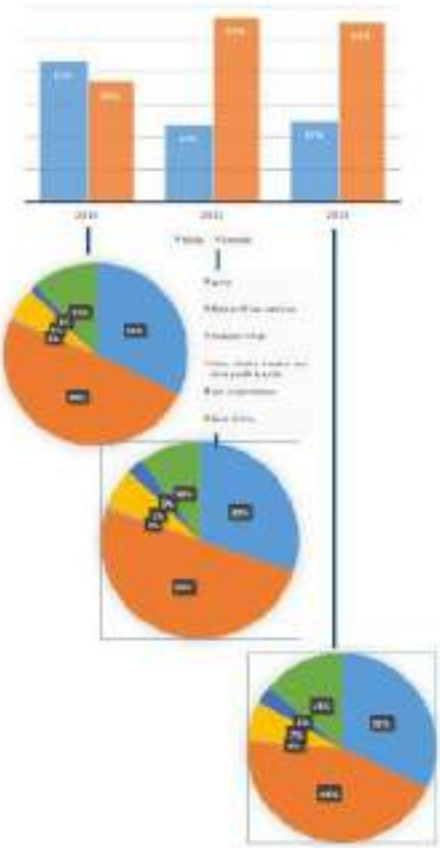
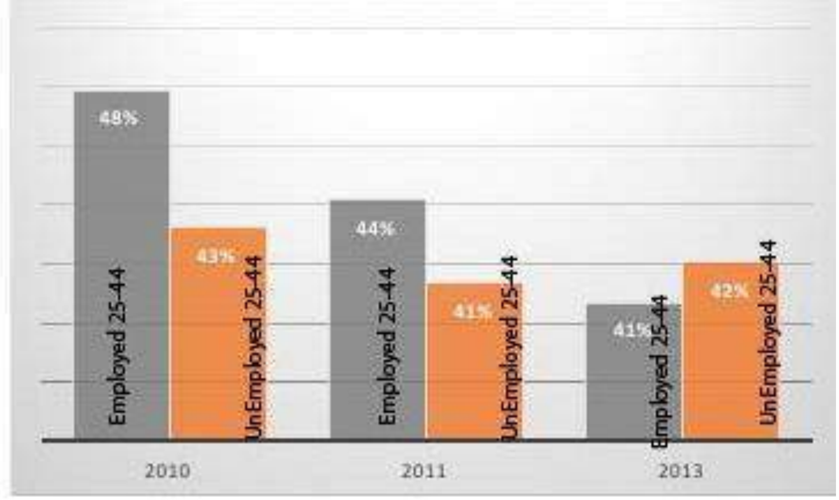


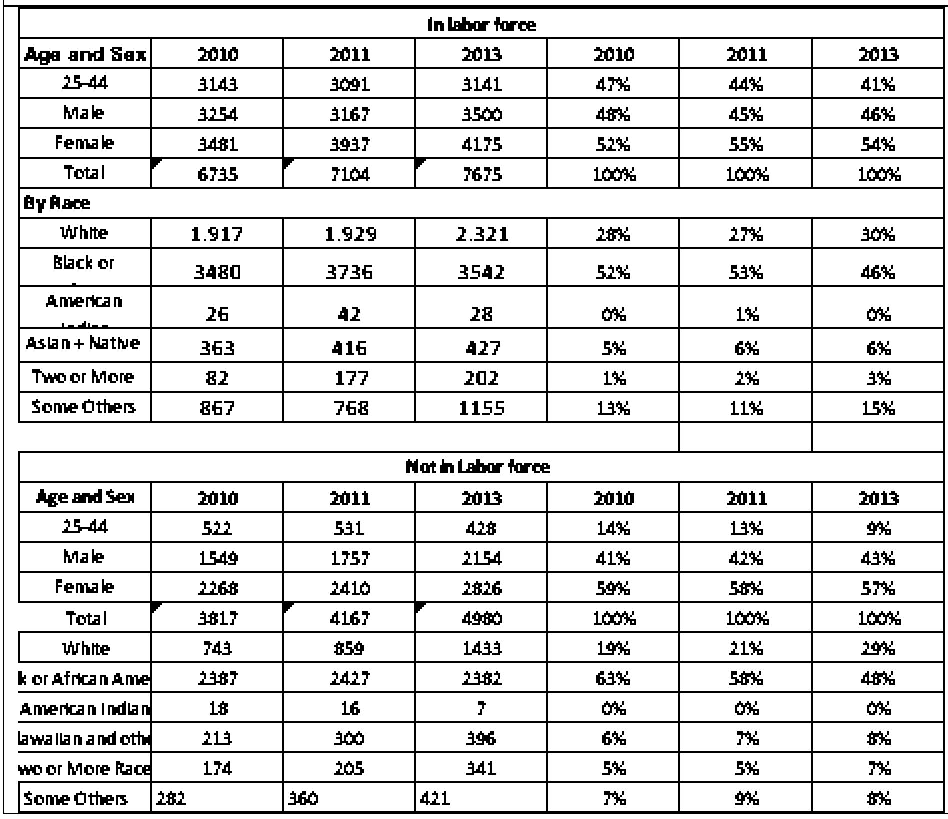
Fig. 2 Unemployment By Age and race

Fig. 3 Employed and Unemployed 25-44



Comments: In the target area is evident the connection between low incomes, low level of education and employment and unemployment. In the last years is clear in the target area an increase of employment rate of females residents, the cause could be the introduction of a high number of part time jobs.

Tab. 2 In labor force and Not in Labor force



In labor force						
Age and Sex	2010	2011	2013	2010	2011	2013
25-44	3143	3091	3141	47%	44%	41%
Male	3254	3167	3500	48%	45%	46%
Female	3481	3937	4175	52%	55%	54%
Total	6735	7104	7675	100%	100%	100%
By Race						
White	1.917	1.929	2.321	28%	27%	30%
Black or	3480	3736	3542	52%	53%	46%
American	26	42	28	0%	1%	0%
Asian + Native	363	416	427	5%	6%	6%
Two or More	82	177	202	1%	2%	3%
Some Others	867	768	1155	13%	11%	15%

Not in Labor force						
Age and Sex	2010	2011	2013	2010	2011	2013
25-44	522	531	428	14%	13%	9%
Male	1549	1757	2154	41%	42%	43%
Female	2268	2410	2826	59%	58%	57%
Total	3817	4167	4980	100%	100%	100%
White	743	859	1433	19%	21%	29%
k or African Ame	2387	2427	2382	63%	58%	48%
American Indian	18	16	7	0%	0%	0%
lawaiian and oth	213	300	396	6%	7%	8%
wo or More Race	174	205	341	5%	5%	7%
Some Others	282	360	421	7%	9%	8%

Fig. 1 In labor force By Age and Sex

Fig. 2 Not in Labor force by Race

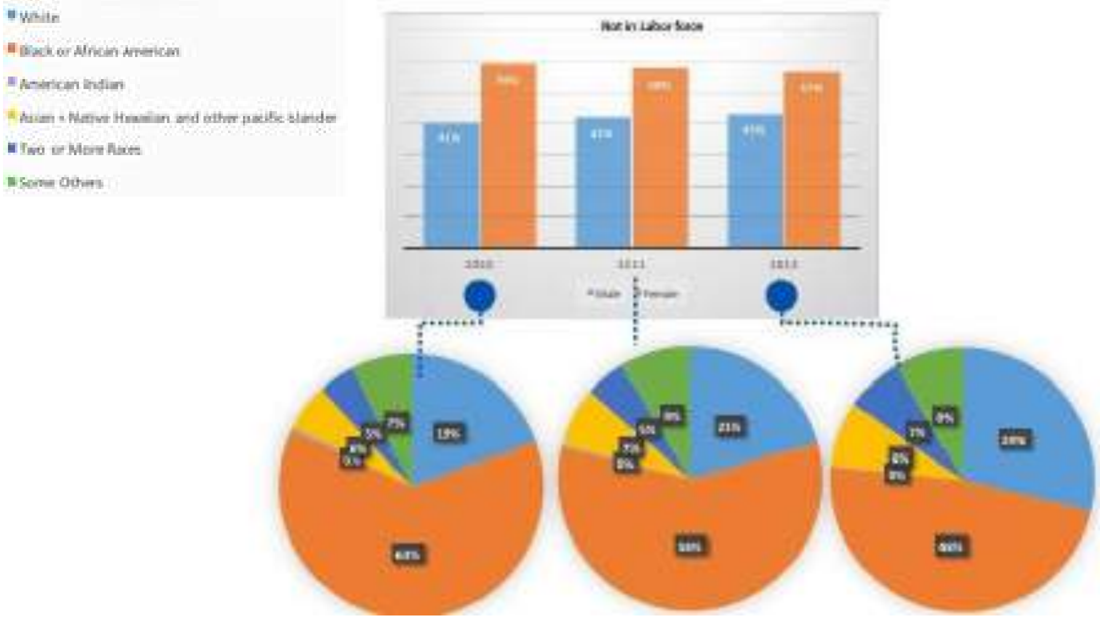
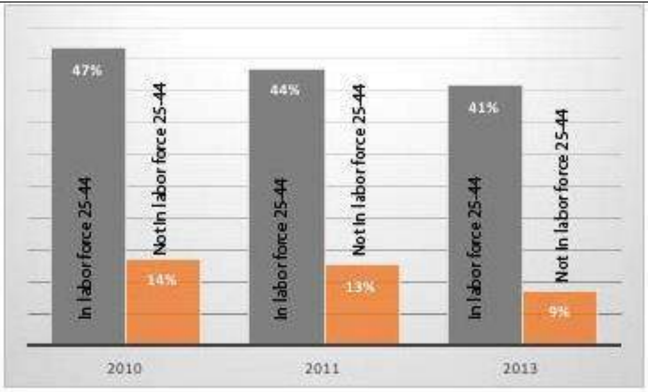


Fig. 3 In labor force and Not in LABOR FORCE 25-44

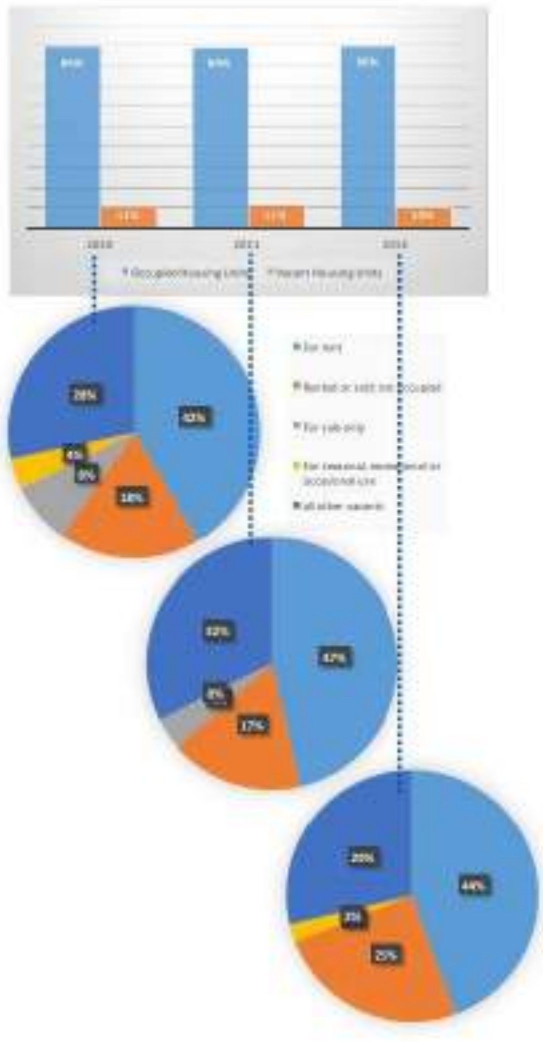


Comments: The majority of the Boston resident labor force is between the ages of 25 and 44.In fact the graph highlight the high percentage of employed beetwen 25-44 with respect to the unemployed.In the target area is very high the percentage in labor force and emerges a low level in unemployed.

Housing Stock

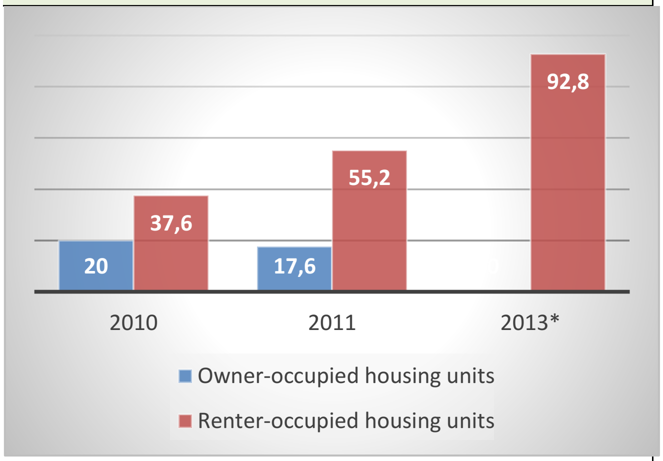
Housing Occupancy						
	2010	2011	2013	2010	2011	2013
Total housing units	6605	6681	6722			
Occupied Housing Units	5892	5939	6021	89%	89%	90%
Vacant Housing Units	713	742	701	11%	11%	10%
Occupied Housing Tenure						
wner-occupied housing un	20	17,6	0	0%	0%	0%
enter-occupied housing un	27,1	30,7	26,3	0%	1%	0%
Vacant housing unit						
For rent	296	344	311	42%	46%	44%
Rented or sold not occupie	130	127	173	18%	17%	25%
For sale only	57	31	0	8%	4%	0%
onal, recreational or occasi	28	0	16	4%	0%	2%
all other vacants	202	240	201	28%	32%	29%

Fig. 1 Housing Occupancy and Vacant housing Unit



Comments:

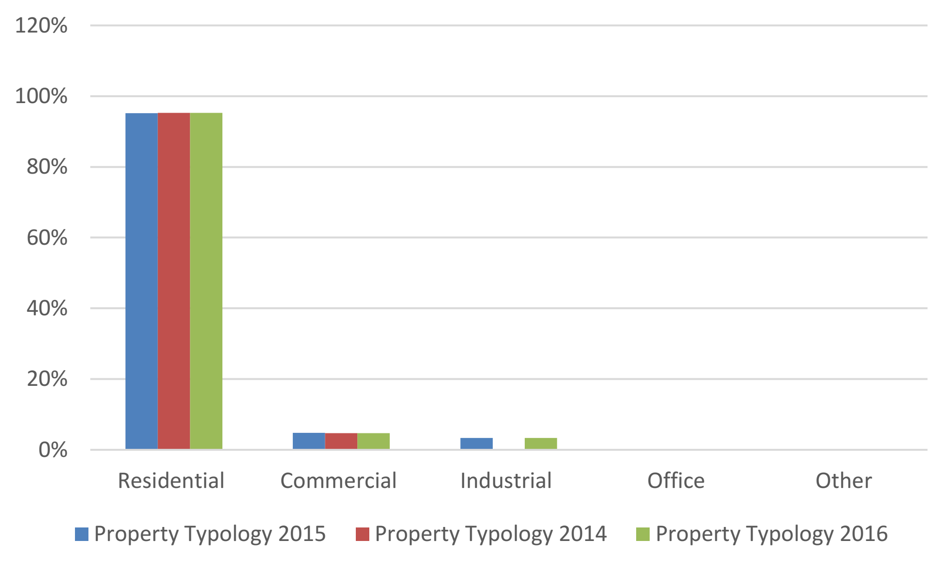
Housing unit growth between 2000 and 2010 was the strongest decade since before 1950: Boston added 20,546 new units of housing, for a decade-long growth rate of 8.2%. Since 2010 to 2013 the housing unit in the target area preserve a costant growth. The graph analysys shows the high percentage of Occupied Housing unit the 89% in 2010 until to the 91% in 2013. The vacant housing unit higlight the high percentage of housing unit for rented, a 28% for seasonal recreational but emerge an high number in 2011 all other vacants



PART 3: Real Estate

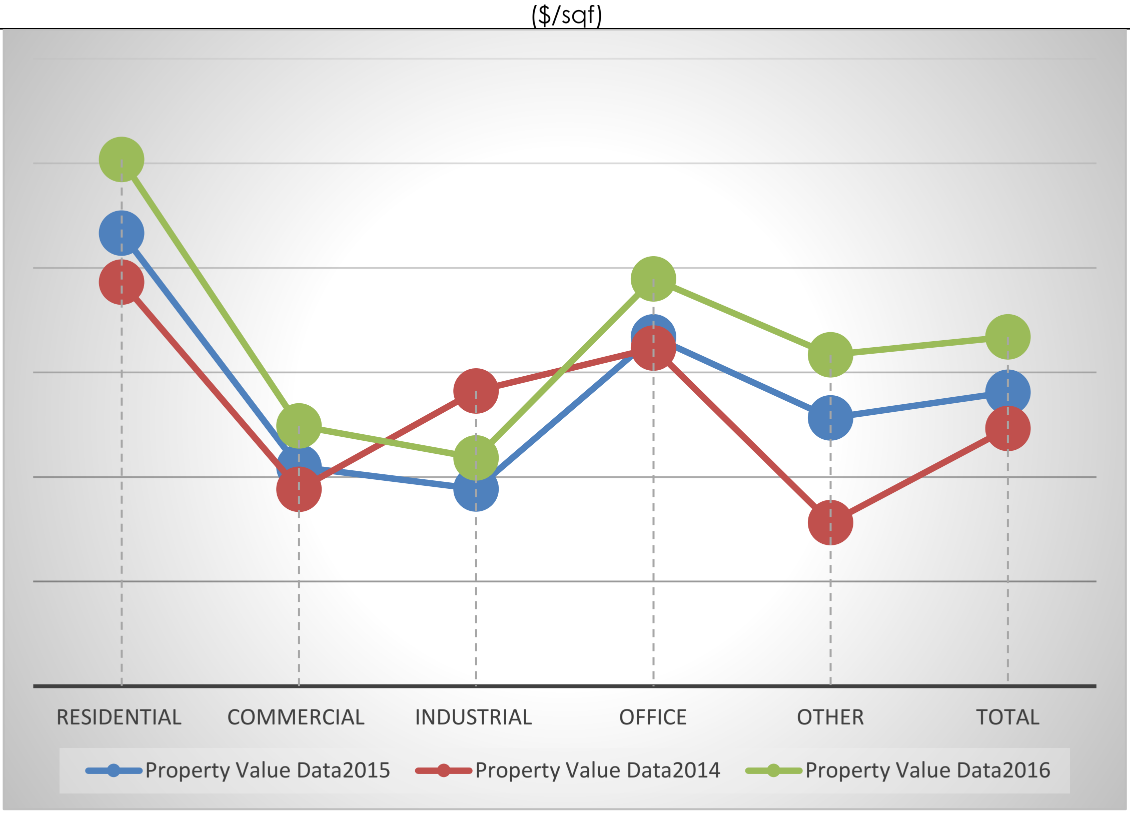
Target Area Parcell Block

Property Type



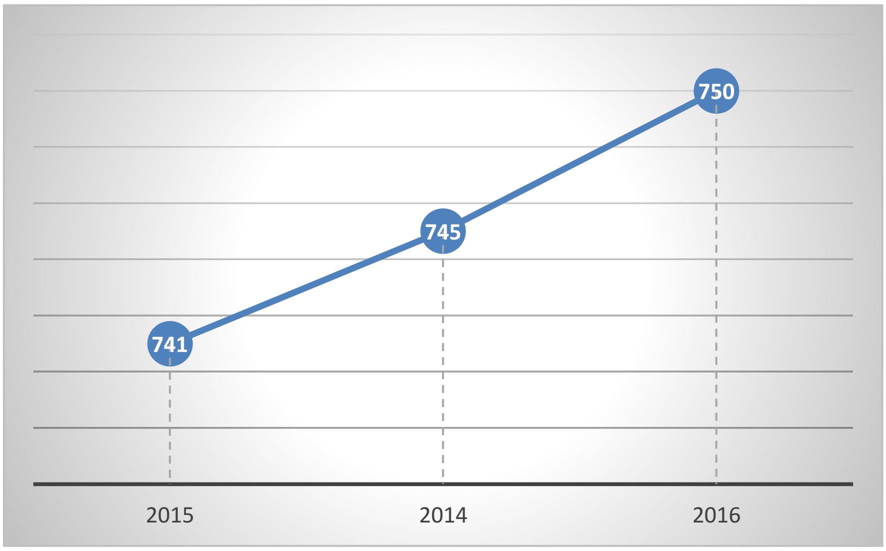
Comments; Since 2014 To 2016 In The Target Area The Property Typology Remain Costant. From Graph Is Evident The Property Typology For Residential (90%), And A Low Percentage In Commercial And Industrial.

Average-Total Assessed Value per Parcel Block/ward
($/sqf)



Comments:Excluding the recession, the housing market in Boston has remained strong(source: Boston Redevelopment authorities). In Boston the assessed value of residential properties in has grown faster than that of commercial properties since 2001. The total assessed value of residential properties was higher than the total assessed value of commercial properties in 2016. Infact the graph highlight the property value per category and in particular shows the total assessed value of Other prosperities was higher than the total assessed value of residential and commercial.

3.3 Average Market Value per parcel block/ward
Residential($/sqf)

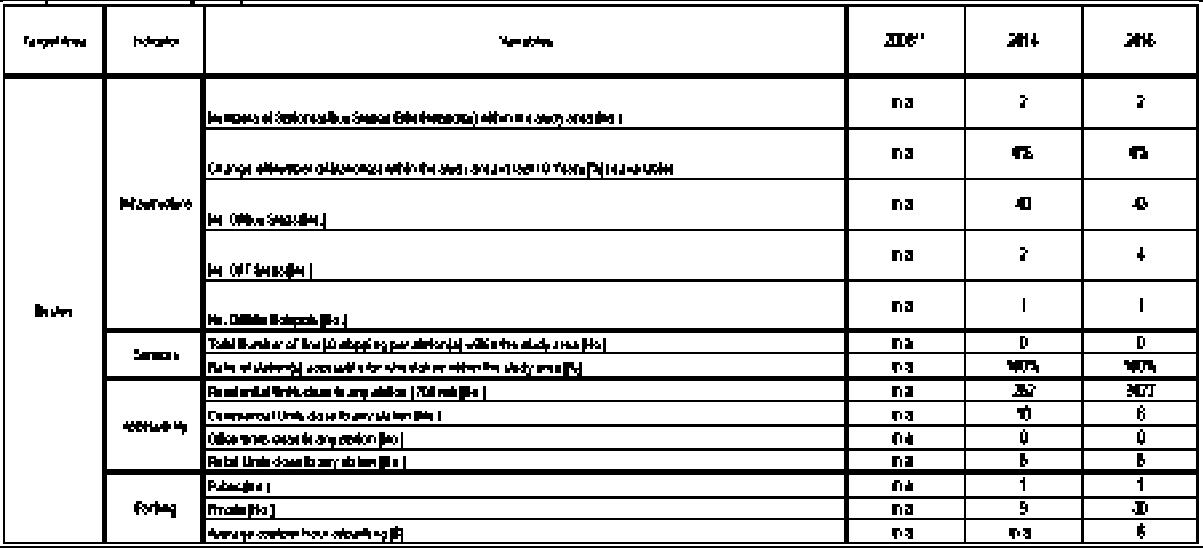


Comments. From Graph Since 2014-2016 is evident the high value per residential. the cause can be the new public policy activating in the area based on Knowledge concentration and expansion of innovation.

Part 4: Services

Trasportation and Infrastracture

4.1 Target area map with centroid spatial identification



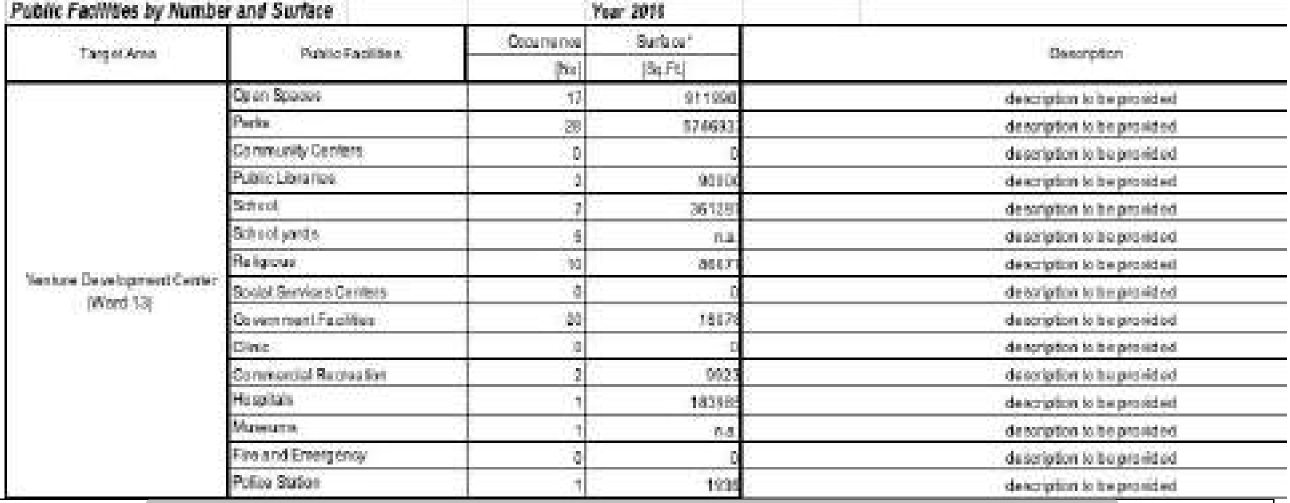
Centroide Coordinates
42,376244
-71,112594

Target area map with centroid spatial identification

Target Area distance from the main Infrastructures

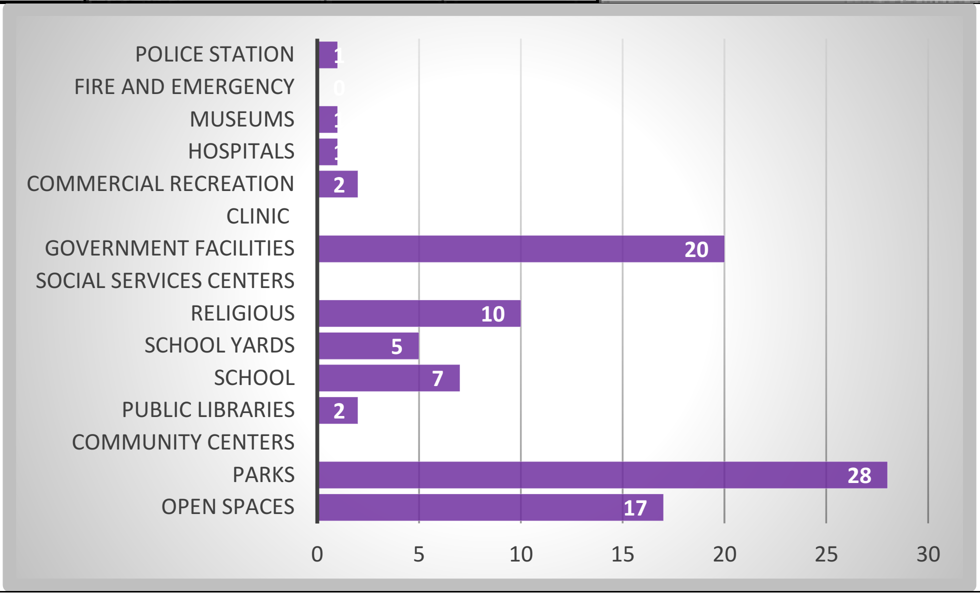
Target Area	Indicator	Variables	by Subway	by Bus	by Car
Target Area	Out region	Distances to the closest International Airport [Km]	4,99	14,06	11,20
		Distances to the closest Port [Km]	2,35	4,29	5,50
		Distances to the closest Highway [Km]	1,65	2,07	3,50

Public facilities by number and Surface



Public Facilities by Number and Surface — **Year 2016**

Target Area	Public Facilities	Occurrence [No]	Surface* [Sq Ft]	Description
Venture Development Center (Ward 13)	Open Spaces	17	911998	description to be provided
	Parks	28	5749337	description to be provided
	Community Centers	0	0	description to be provided
	Public Libraries	2	90800	description to be provided
	School	7	361259	description to be provided
	School yards	5	n.a.	description to be provided
	Religious	10	86677	description to be provided
	Social Services Centers	0	0	description to be provided
	Government Facilities	20	18878	description to be provided
	Clinic	0	0	description to be provided
	Commercial Recreation	2	9923	description to be provided
	Hospitals	1	183985	description to be provided
	Museums	1	n.a.	description to be provided
	Fire and Emergency	0	0	description to be provided
	Police Station	1	1936	description to be provided

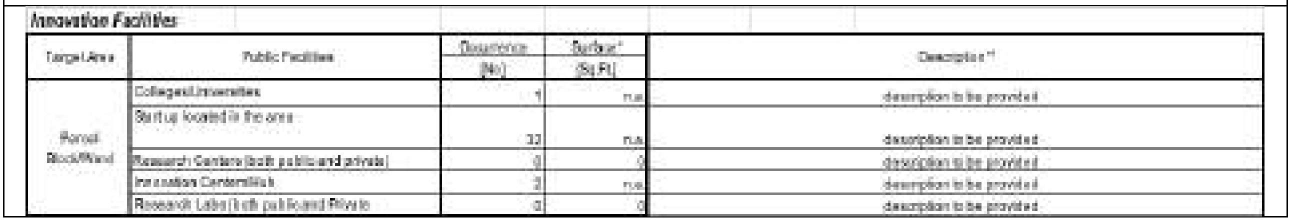


Comments: From Graph's analysis emerging the high number of public facilities in the area, more in particular 20 governament facilities, 10 religious, 5 school yards, 28 parks and 17 open spaces.

In fact, the target areas the knowledge dynamics in activating the concentration of innovation generate spillover effects, which supported by urban planning tools allow the expansion of innovation.

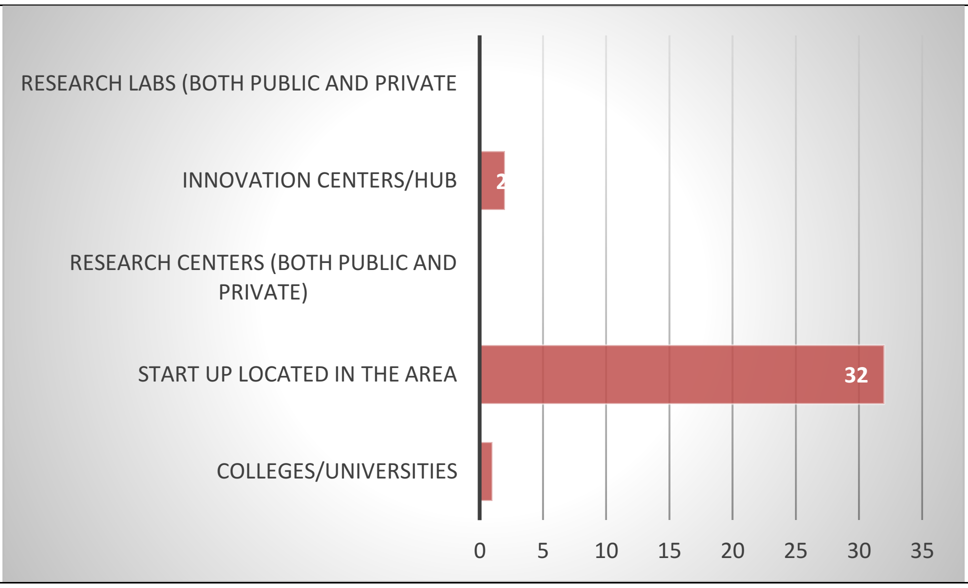
It is possible to argue that knowledge dynamics and innovation may find in cities a fertile ground in designing mix and tailored policies, derived from the nature of urban regeneration policy frame.

5.2 Innovation Facilities



Innovation Facilities

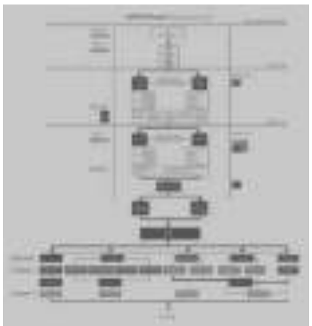
Target Area	Public Facilities	Occurrence [No]	Surface* [Sq Ft]	Description *1
Parcel Block/Ward	Colleges/Universities	1	n.a.	description to be provided
	Start up located in the area	32	n.a.	description to be provided
	Research Centers (both public and private)	0	0	description to be provided
	Innovation Centers/Hub	3	n.a.	description to be provided
	Research Labs (both public and Private)	0	0	description to be provided

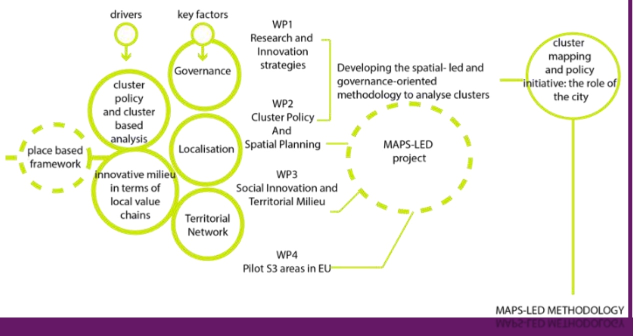


Comments: From graph is evident The High number of 32 start up located in the area and two innovation hubs. In particular emerges the role of Venture Development Centre (VDC), it's a non-profit organization spatially localized in University of Massachusetts (Zip Code 02125). Mainly identified as a **business incubator**, it delivers the needed support to start-ups companies to turn their visions and ideas into reality by providing physical laboratories, financial aids and the eco-environment for entrepreneurs to inspire and innovate.

S3: CLUSTER POLICY & SPATIAL PLANNING

KNOWLEDGE DYNAMICS, SPATIAL DIMENSION AND ENTREPRENEURIAL DISCOVERY PROCESS





RESERACH FINDINGS

CLUSTER SPATIALISATION
ANNEX 2

MARCH 2017

MAPS-LED PROJECT WAS FOUNDED BY
HORIZON 2020 MSCA RISE

This Scientific Report is part of a project that has received funding from the **European Union's Horizon 2020 research and innovation programme under grant agreement N°645651**

MAPS -LED Project
Multidisciplinary ApproachTo Plan Smart specialisation strategies For Local Economic Development
Work Package no. 2

S3: CLUSTER POLICY & SPATIAL PLANNING

Deliverable 2.3
KNOWLEDGEDYNAMICS SPATIAL DIMENSION AND ENTREPRENEURIAL DISCOVERY PROCESS
CLUSTER SPATIALISATION ANNEX 2

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INDEX

Clusters are defined by Porter as "geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition".

The research activities demonstrated that the geographic concentrations are characterised by a multi-scalar and multivariable geography, in the sense that in each territorial dimension (from state level to city level), the cluster provides a conceptual framework to describe and analyse important aspects of modern economies of that territorial dimension. Its role is not to define a specific area, but to characterise the specific geographic area in terms of innovation, specialisation and capacity to activate competitive and comparative advantages (Porter, 2013).

The US cluster mapping portal identified 51 traded clusters and 16 local clusters. All these clusters are distributed on the territory of US, among the three territorial units (State, Metro/Micropolitan Statistical Area, and County). Each territory has a cluster portfolio that indicates the top clusters by specialised employment for both traded and local clusters.

The Maps-Led Cluster spatialisation aimed to figure out a methodology to give a physical configuration to the clusters that are performed in the Boston area.

In particular, the research activities for cluster spatialisation mapping method are focused on three main steps: 1) Data gathering (qualitative-quantitative data); 2) Data Analysis (qualitative-quantitative data); 3) Mapping (Maps).

The methodology has a Hierarchical Structure and is organised in four sequential, iterative and consecutive phases:

First Phase: The Boston Metropolitan Statistical Areas

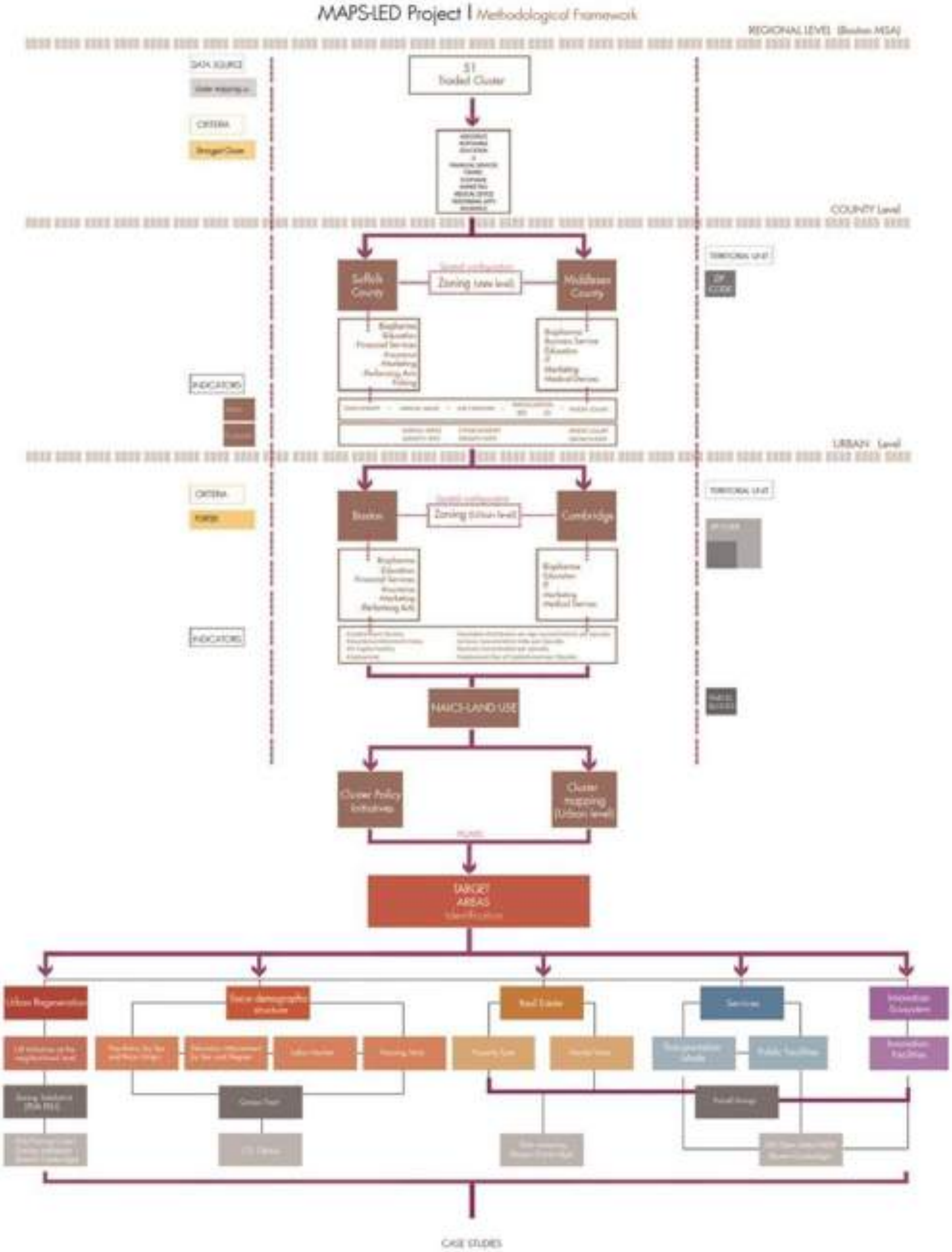
Section 1: General Maps

Second Part: Cluster Spatialisation at County Level

Section 2: Cluster Morphology at County Level
Section 3: Cluster Contiguity at County Level
Section 4: Regional Insights

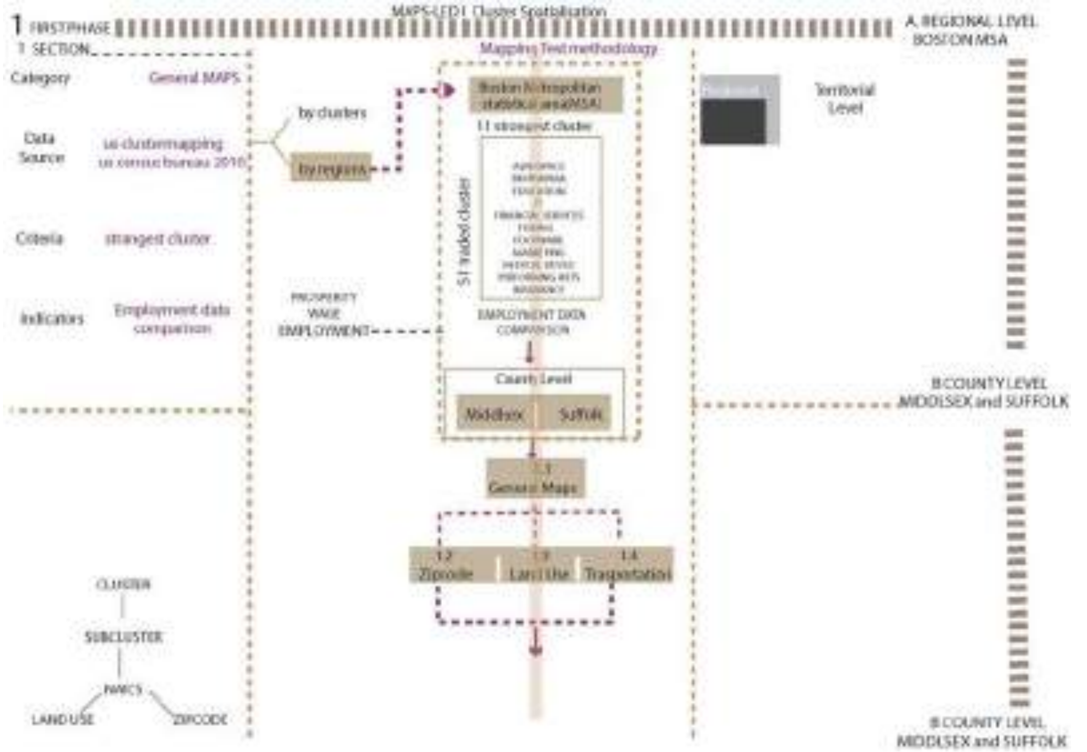
Third Part: Cluster Spatialisation at Urban level

Section 5: Cluster Morphology at Urban Level
Section 6: Sub-cluster Occurrence at Urban Level
Section 7: NAICS-Land Use Cluster Association
Section 8: Target Area Analysis



MAPS-LED Project | Methodological Framework

First Phase: MAPS-LED Cluster Spatialisation



The First phase explains the Preliminary research activities conducted at the Regional Level (from Boston Metropolitan Statistical Area to Middlesex and Suffolk Counties) aimed at the acquisition of qualitative and quantitative data for the cluster territorial analysis. Starting from data available on the US Cluster mapping portal the so-called "strong cluster" at the county level have been selected. The "strong clusters" are recognised on High Employment Specialisation exploited in a Region (in the top 25% of all regions by specialisation, and gathering minimum criteria for employment and establishment).

Data available on the US Cluster Mapping Portal indicated eleven (11) strong clusters (Aerospace, Biopharmaceutical, Education, IT, Financial services, Fishing, Business Services, marketing, Medical Device, Performing Arts, Insurance) in the Boston Metropolitan Statistical Area, which include seven (7) counties.

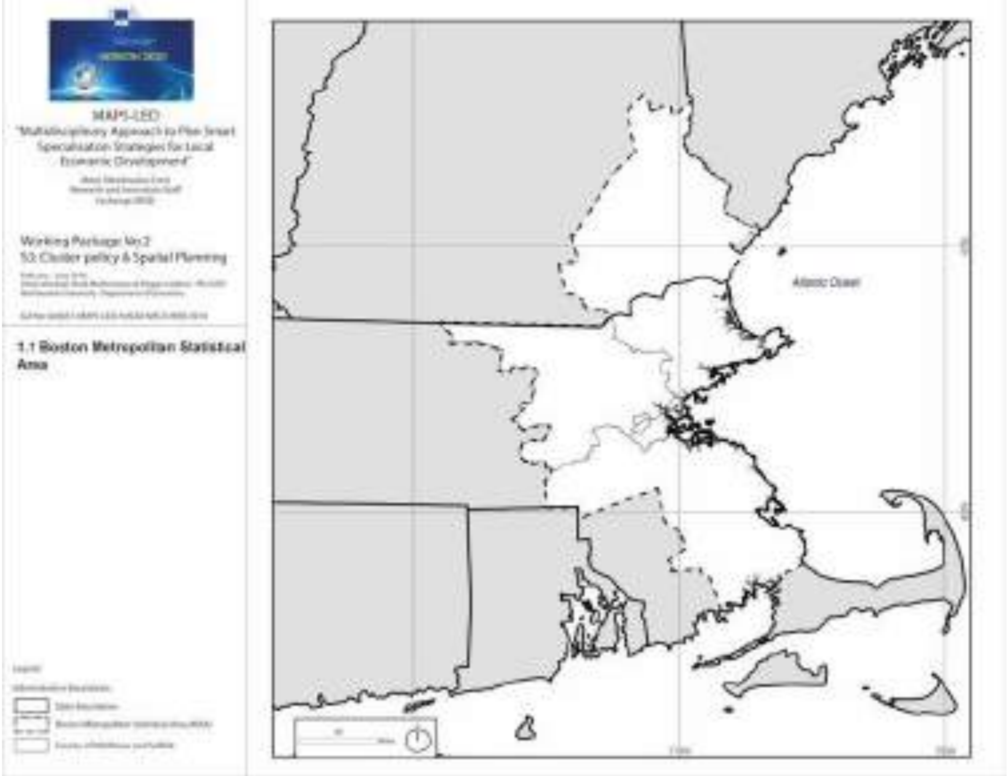
The County of Middlesex and Suffolk have been selected thanks to the employment performance in these clusters, which was the highest among the seven counties belonging to the MSA.

The maps produced in this early stage are the following:

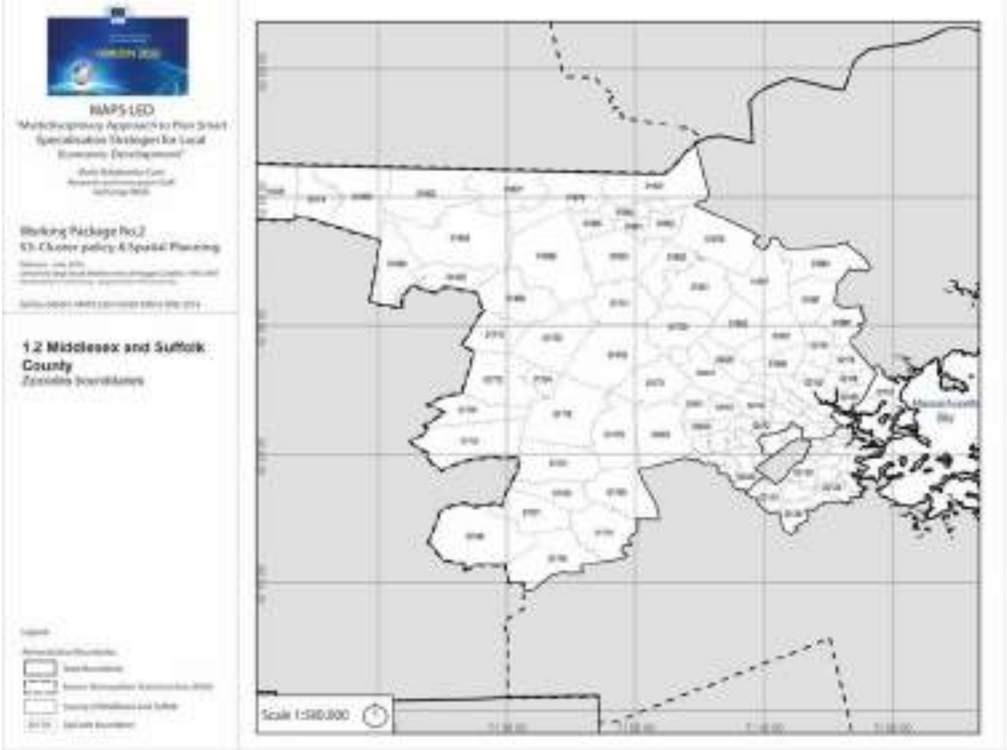
Section 1 General Maps

1.1 Boston Metropolitan Statistical Area
1.2 Middlesex and Suffolk Counties
1.3 Middlesex and Suffolk Counties Land Use
1.4 Transportation Network

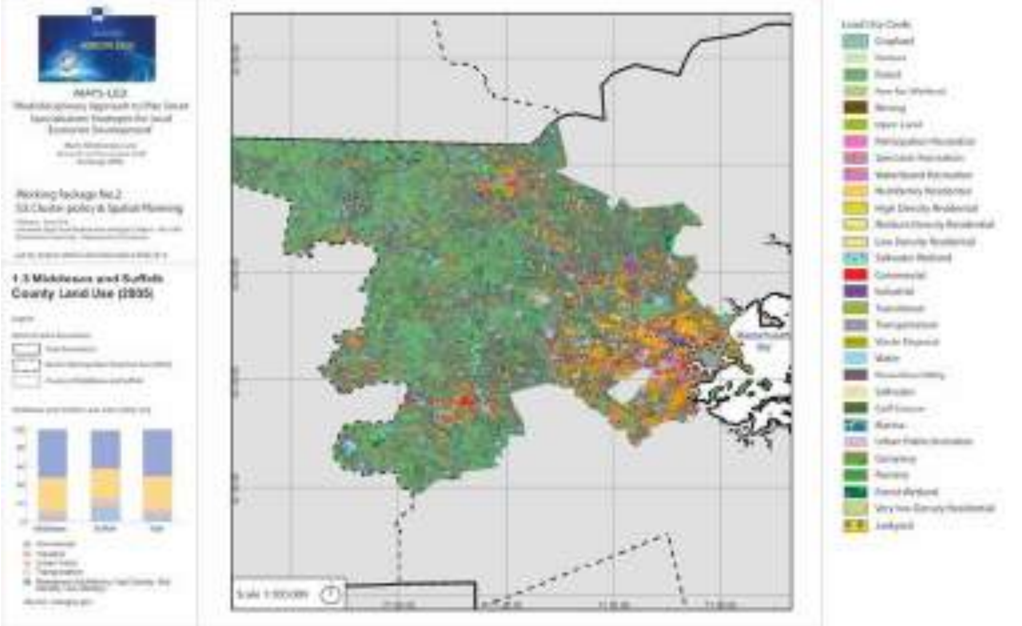
1.1 Boston Metropolitan Statistical Area



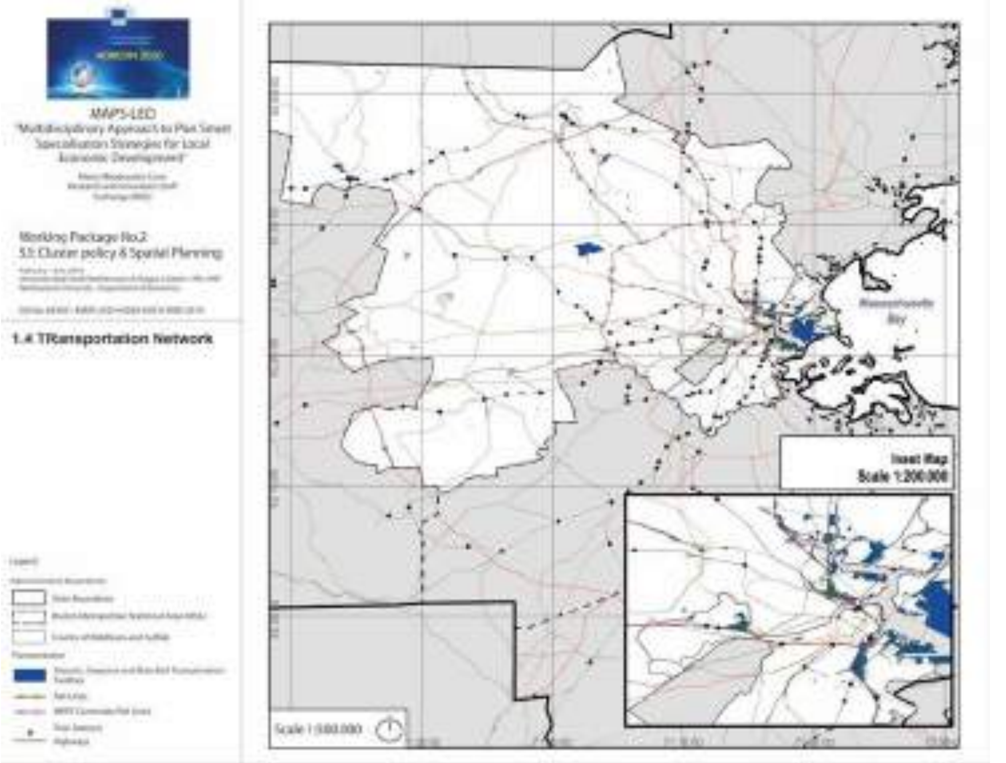
1.2 Middlesex and Suffolk Counties



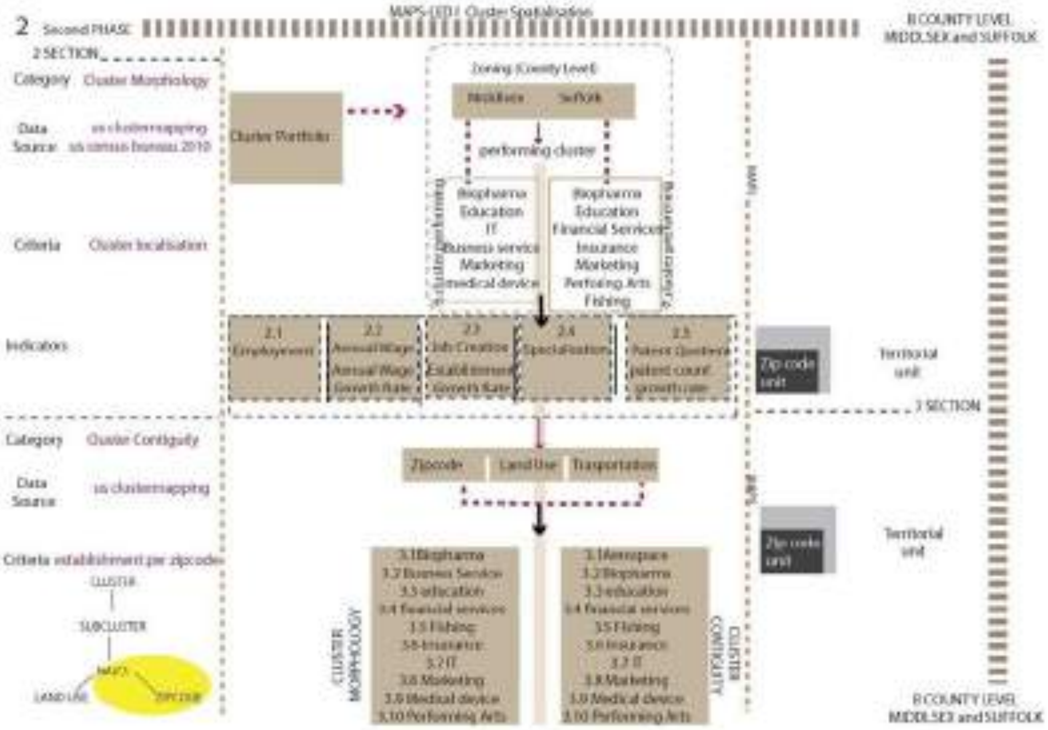
1.3 Middlesex and Suffolk Counties Land Use



1.4 Transportation Network



Second phase: Cluster morphology and cluster contiguity



The second phase has been articulated in three main section:
1) Cluster Morphology;
2) Cluster contiguity;
3) Regional Insights.

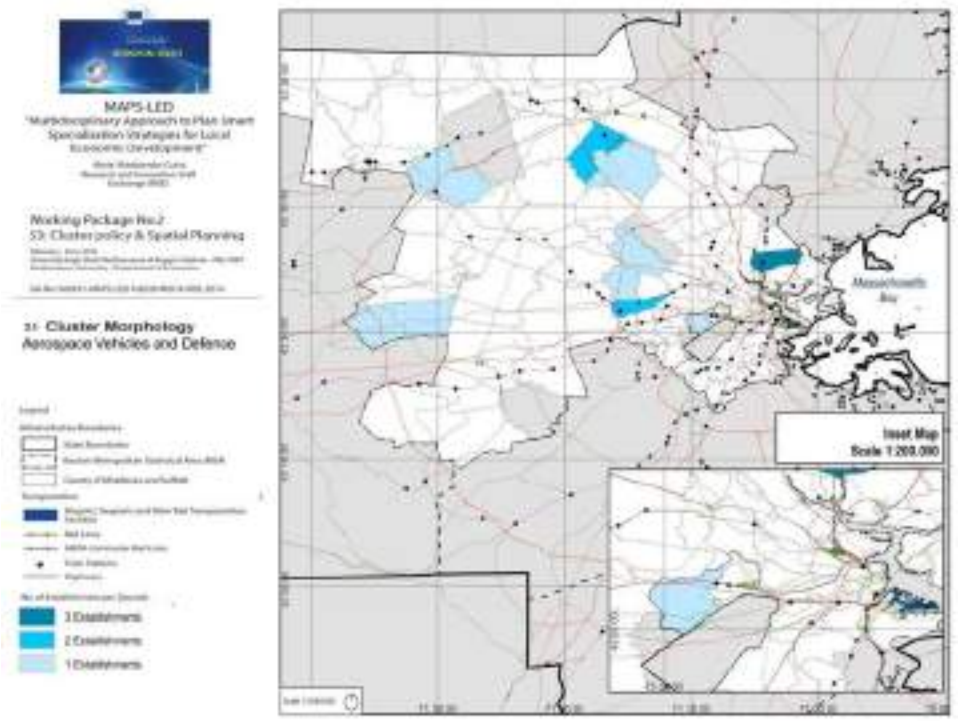
The research activities in the first section intended to examine the characterization of the area observing the cluster Morphology and in the second section aimed to comprehends the spatial Contiguity at County level (Middlesex and Suffolk).

The criteria utilised are based on "cluster localisation" for the morphology dynamics and "on establishment per Zipcode" for the spatial contiguity. The research activities focused on 6 strong cluster for the Middelsex County (Biopharma, Education, IT, Business Service, Marketing and Medical Devise) and 7 strong cluster for the Suffolk County (Biopharma, Education, Financial Service, Insurance, Marketing, Performing Arts and Fishing) exploiting 5 main indicators (Employment; Annual wage; Job creation; Specialisation; patent quotient). Each section is valorized from elaboration and representation of cluster morphology and cluster contiguity maps:

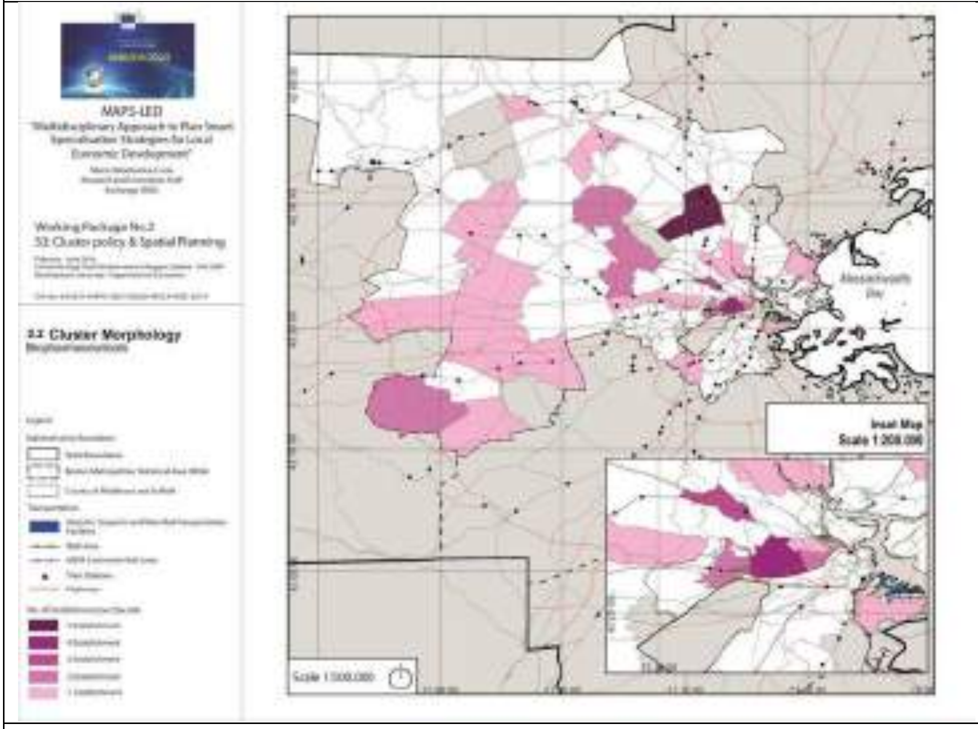
Cluster Morphology at County Level

- 2.1 Cluster Morphology Aerospace Vehicles and Defence
- 2.2 Cluster Morphology Biopharmaceuticals
- 2.3 Cluster Morphology Business Services
- 2.4 Cluster Morphology Education and Knowledge Creation
- 2.5 Cluster Morphology Financial Services
- 2.6 Cluster Morphology Fishing and Fishing Products
- 2.7 Cluster Morphology Insurance Services
- 2.8 Cluster Morphology Information Technology
- 2.9 Cluster Morphology Marketing, Design and Publishing
- 2.10 Cluster Morphology Medical Devices
- 2.11 Cluster Morphology Performing Arts

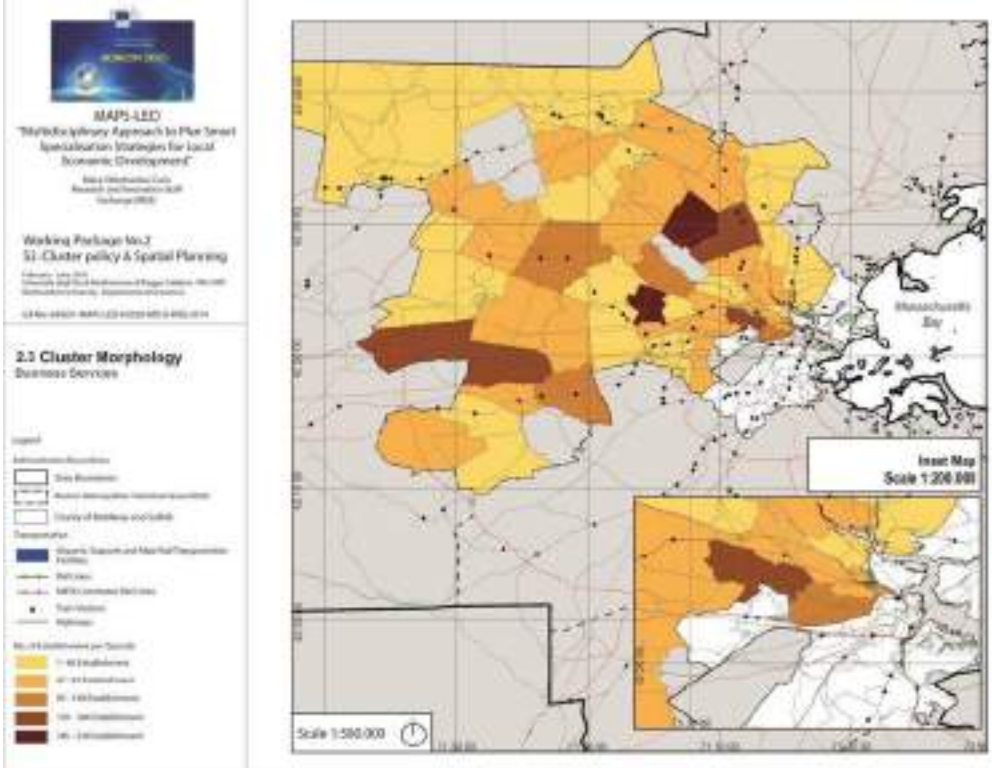
2.1 Cluster Morphology Aerospace Vehicles and Defense



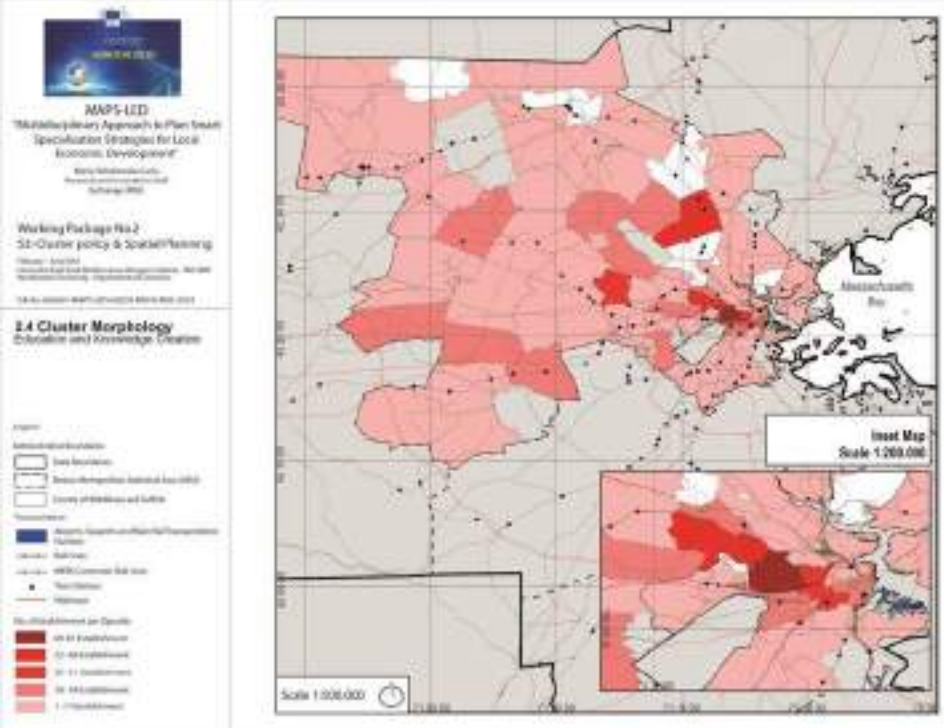
2.2 Cluster Morphology Biopharmaceuticals



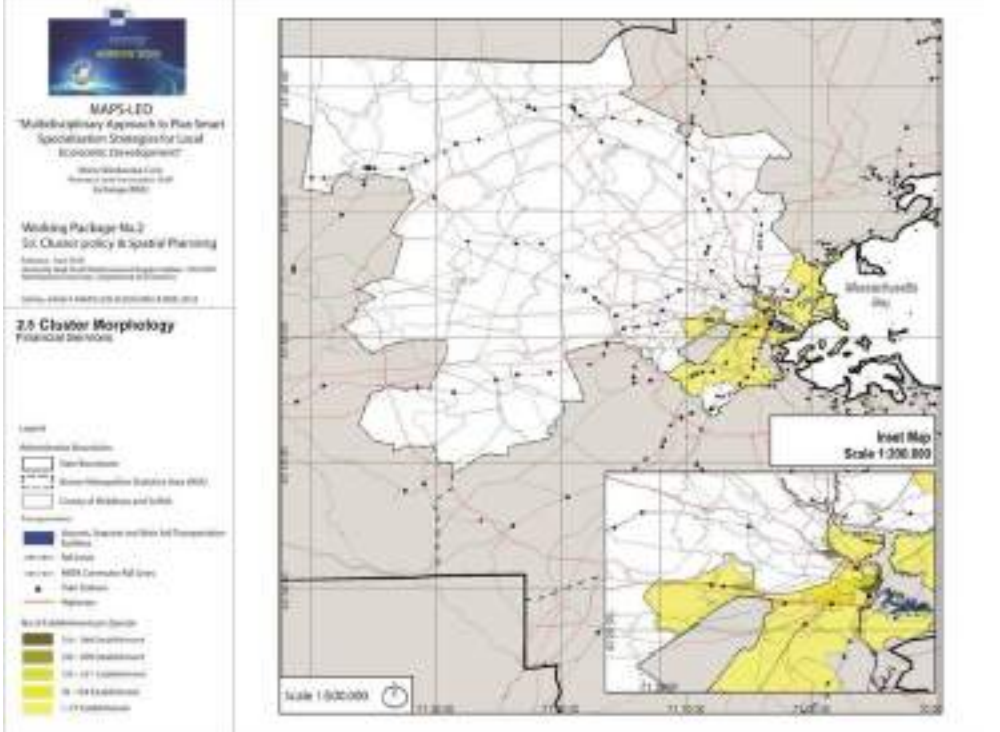
2.3 Cluster Morphology Business Services



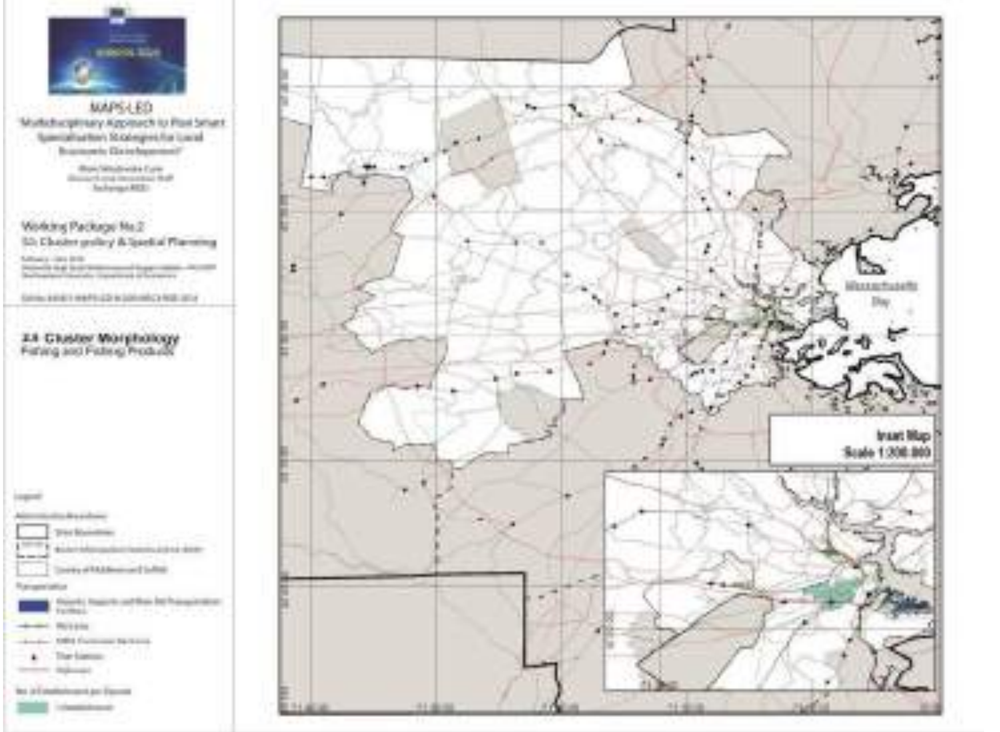
2.4 Cluster Morphology Education and Knowledge Creation



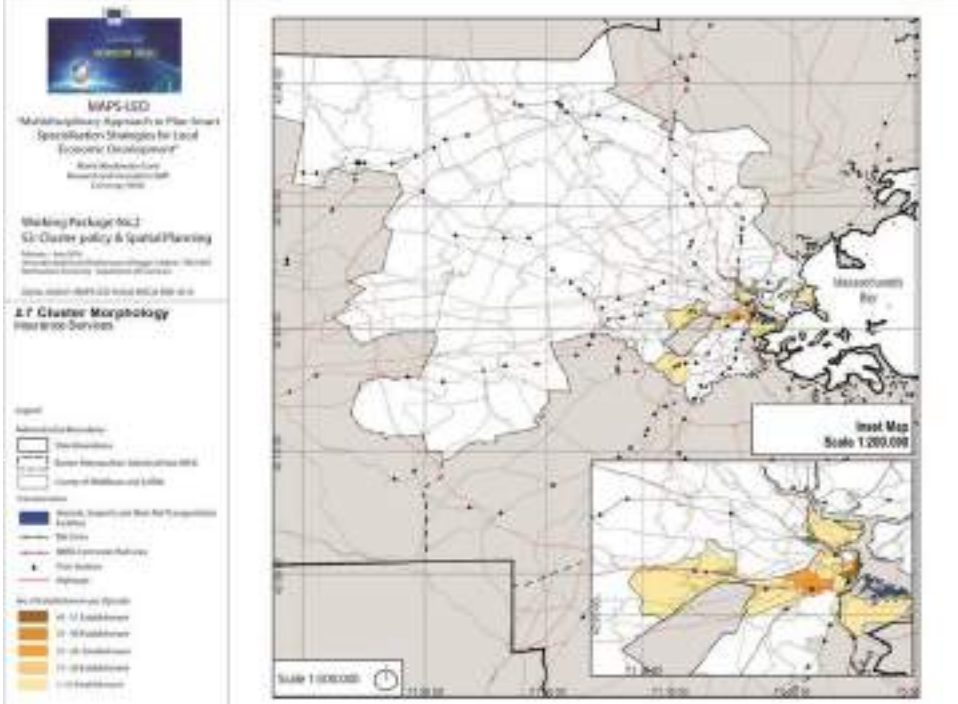
2.5 Cluster Morphology Financial Services



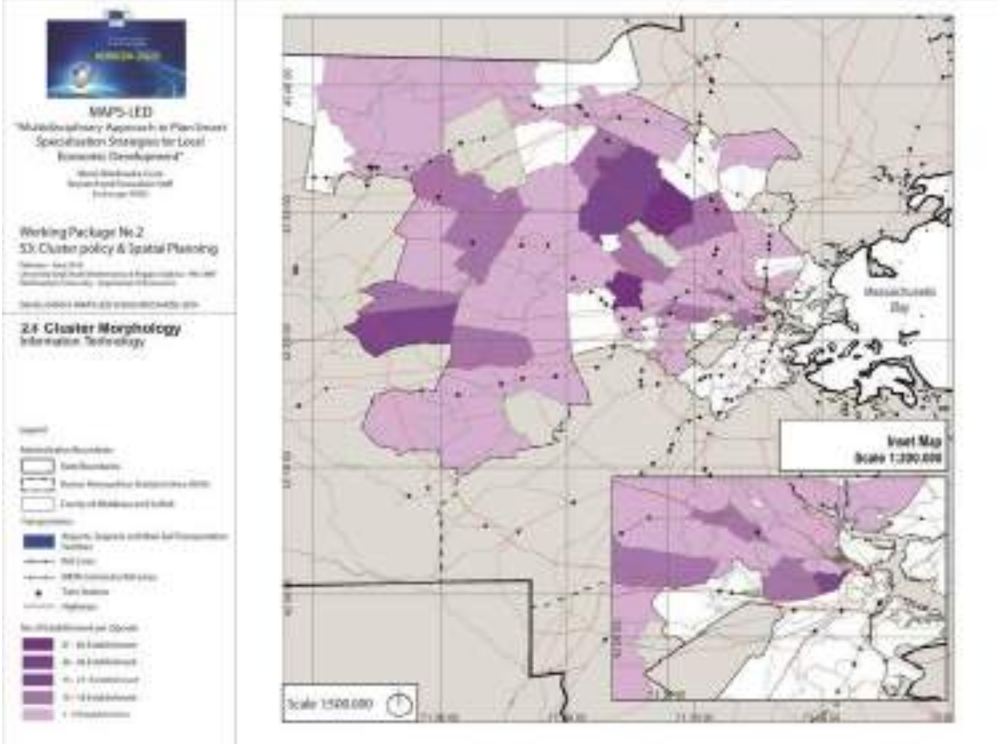
2.6 Cluster Morphology Fishing and Fishing Products



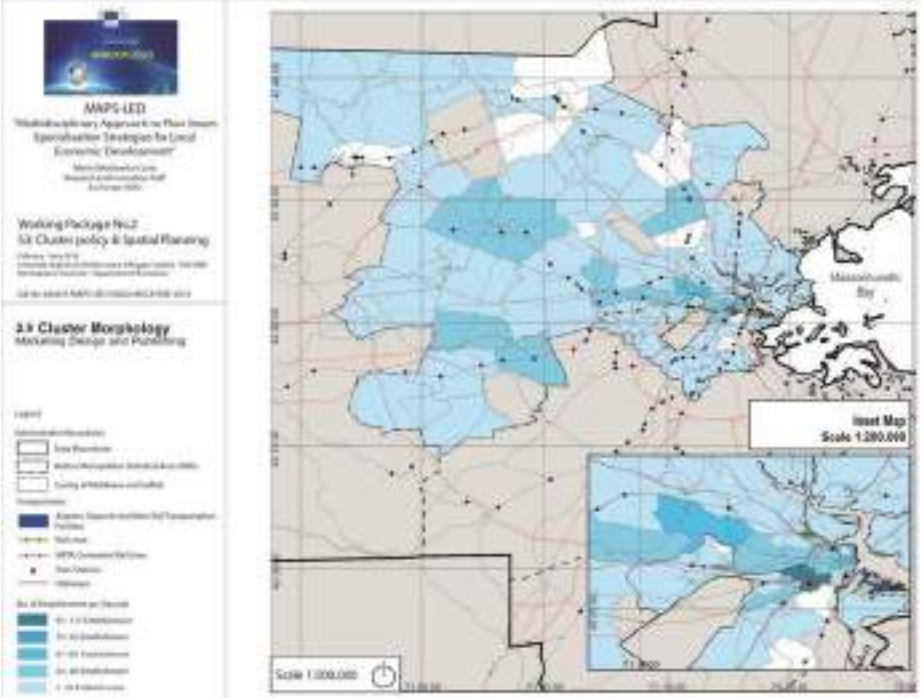
2.7 Cluster Morphology Insurance Services



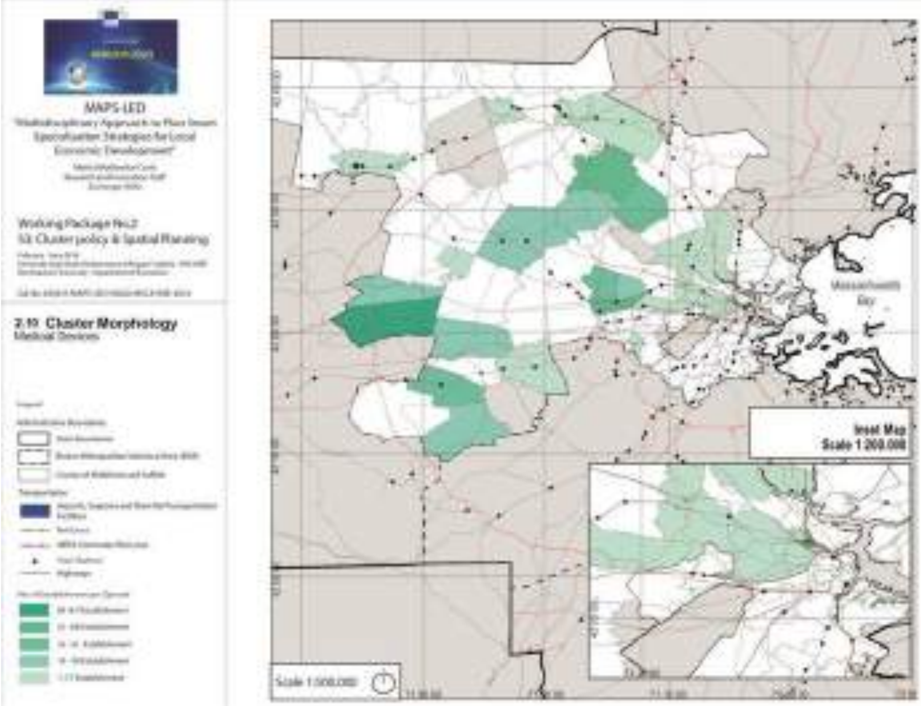
2.8 Cluster Morphology Information Technology



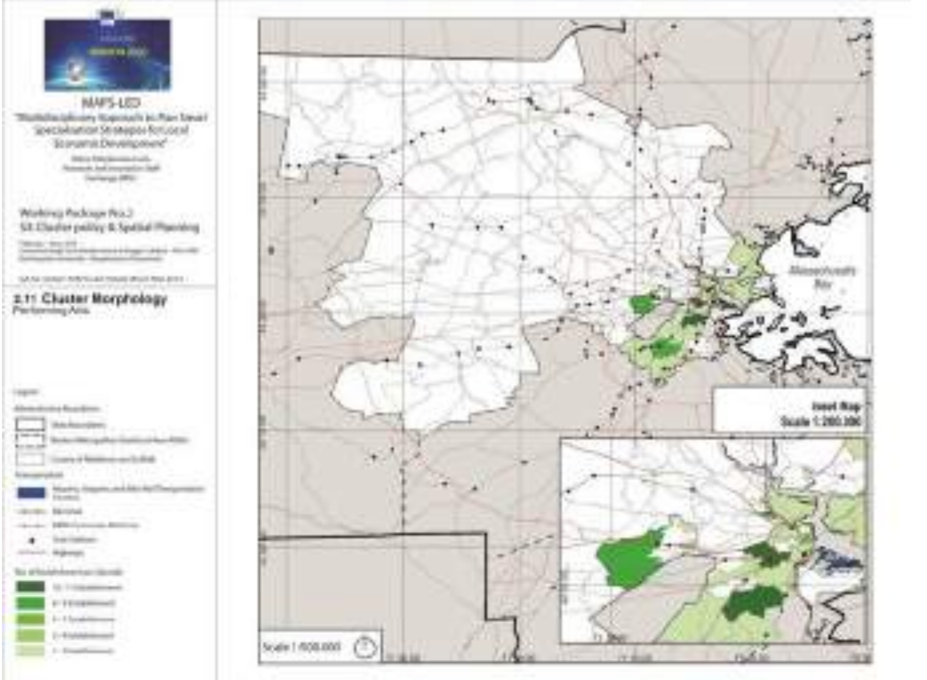
2.9 Cluster Morphology Marketing, Design and Publishing



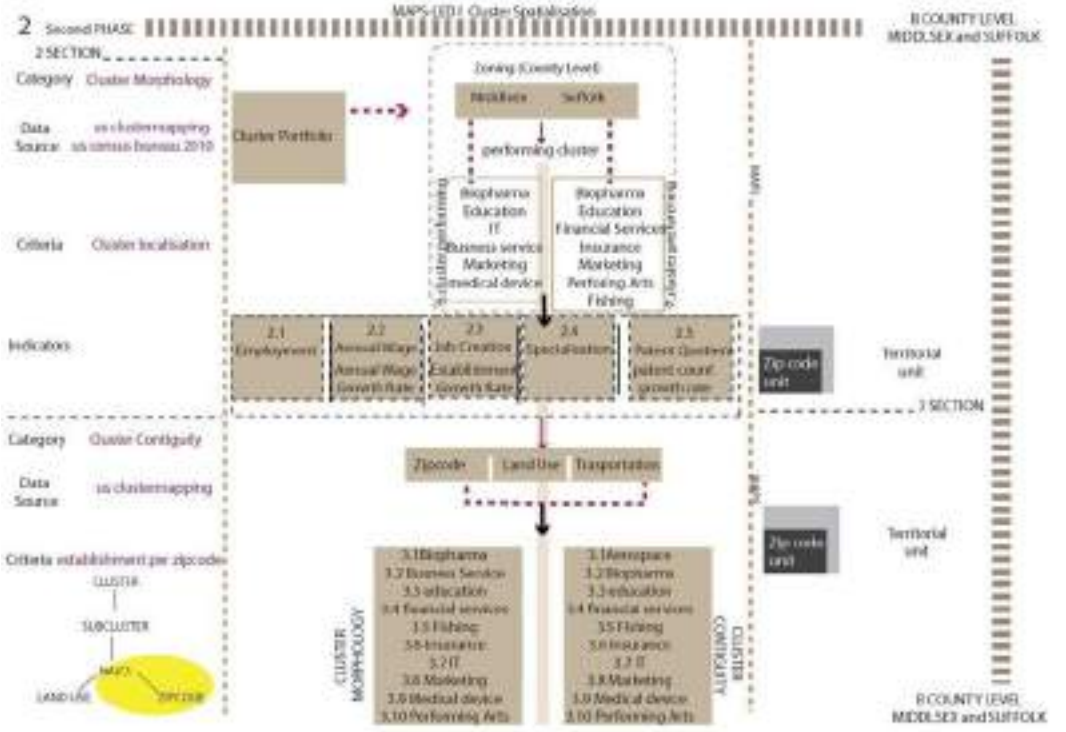
2.10 Cluster Morphology Medical Devices



2.11 Cluster Morphology Performing Arts



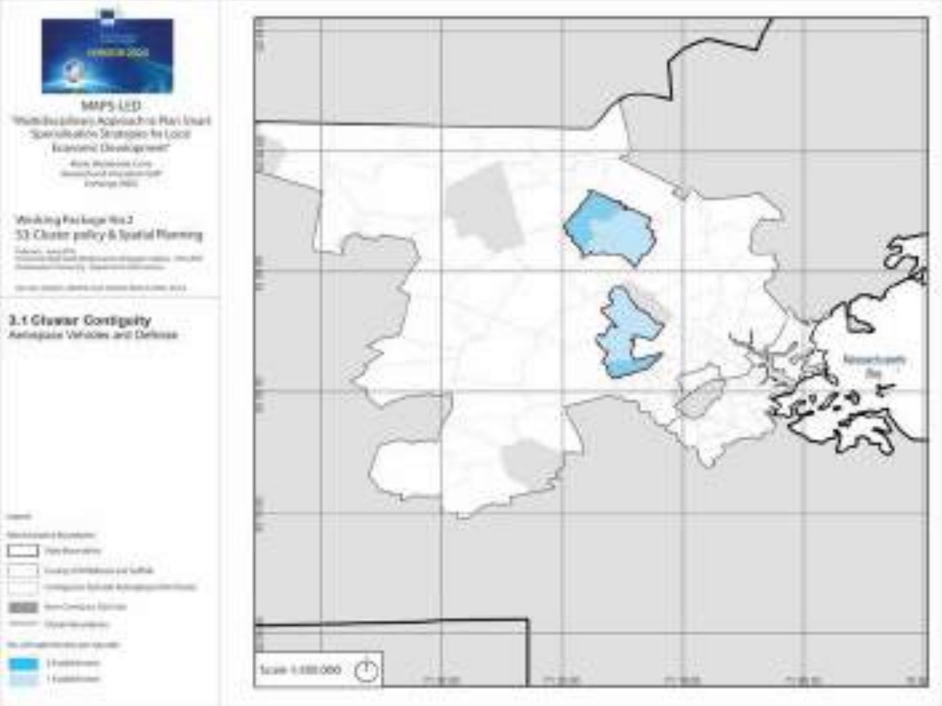
Cluster contiguity



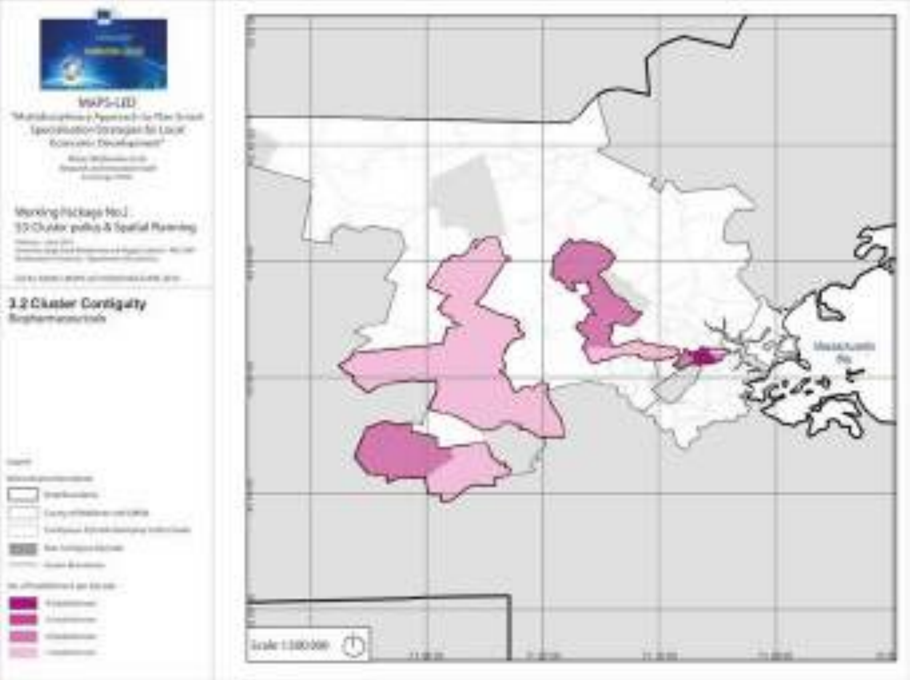
Cluster Contiguity at County Level

3.1 Cluster Contiguity Aerospace Vehicles and Defence
3.2 Cluster Contiguity Biopharmaceuticals
3.3 Cluster Contiguity Business Services
3.4 Cluster Contiguity Education and Knowledge Creation
3.5 Cluster Contiguity Financial Services
3.6 Cluster Contiguity Insurance Services
3.7 Cluster Contiguity Information Technology
3.8 Cluster Contiguity Marketing, Design and Publishing
3.9 Cluster Contiguity Medical Devices
3.10 Cluster Contiguity Performing Arts

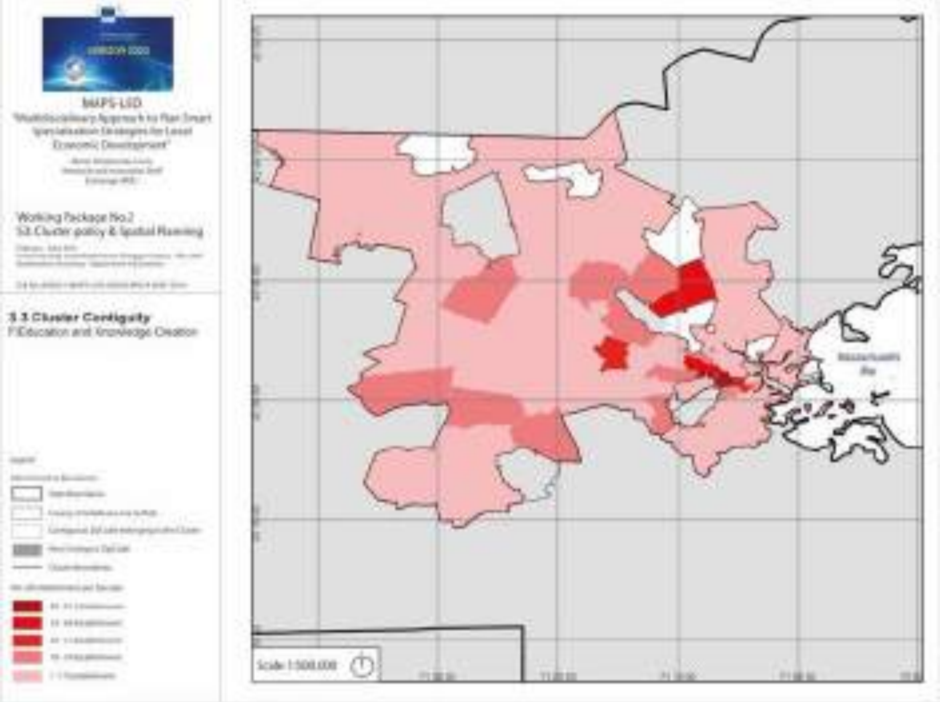
3.1 Cluster Contiguity Aerospace Vehicles and Defence



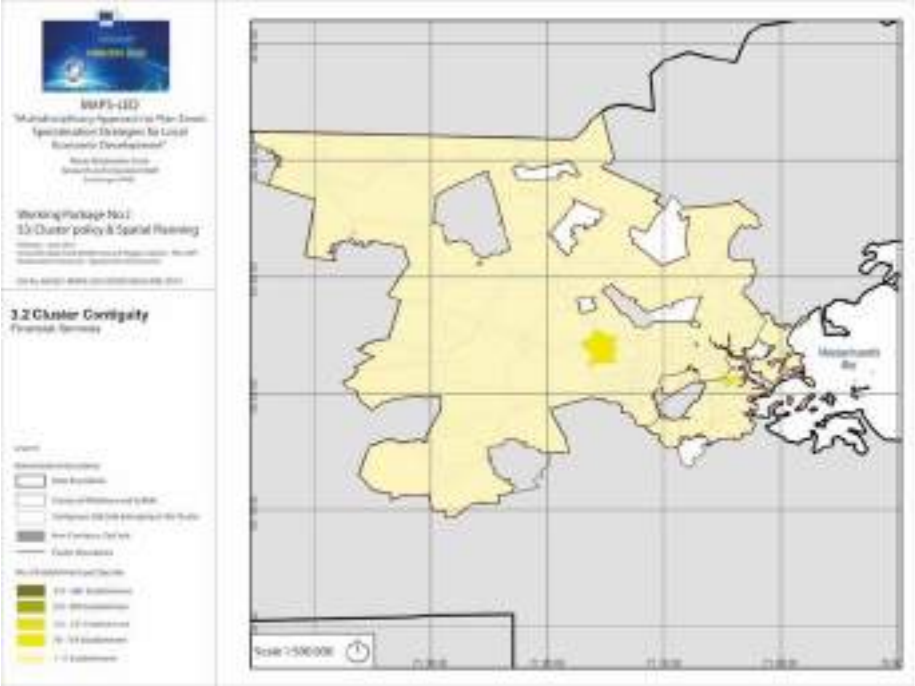
3.2 Cluster Contiguity Biopharmaceuticals



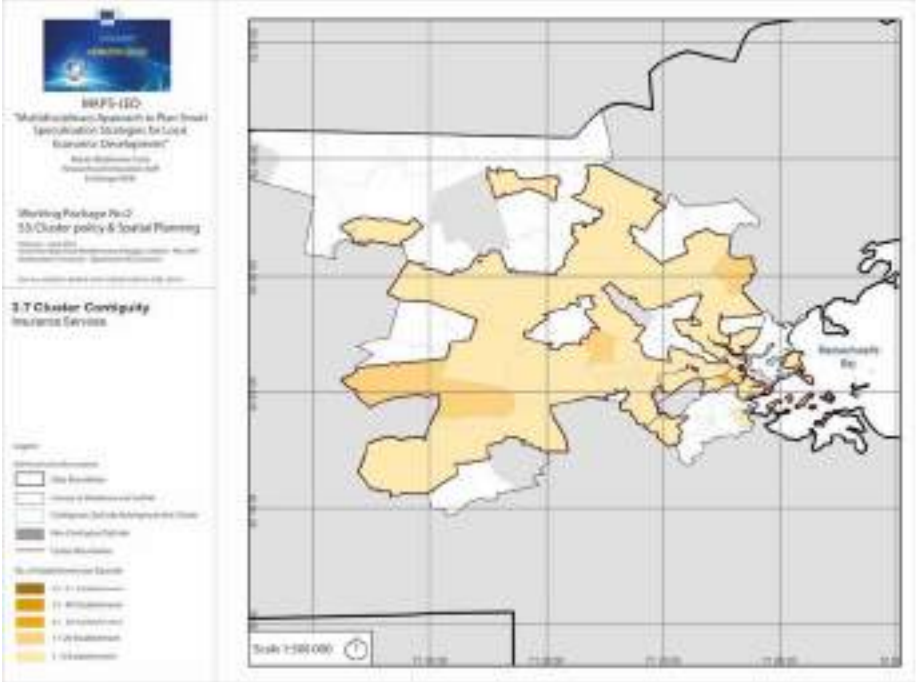
3.3 Cluster Contiguity Education and Knowledge Creation



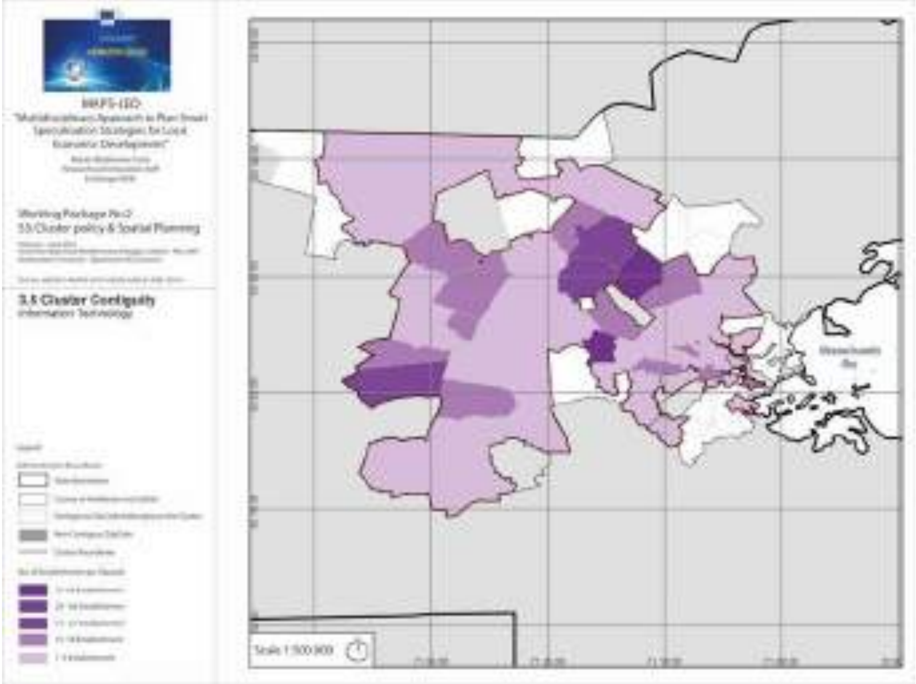
3.4 Cluster Contiguity financial services



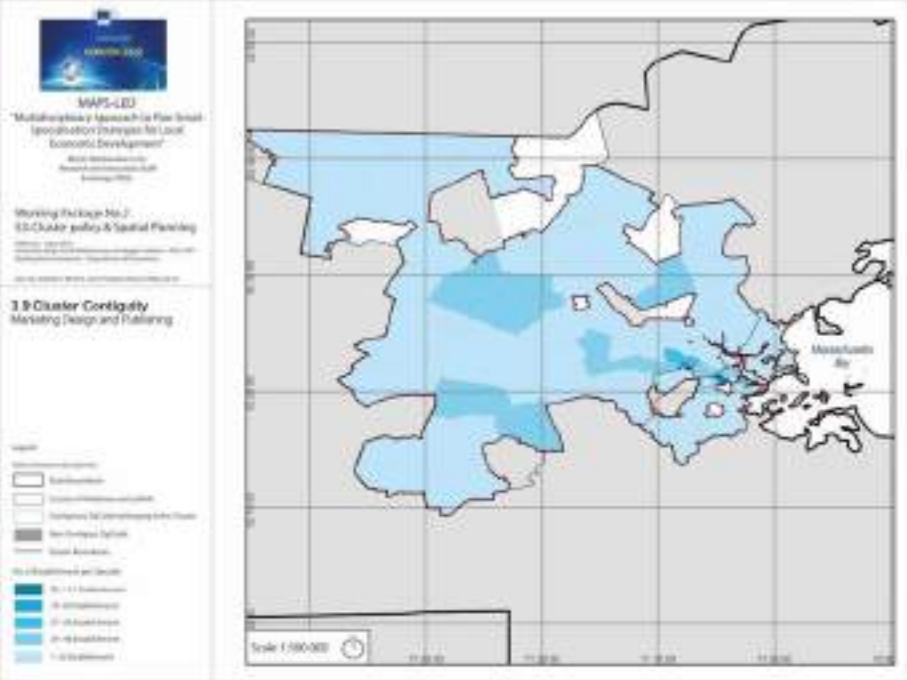
3.6 Cluster Contiguity Insurance Services



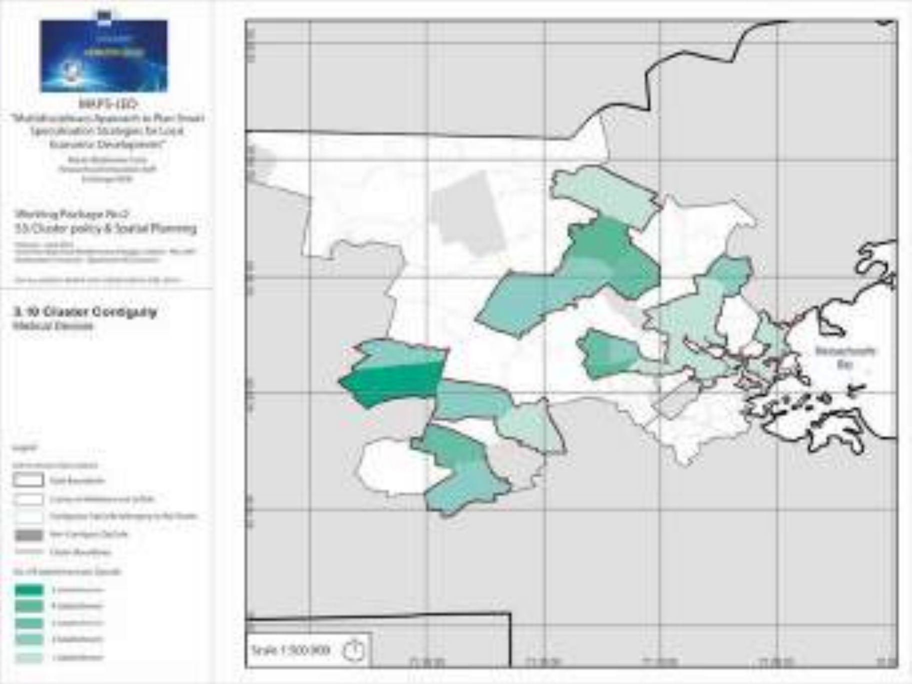
3.7 Cluster Contiguity Information Technology



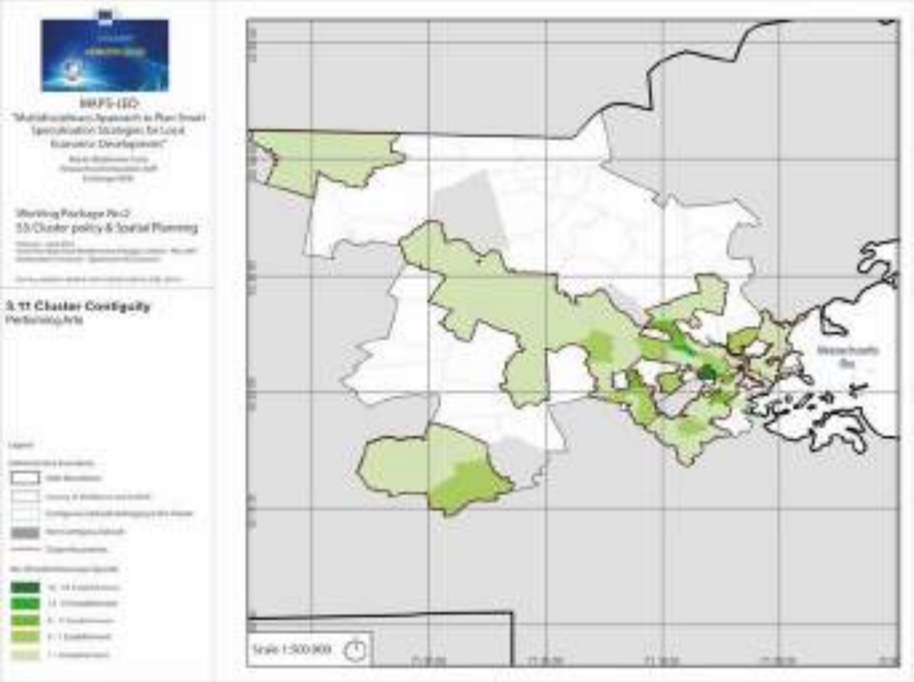
3.8 Cluster Contiguity Marketing, Design and Publishing



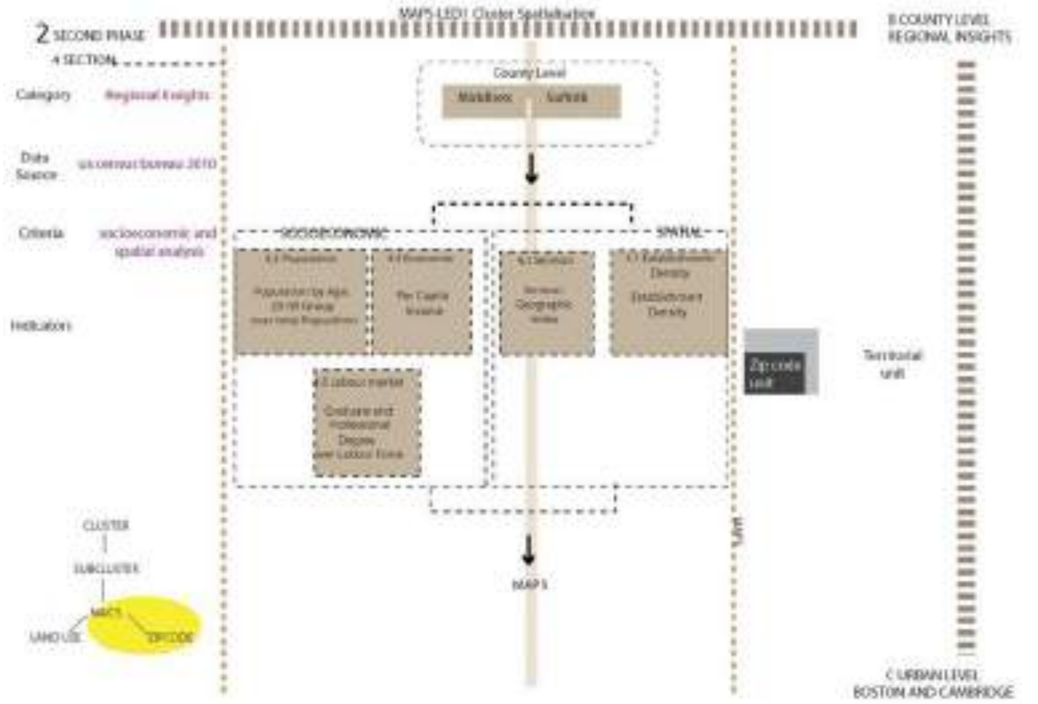
3.9 Cluster Contiguity Medical Devices



3.10 Cluster Contiguity Performing Arts



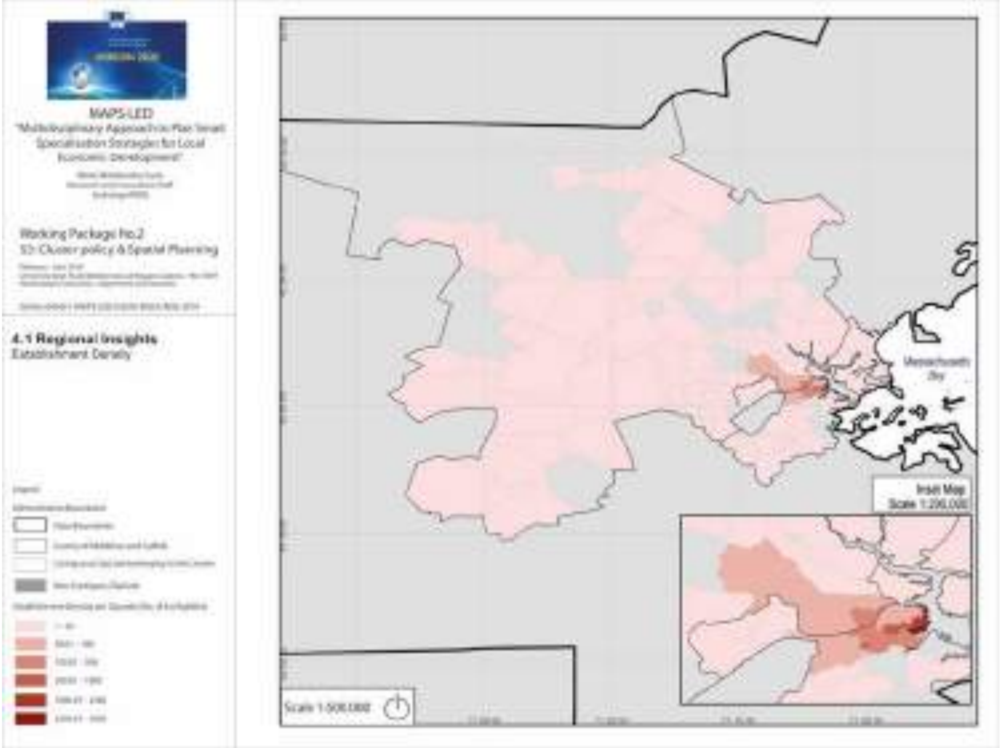
Regional Insights



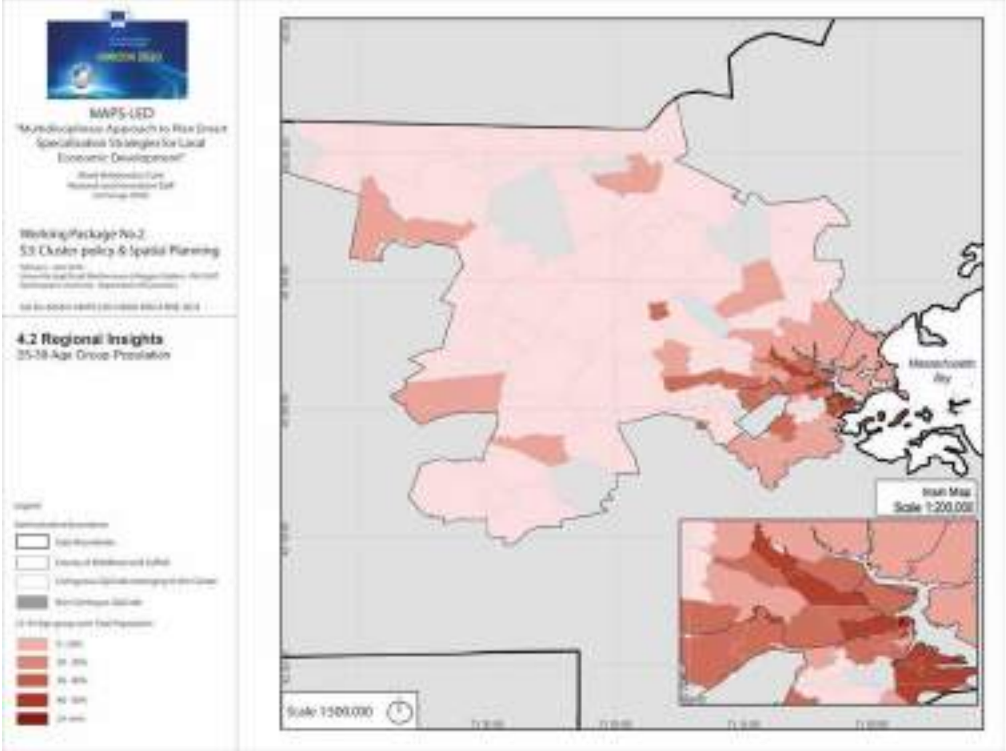
Regional Insights

4.1 Establishments Density
4.2 25-39 Age Group Population
4.3 Services Geographic Index
4.4 Per Capita Income per Zip Code
4.5 Graduate Profession Degree over Labor Force

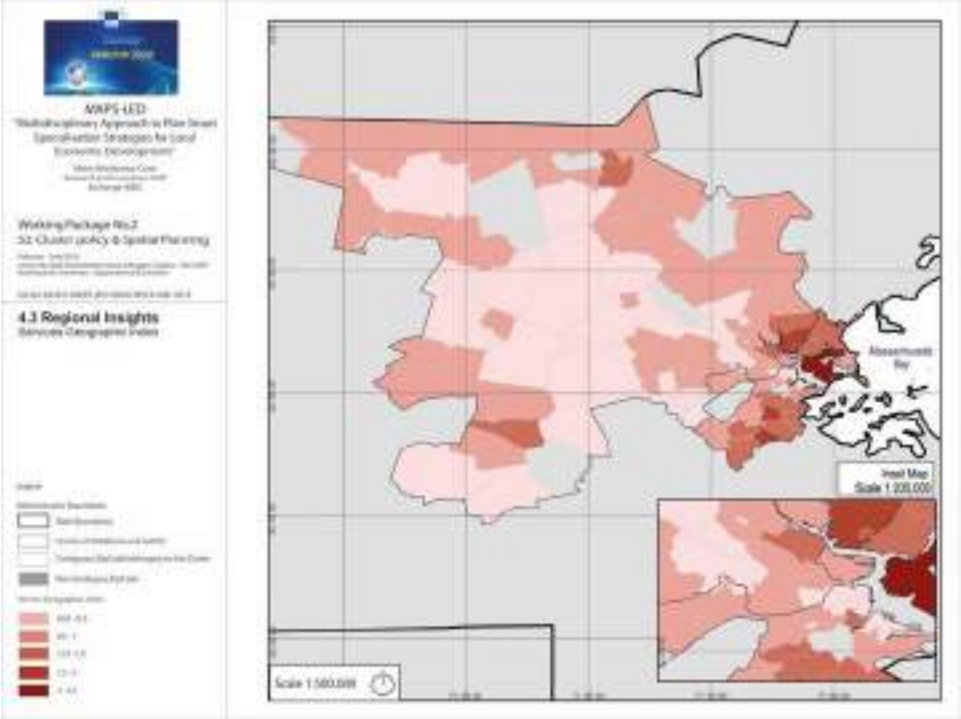
4.1 Establishments Density



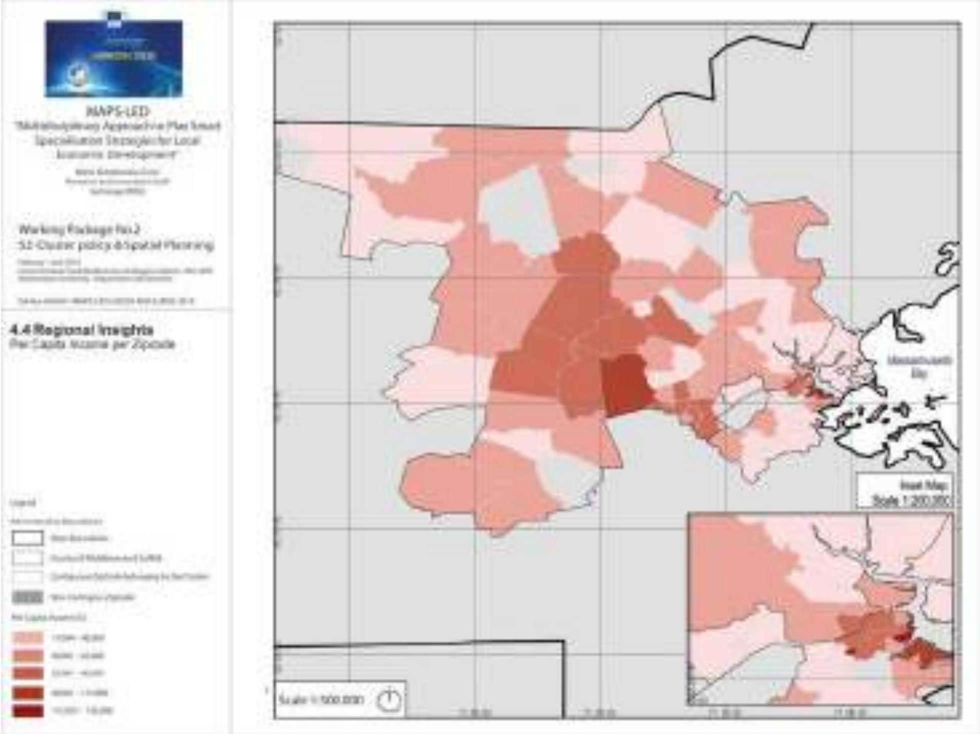
4.2 25-39 Age Group Population



4.3 Services Geographic Index



4.4 Per Capita Income per Zip Code

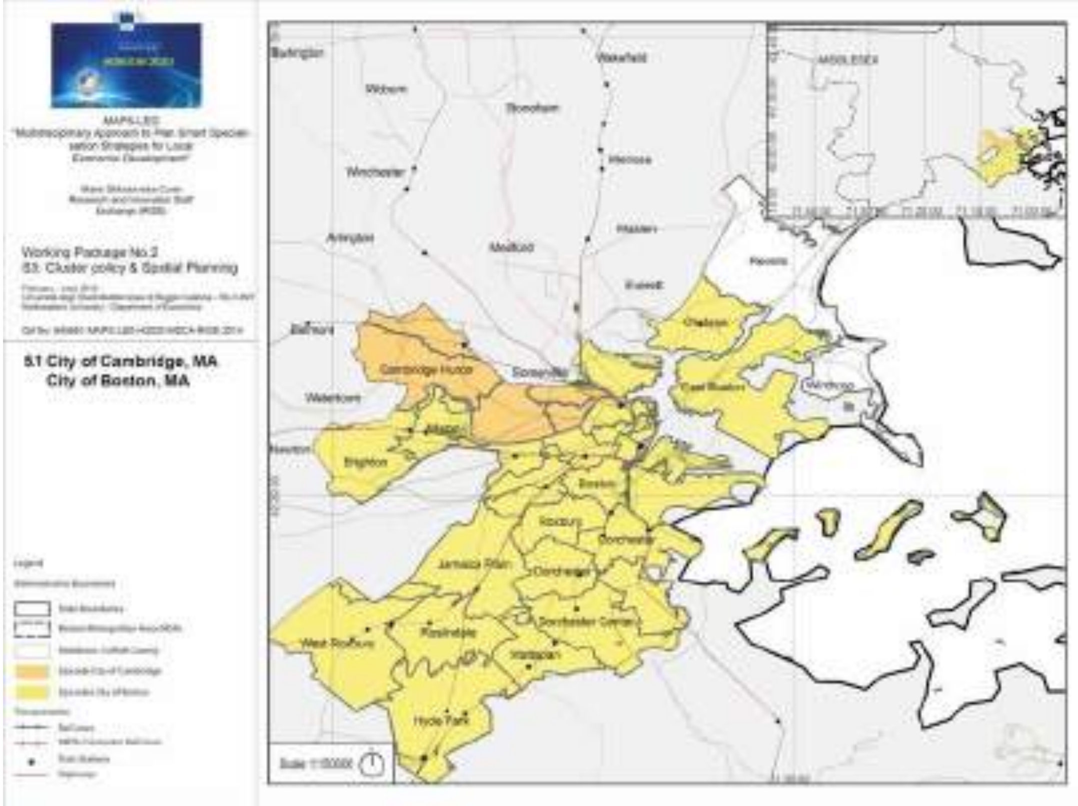


Cluster Morphology at urban level

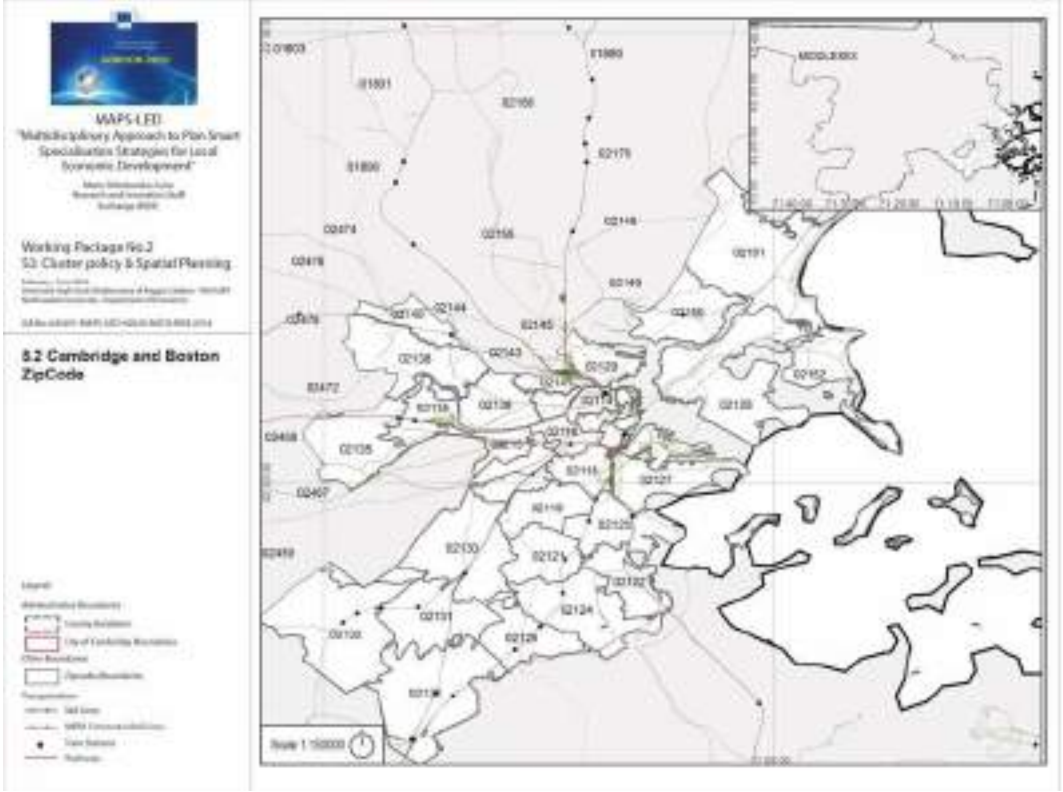
The third phase intends to analyse the cluster at the city/urban level. This phase started with the definition of the context to analyse. At this regard specific maps have been produced for the area of inquiry (City of Cambridge and City of Boston) finalised at the cluster identification at city level: Zipcode; Land Use; Transportation. Subsequently, clusters have been mapped by establishment density per zipcode.

Cluster Morphology at Urban Level

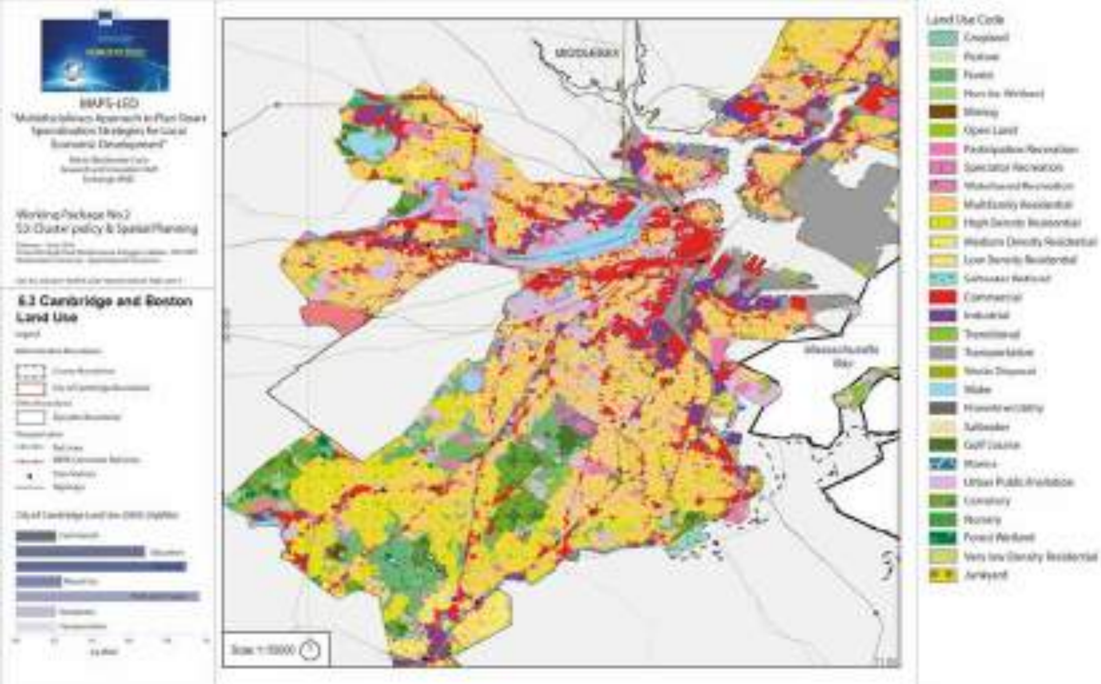
5.1 City of Cambridge, MA and City of Boston, MA



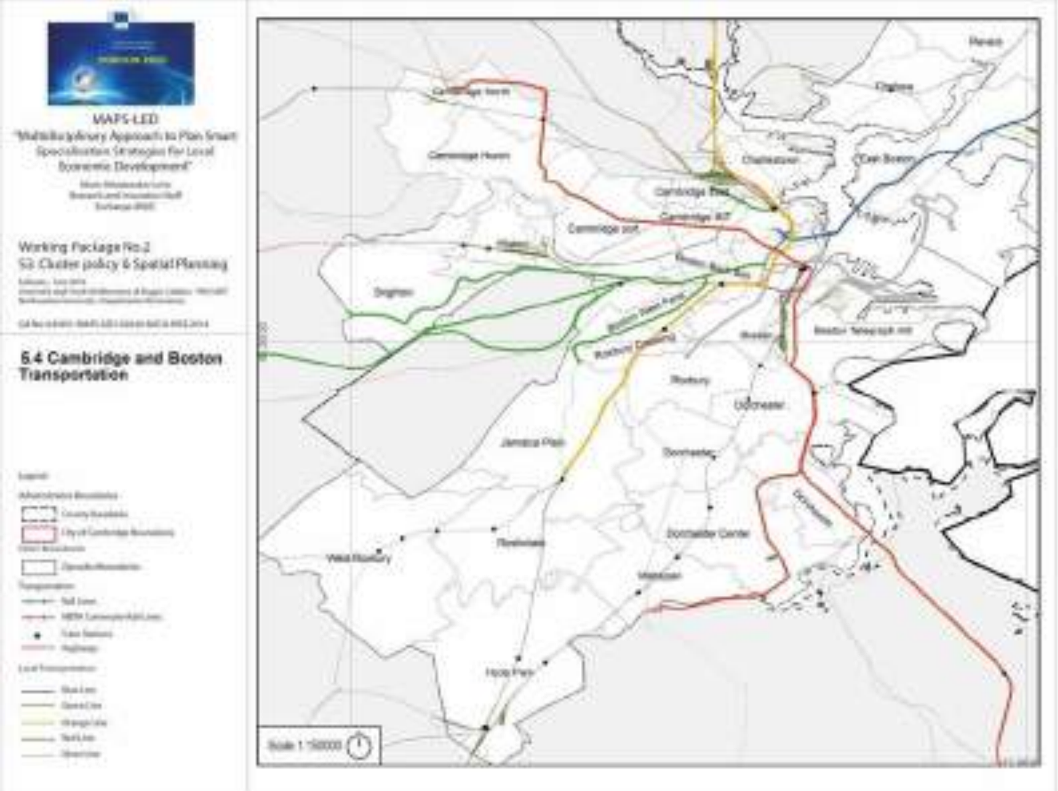
5.2 Cambridge and Boston Zip Codes



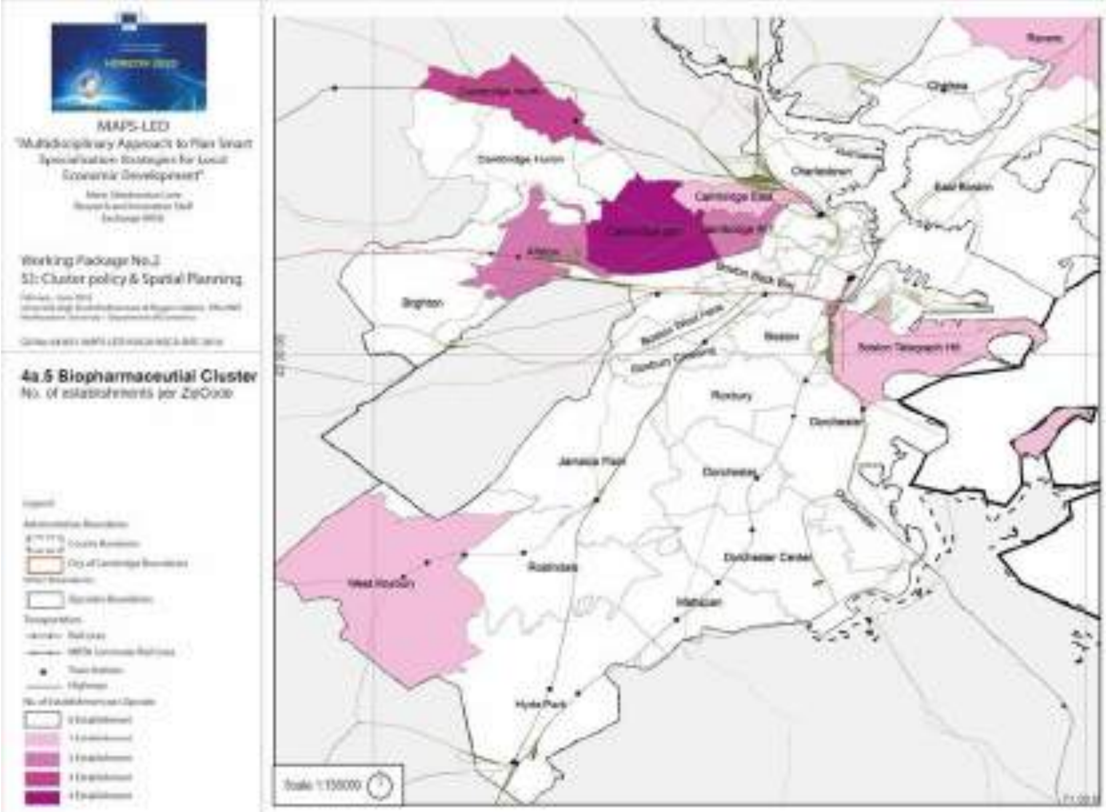
5.3 Cambridge and Boston Land Use



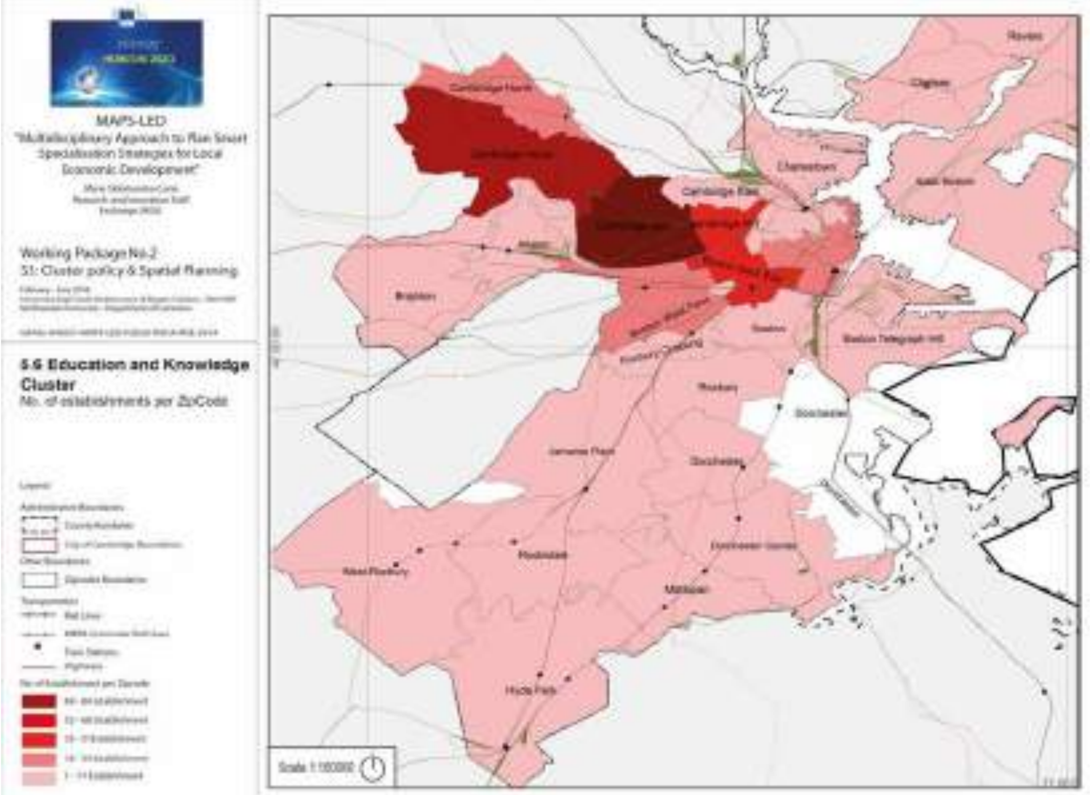
5.4 Cambridge and Boston Transportation



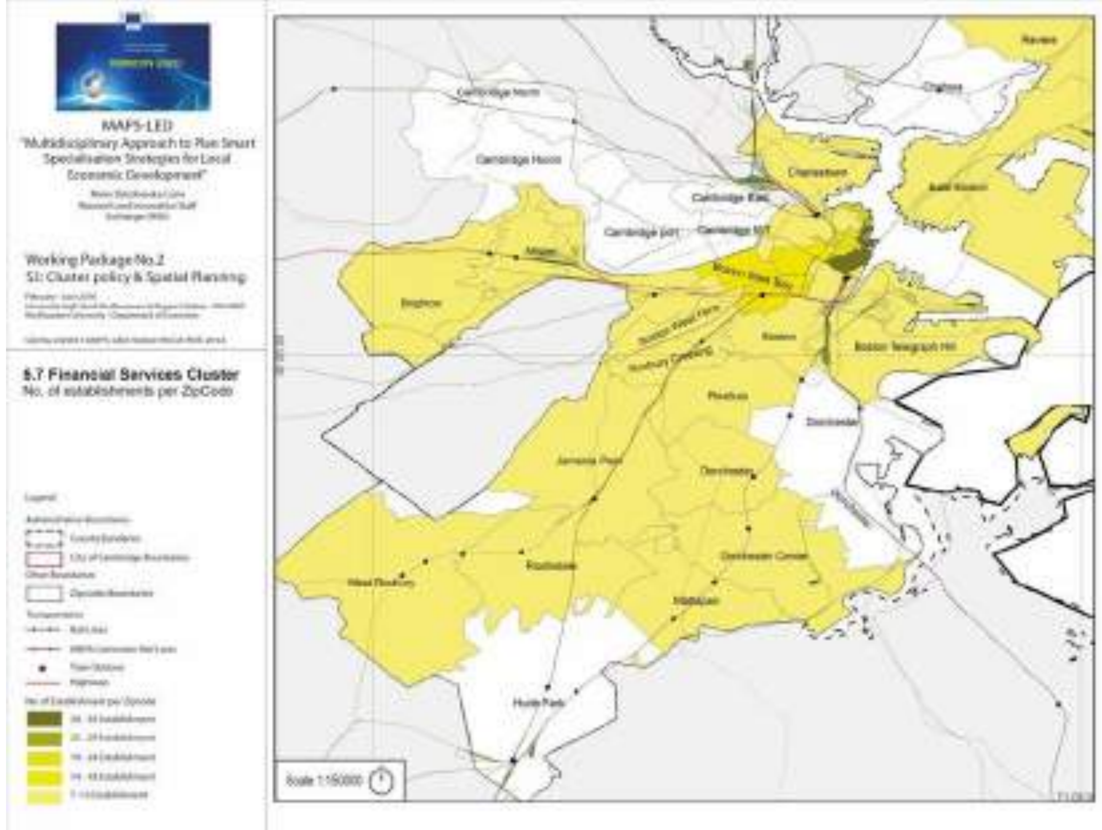
5.5 Cluster Biopharmaceuticals Establishment per Zipcode



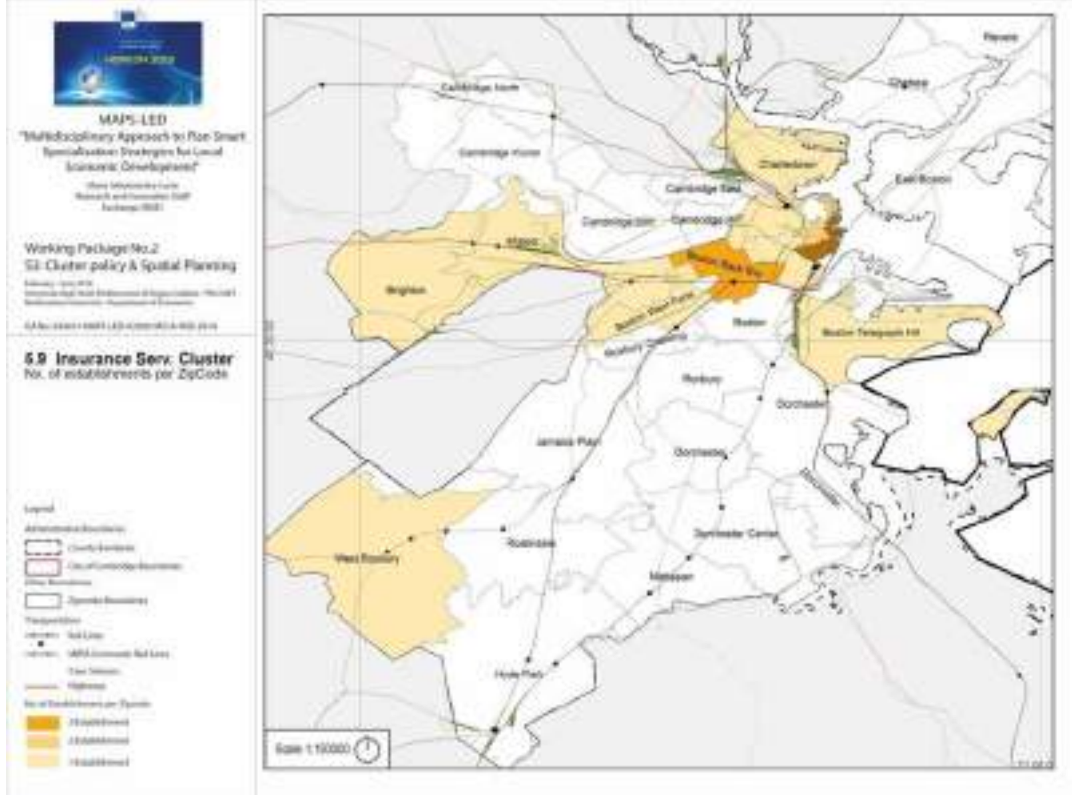
5.6 Cluster Education and Knowledge Creation Establishment per Zipcode



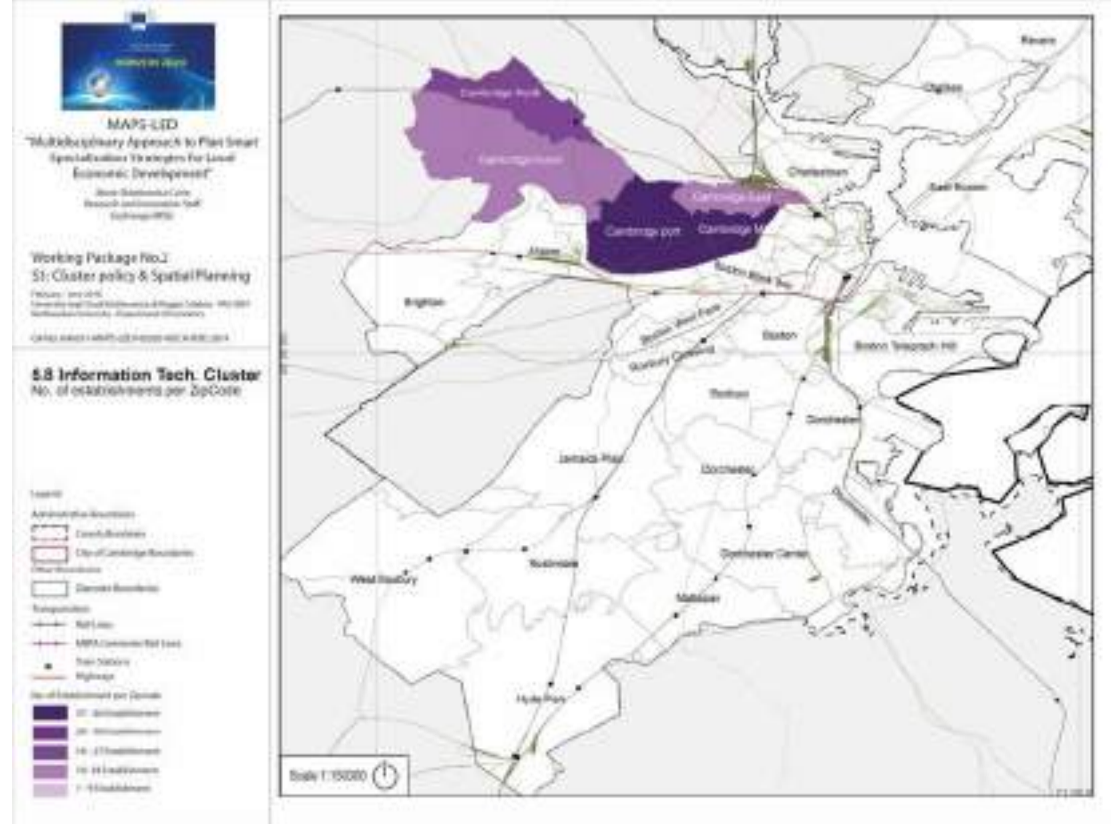
5.7 Cluster Financial Services Establishment per Zipcode



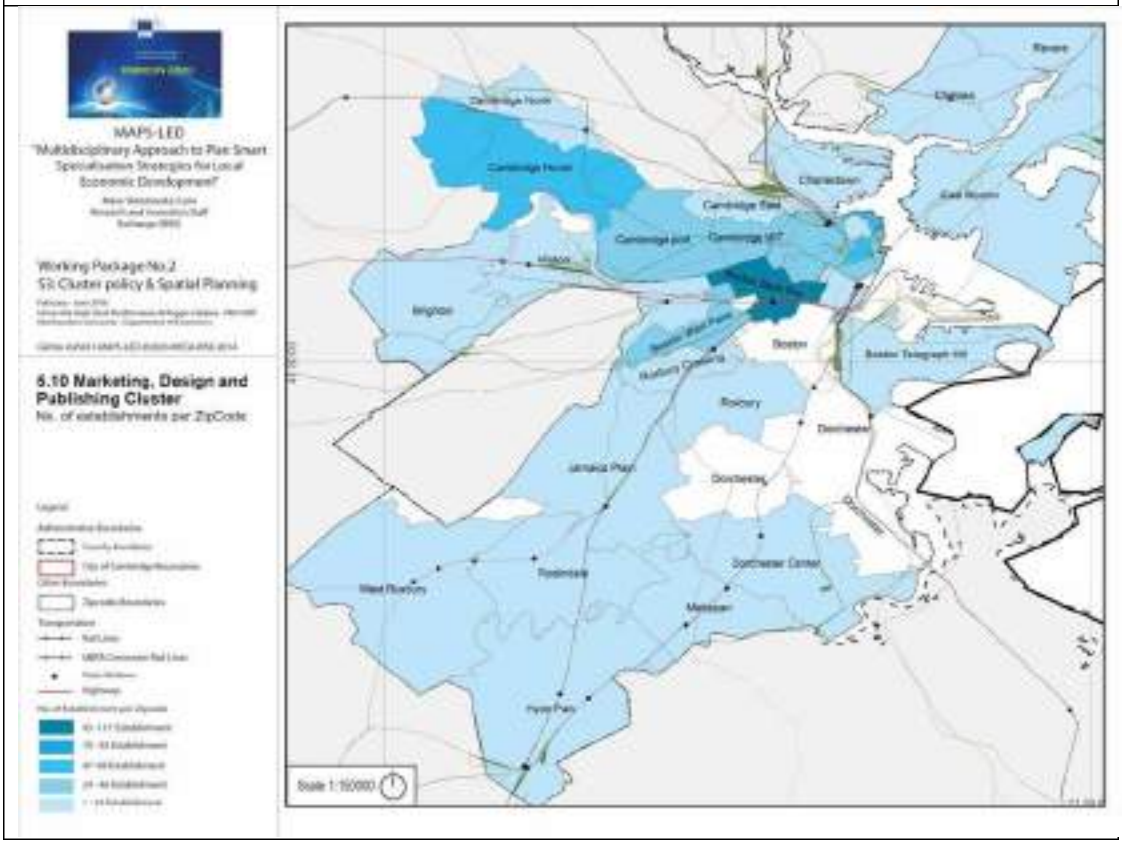
5.8 Cluster Insurance Services Establishment per Zipcode



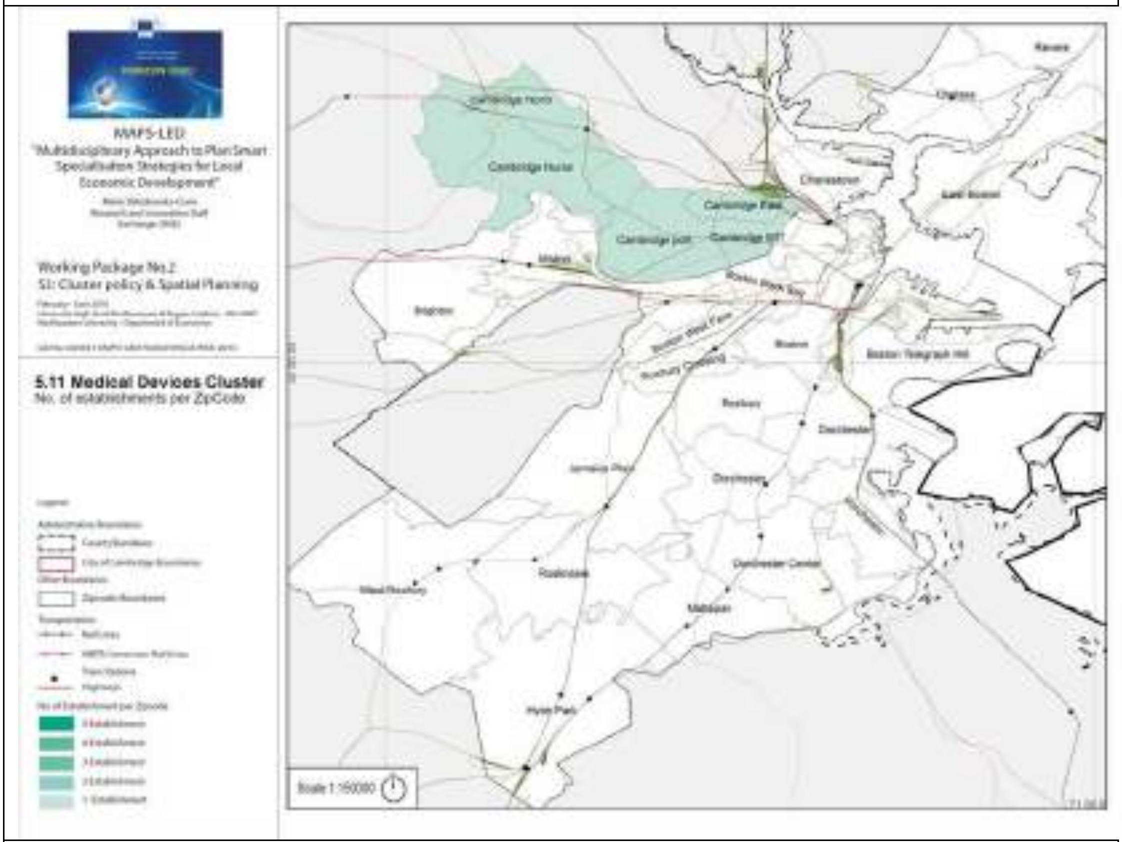
5.9 Cluster Information Technology Establishment per Zipcode



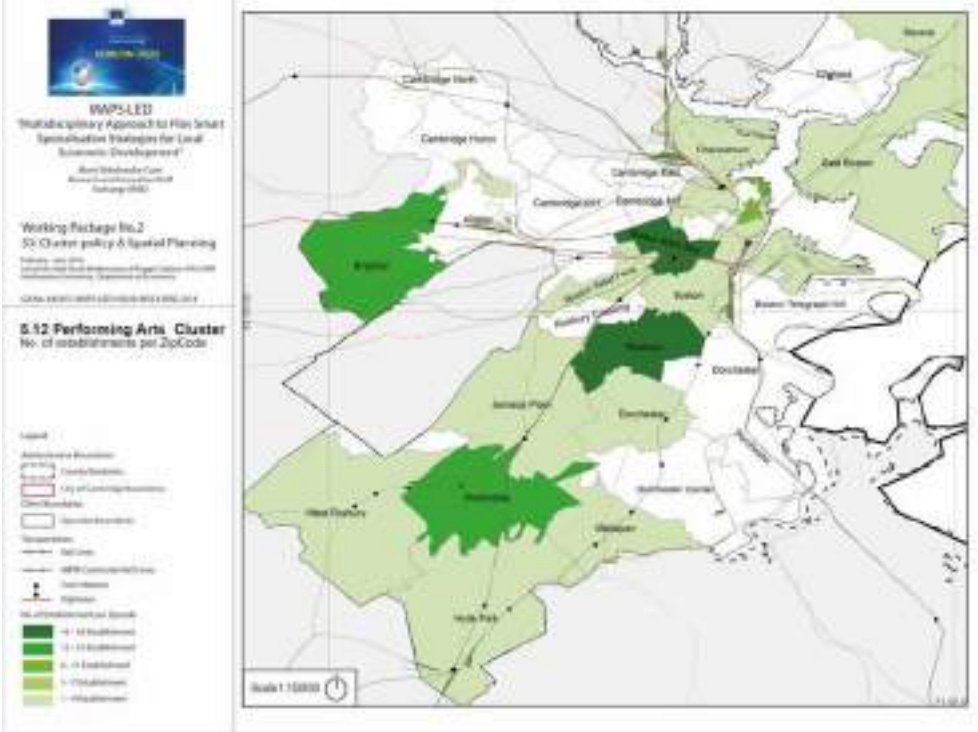
5.10 Cluster Marketing, Design and Publishing Establishment per Zipcode



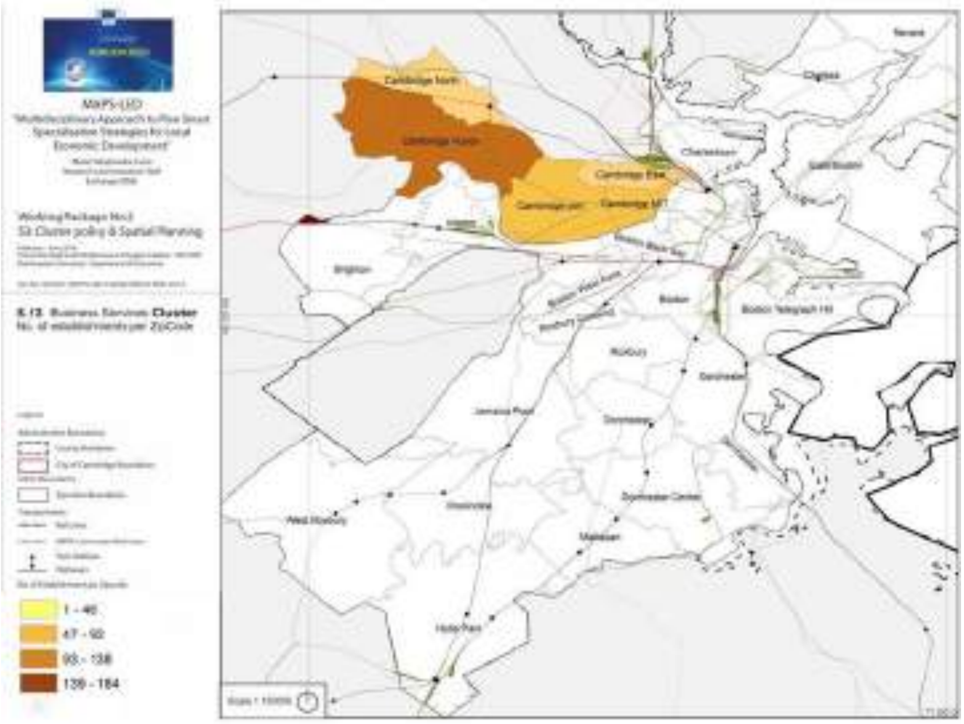
5.11 Cluster Medical Devices Establishment per Zipcode



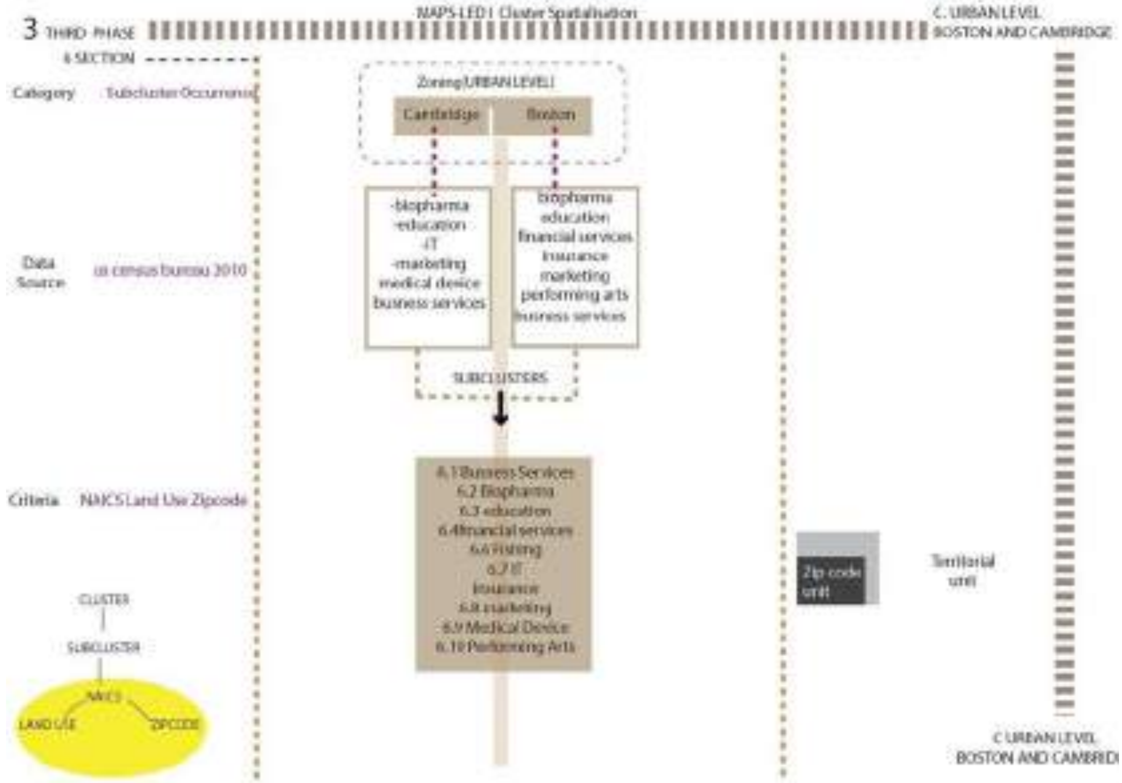
5.12 Cluster Performing Arts Establishment per Zipcode



5.13 Cluster Business Services Establishment per Zipcode



Subcluster occurrence

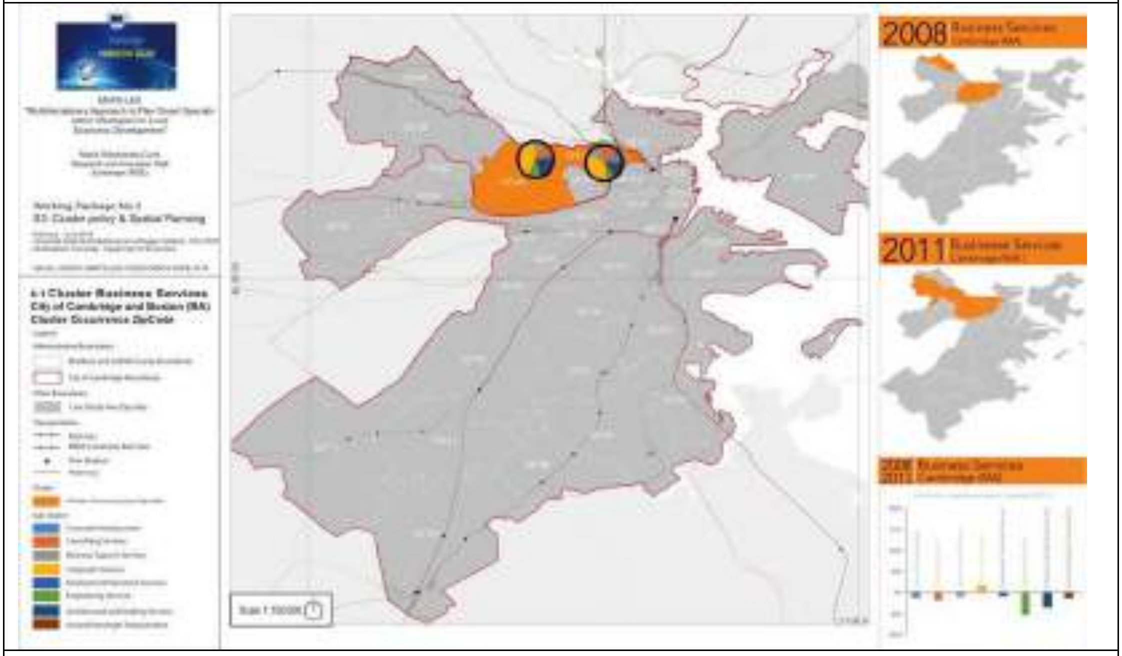


In order to bring the analysis up to a more detailed level the spatial configuration of clusters at city level have been analysed in terms of sub-cluster occurrence. This step allows to define the structure of the cluster and could result crucial in the understanding of interdependency/interlinkages of industries in some sector that are localised in different areas. This phase concludes the section with the sub-cluster occurrences maps, and are classified in:

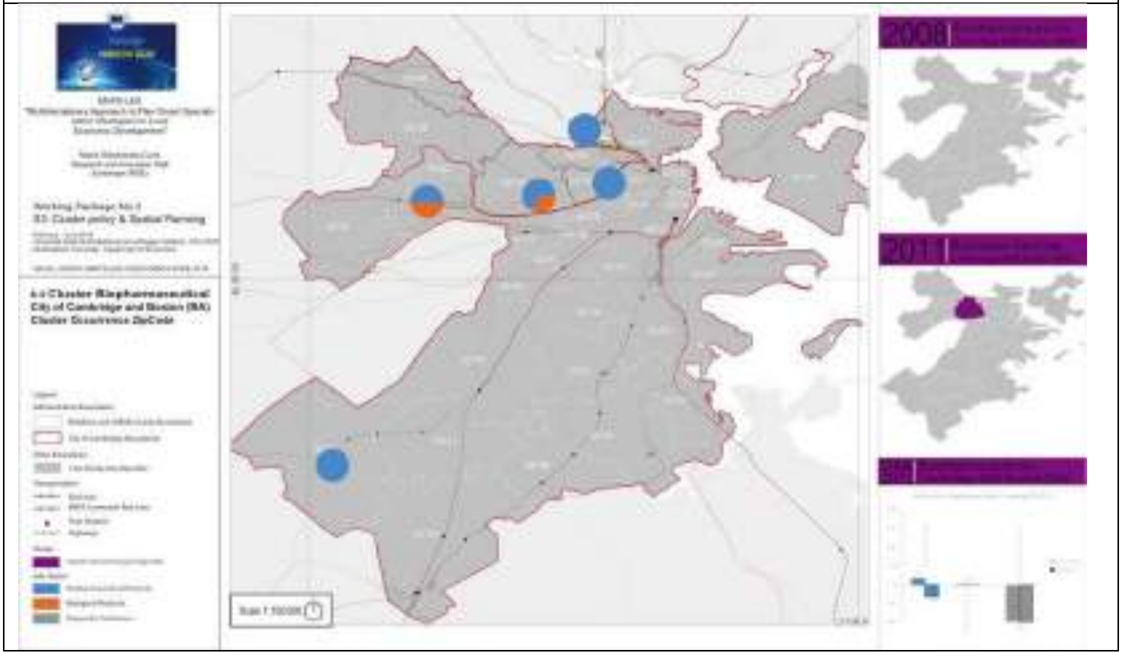
Sub-cluster Occurrence at Urban Level

6.1 Sub-cluster Occurrence Business Services
6.2 Sub-cluster Occurrence Biopharmaceuticals
6.3 Sub-cluster Occurrence Education and Knowledge Creation
6.4 Sub-cluster Occurrence Financial Services
6.5 Sub-cluster Occurrence Insurance Services
6.6 Sub-cluster Occurrence Information Technology
6.7 Sub-cluster Occurrence Marketing, Design and Publishing
6.8 Sub-cluster Occurrence Medical Devices
6.9 Sub-cluster Occurrence Performing Arts
6.10 Total Clusters Occurrence City of Boston (MA) Cluster Occurrence per Zip Code

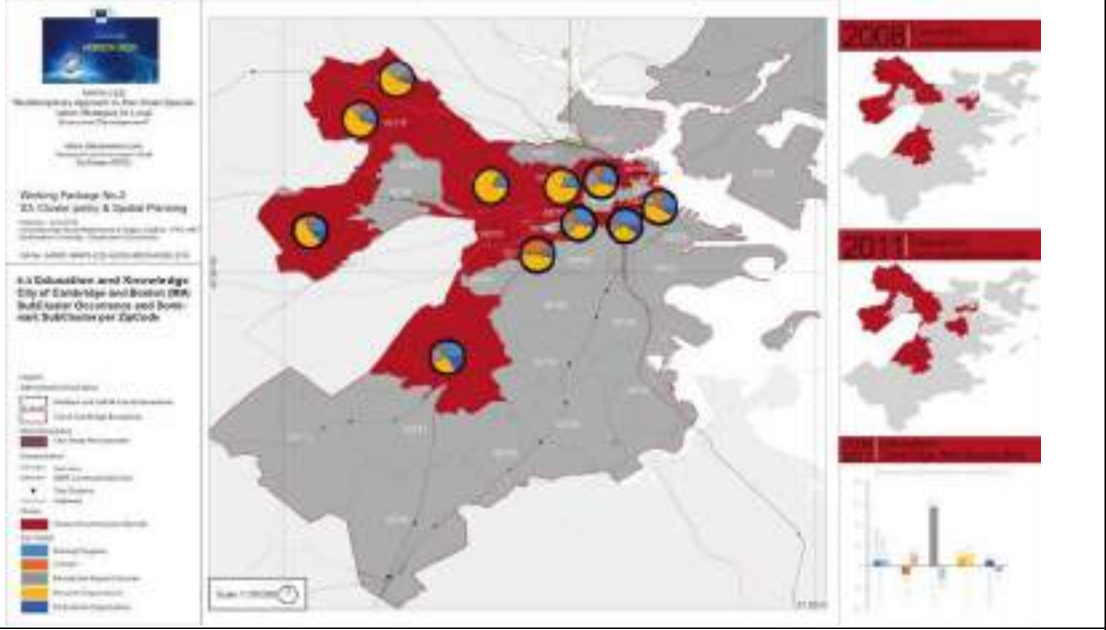
6.1 Sub-cluster Occurrence Business Services



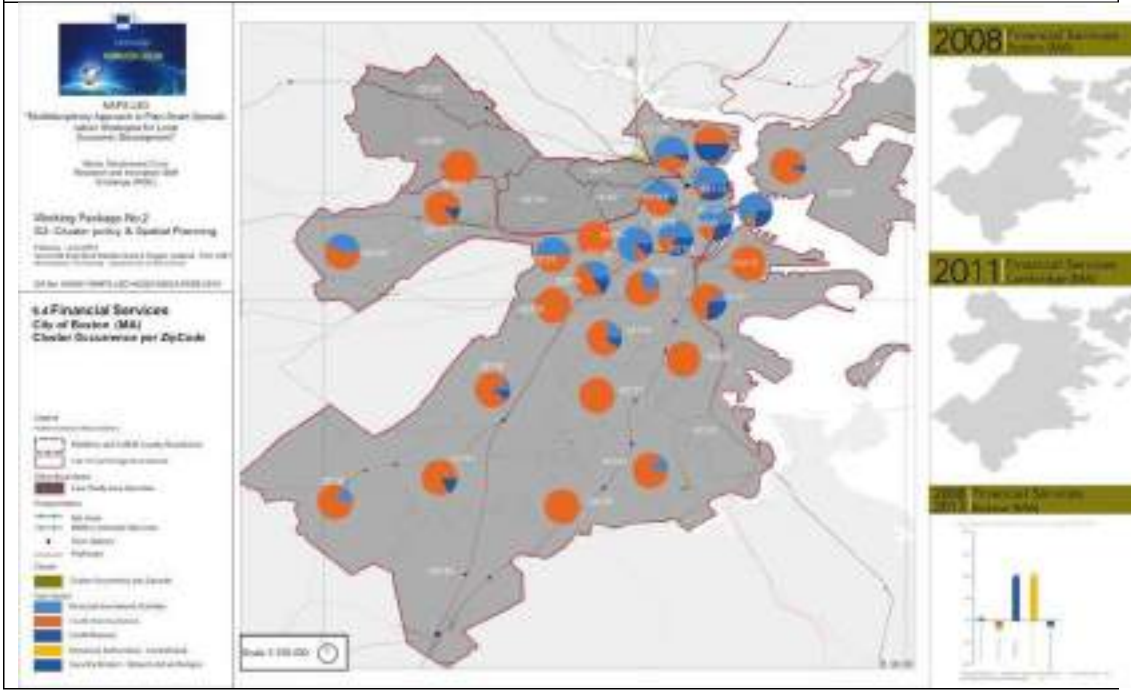
6.2 Sub-cluster Occurrence Biopharmaceuticals



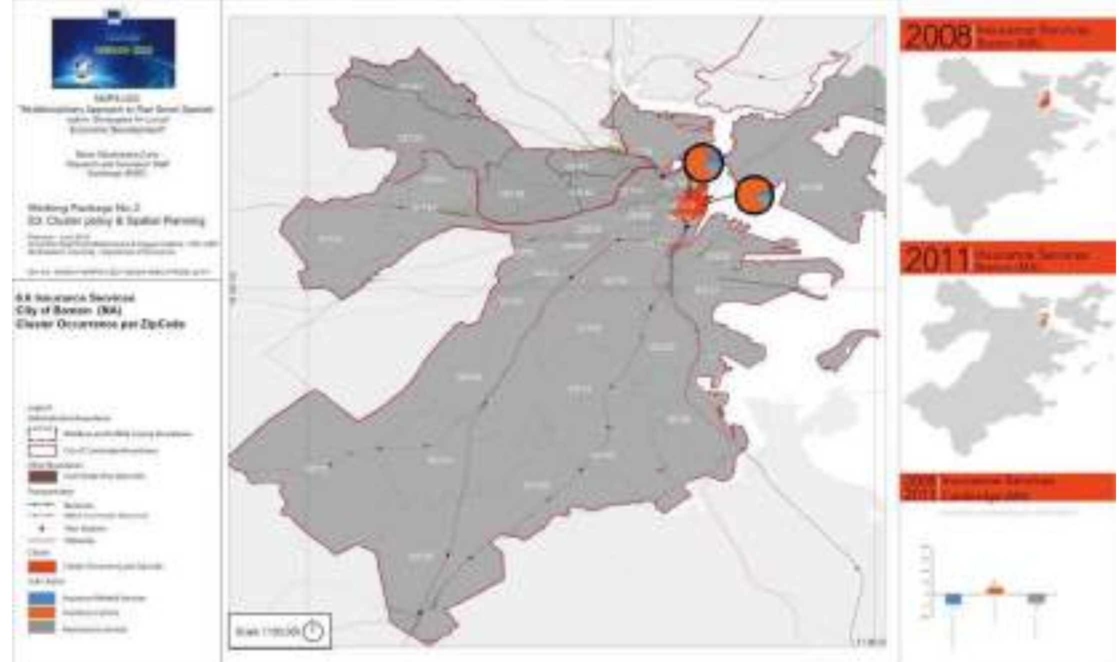
6.3 Sub-cluster Occurrence Education and Knowledge Creation



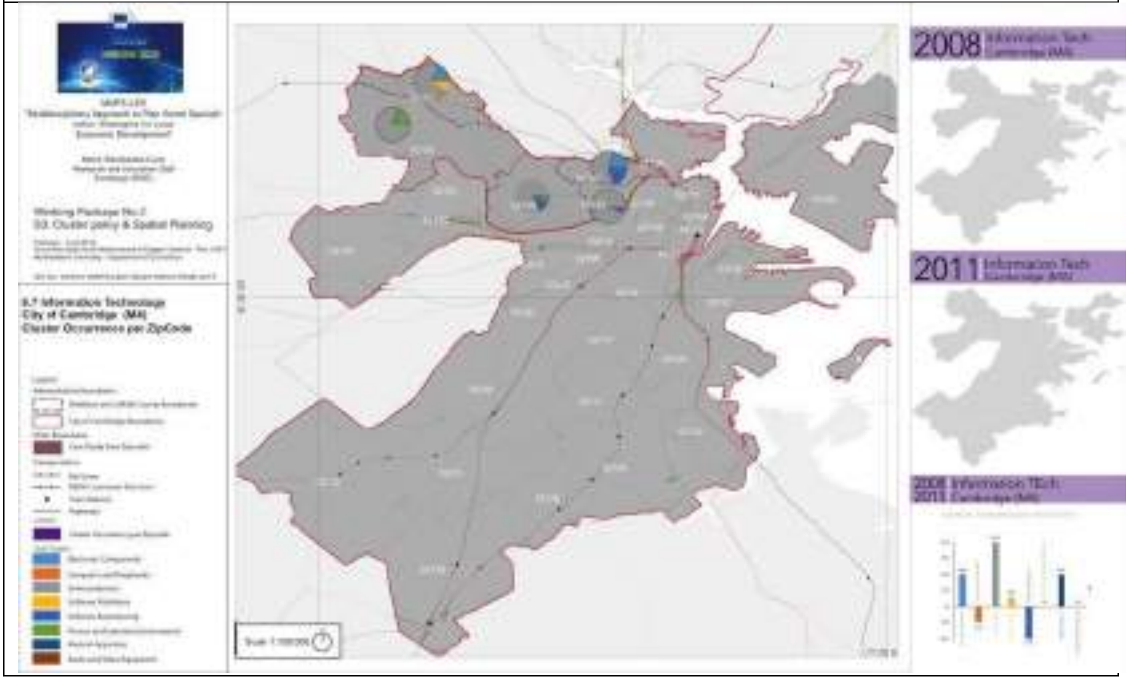
6.4 Sub-cluster Occurrence Financial Services



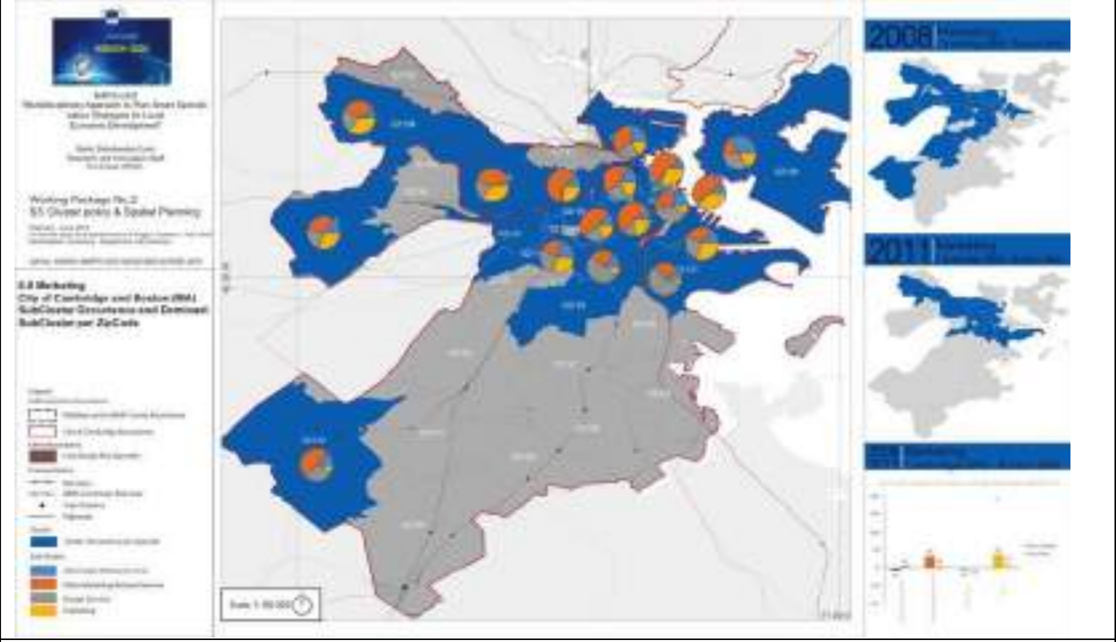
6.5 Sub-cluster Occurrence Insurance Services



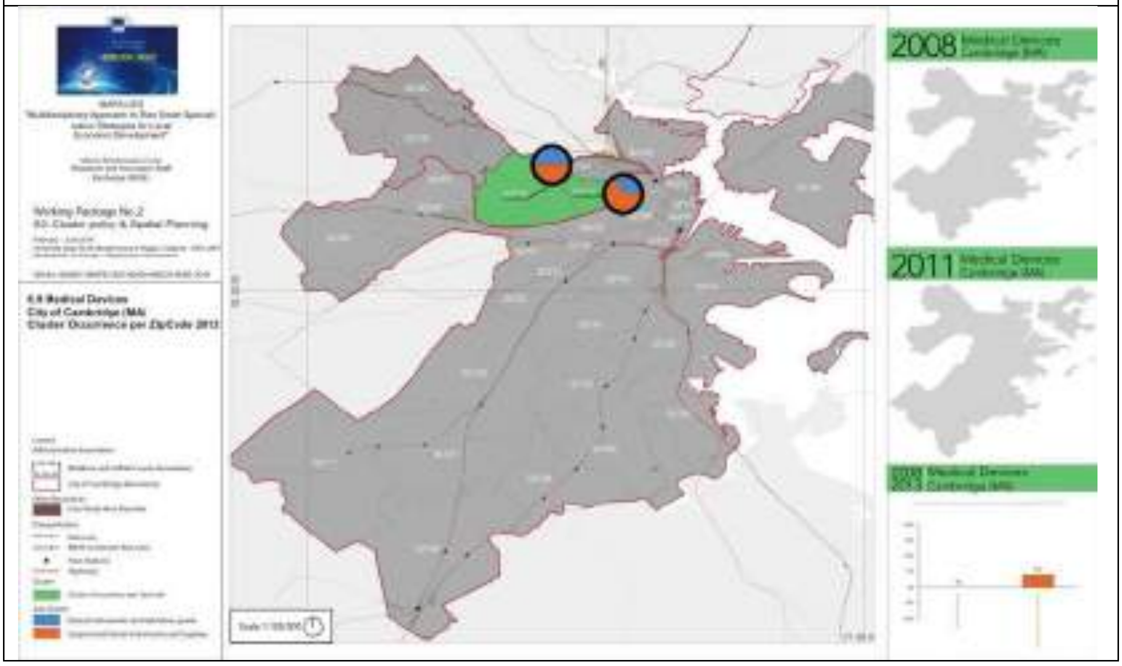
6.6 Sub-cluster Occurrence Information Technology



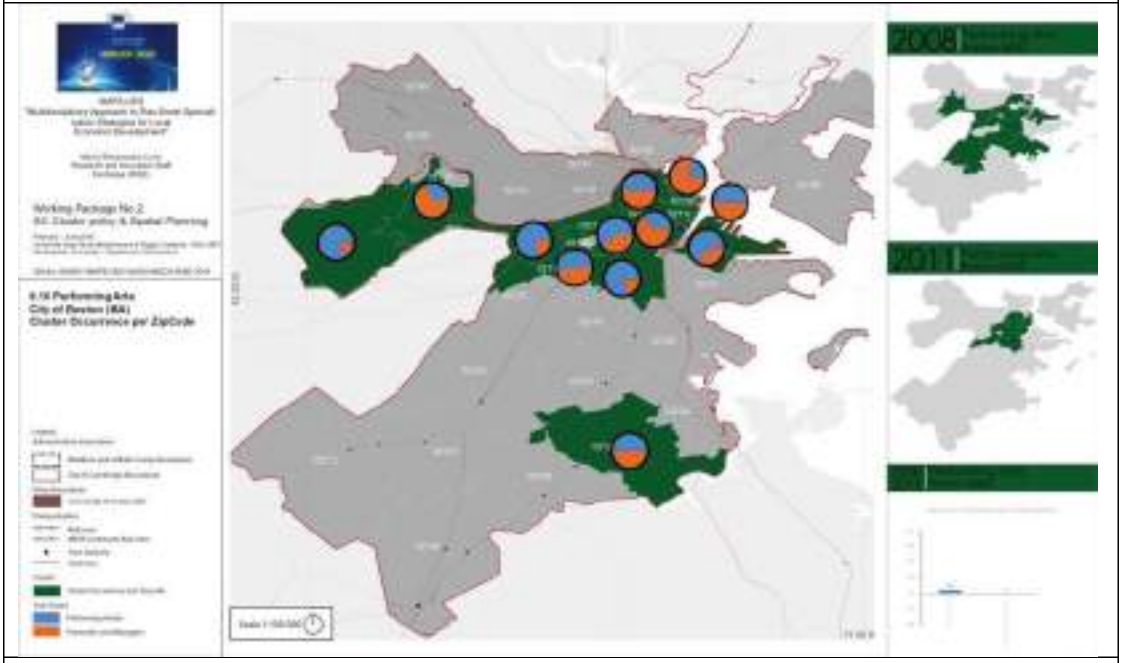
6.7 Sub-cluster Occurrence Marketing, Design and Publishing



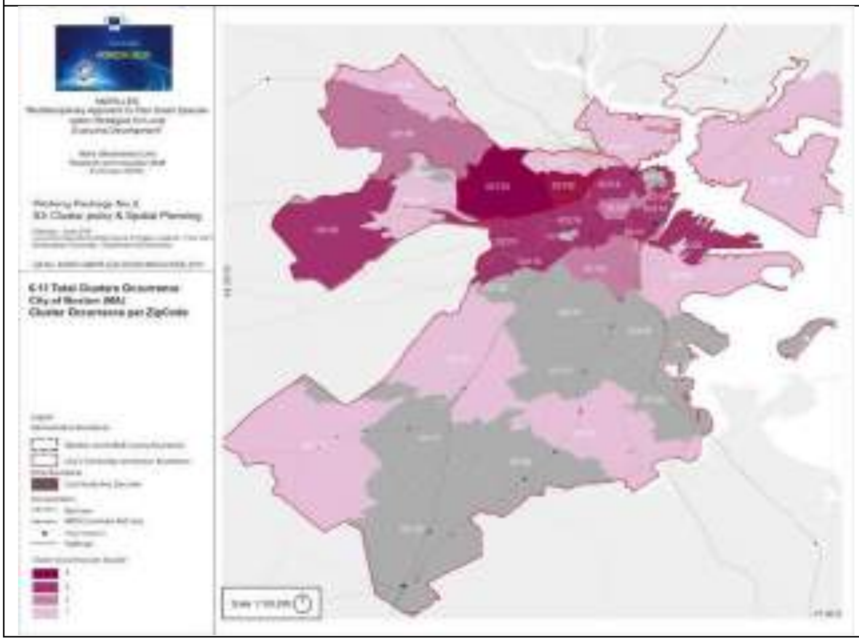
6.8 Sub-cluster Occurrence Medical Devices



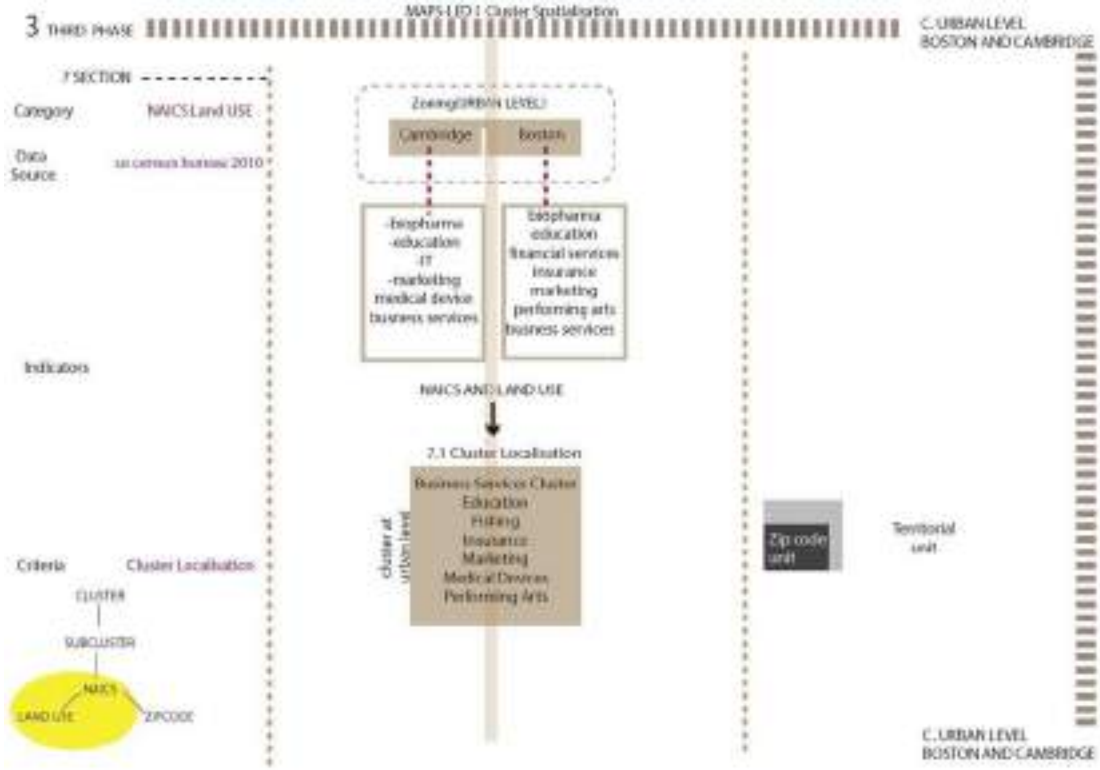
6.9 Sub-cluster Occurrence Performing Arts



6.10 Total Clusters Occurrence City of Boston (MA) Cluster Occurrence per ZipCode

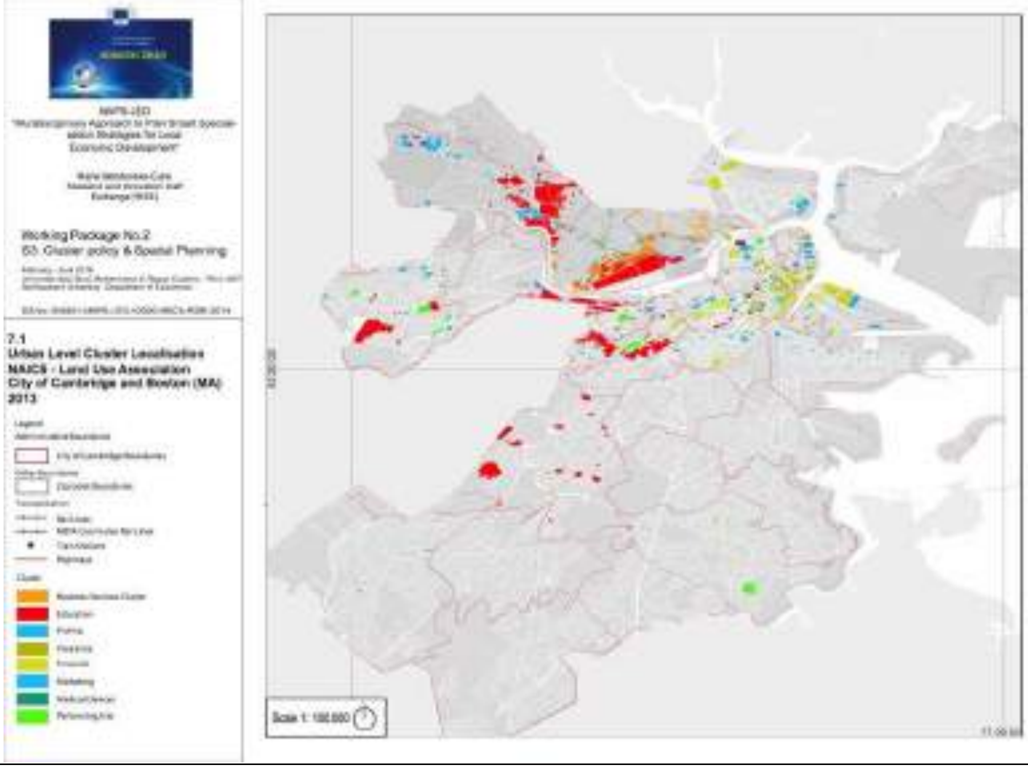


Third phase: Cluster Spatialisation at Urban Level

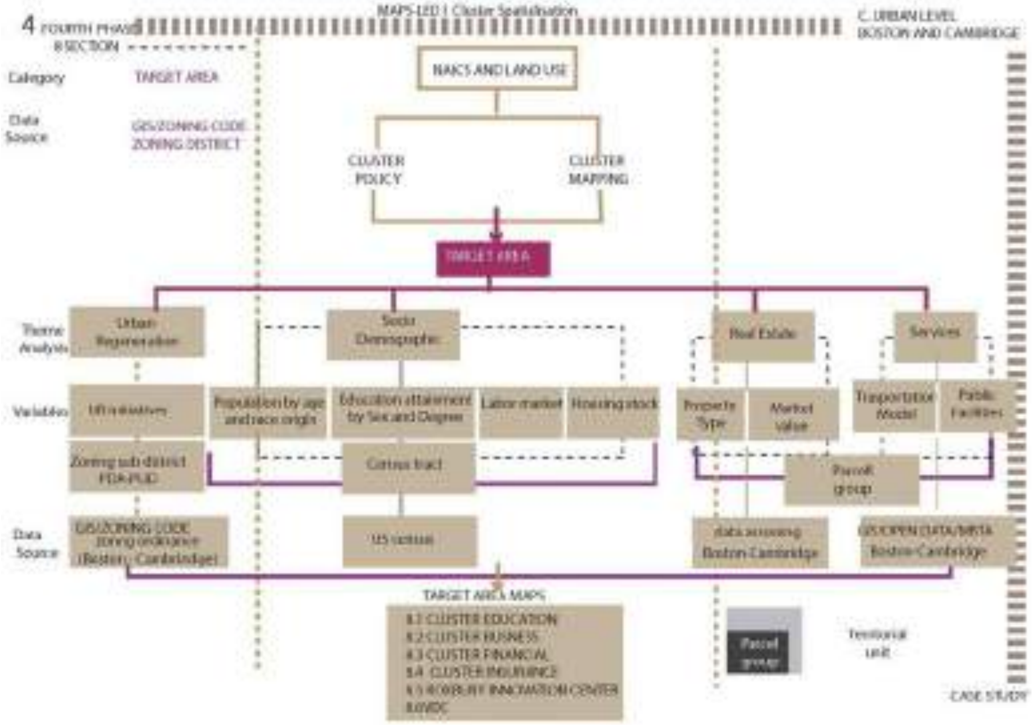


NAICS-Land Use Cluster Association

7.1 Urban Level Cluster Spatialisation



Fourth phases: Target Area analysis



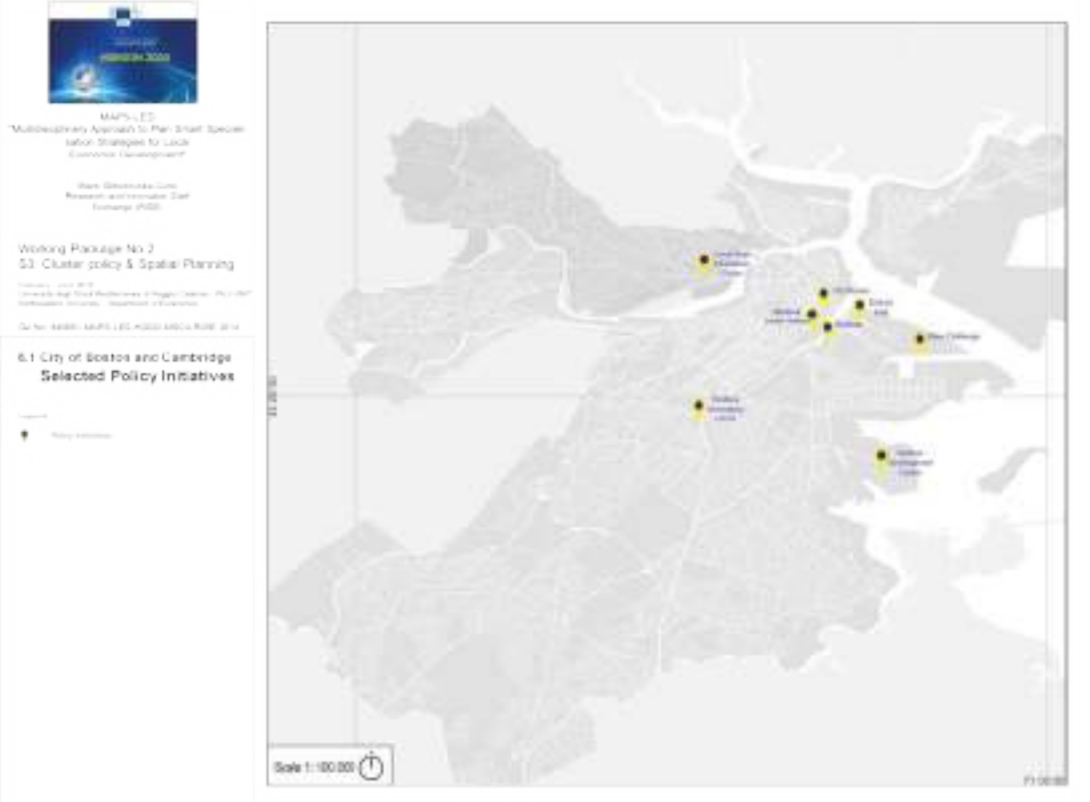
The research activities in the last phase have deduced that the city level is more appropriate to analyse the surrounding conditions in innovation concentration, based on the assumption that the localisation of clusters allows to consider them as innovation concentration proxy.
The case studies in Boston have been organised at the city level. The structure of the analysis is divided into two parts:

-The identification of target areas based on the innovation concentration (the cluster mapped at the city level) by incorporating the parcel and census track dimensional levels. In this way, the analysis of socioeconomic aspects and urban phenomena (real estate, facilities and transports) was possible.

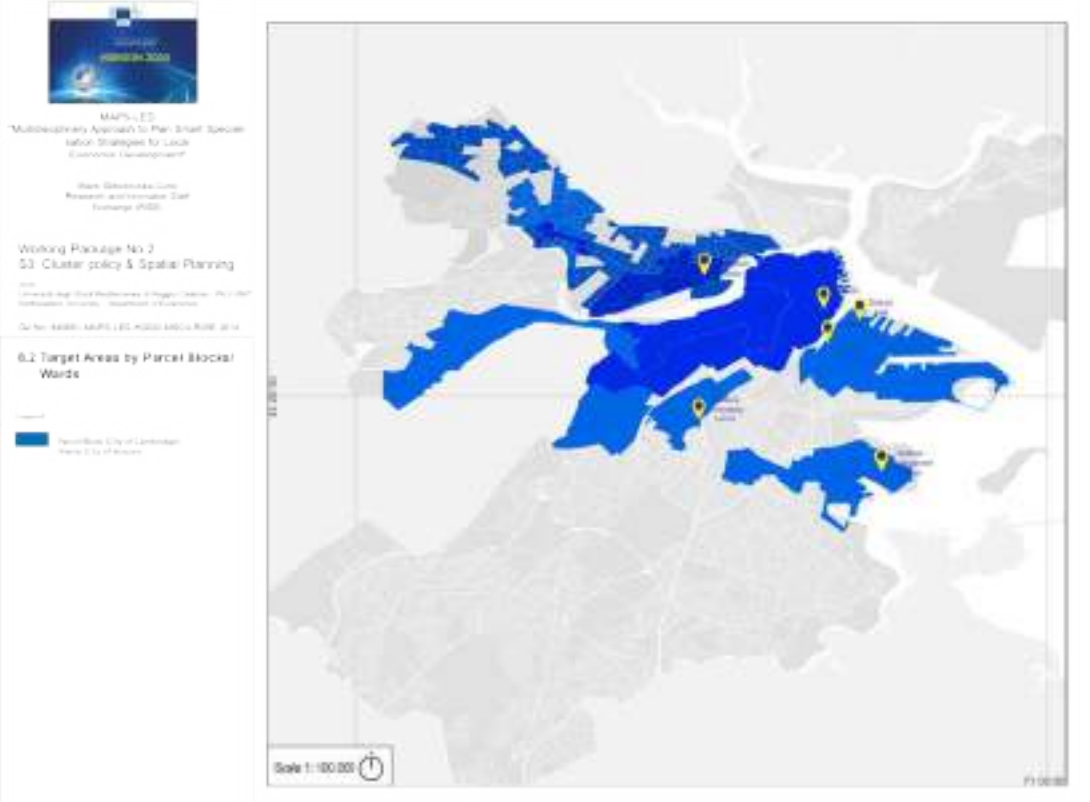
-The identification of innovation spaces (innovation districts, innovation hub) to analyse the role of community with respect the innovation process connected to cluster occurrence.

Section 8 TARGET AREA ANALYSIS

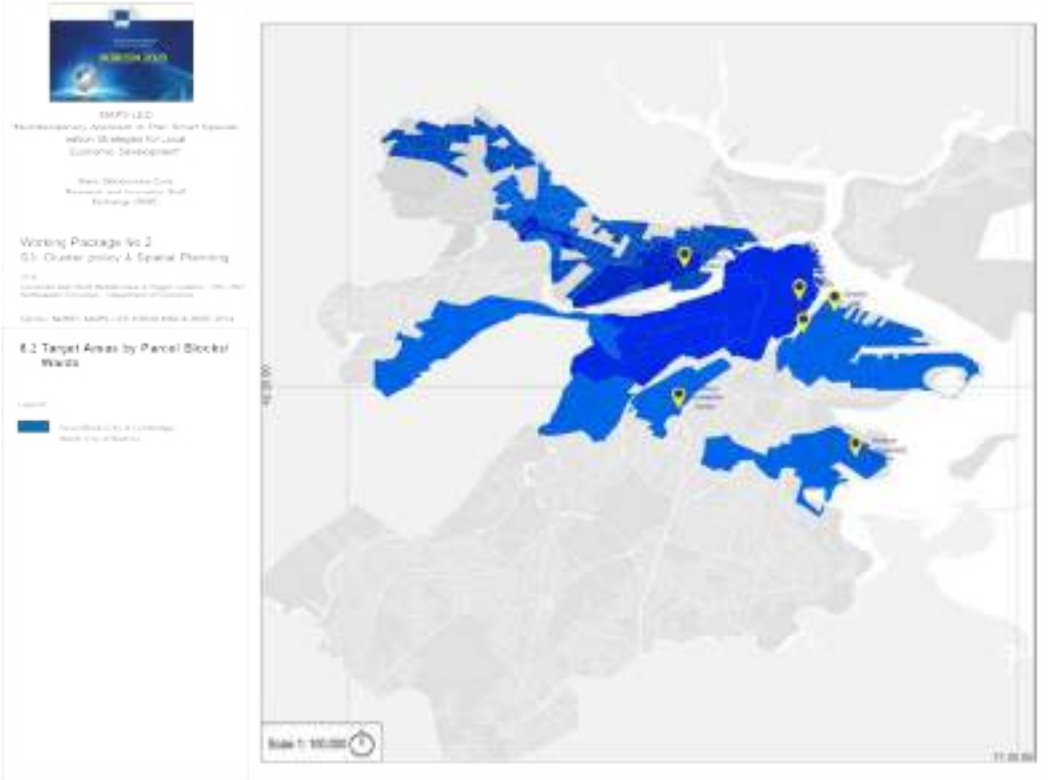
8.1 City of Boston and City of Cambridge Selected Policy Initiatives



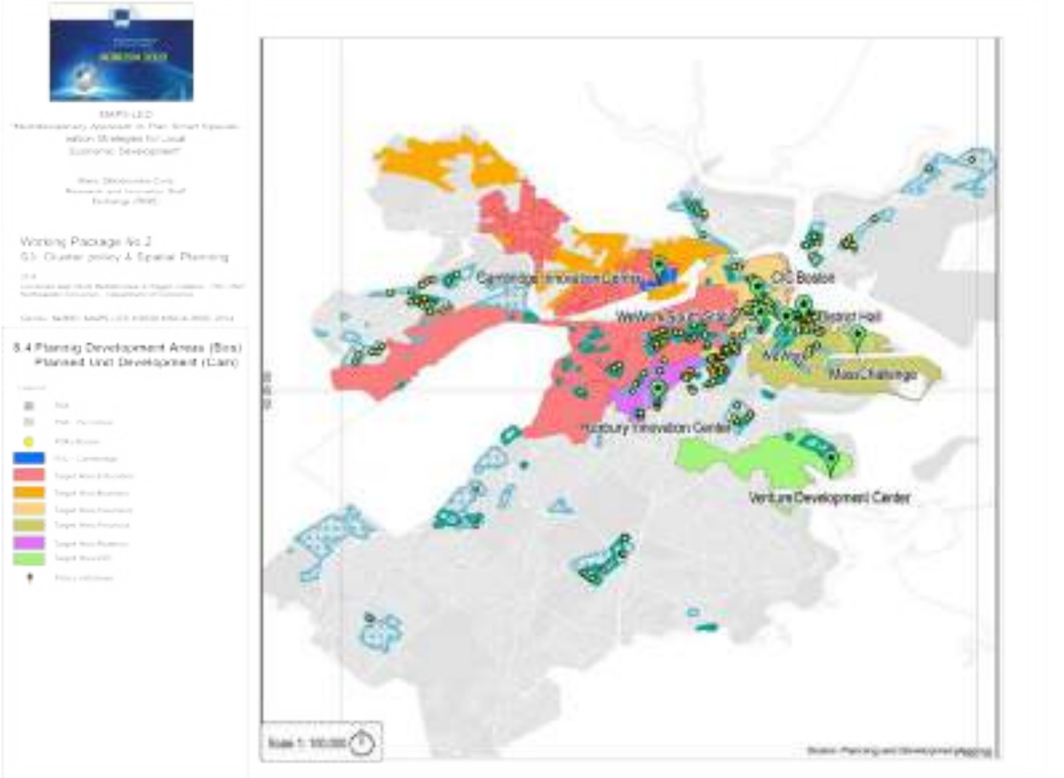
8.2 Target Areas by Parcel Blocks/Wards



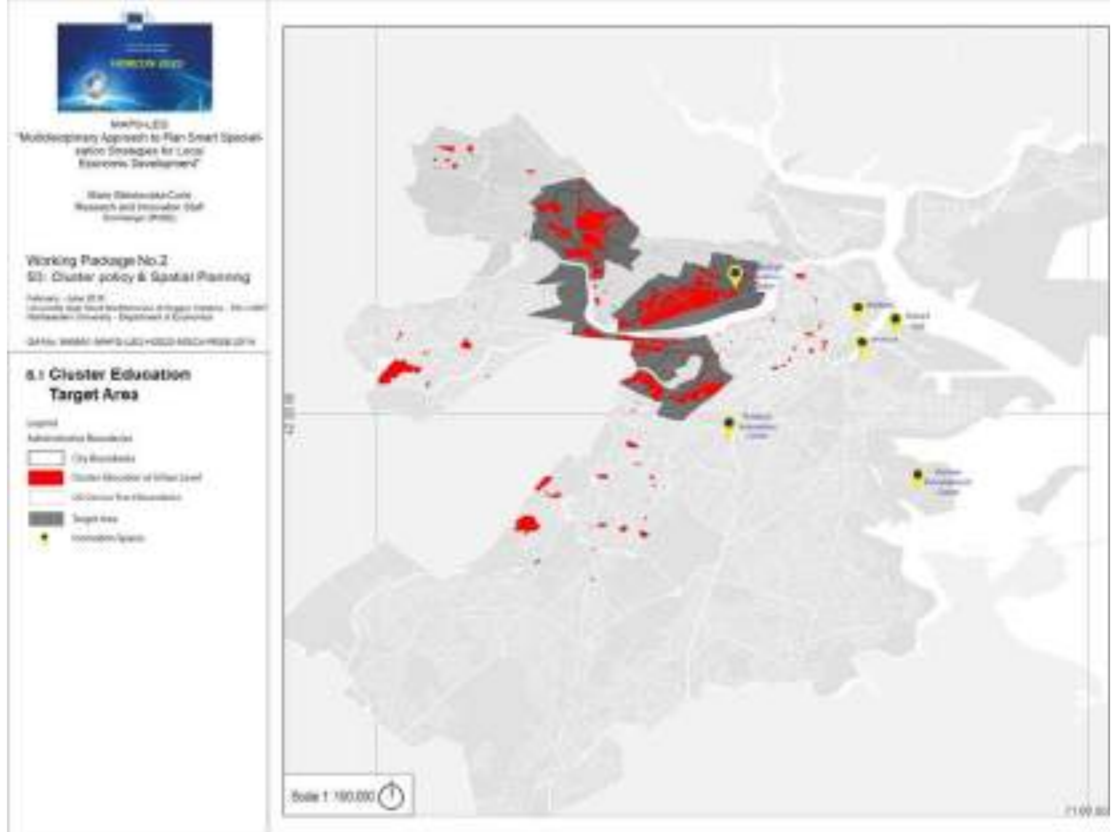
8.3 Target Areas by Parcel Blocs/Wards



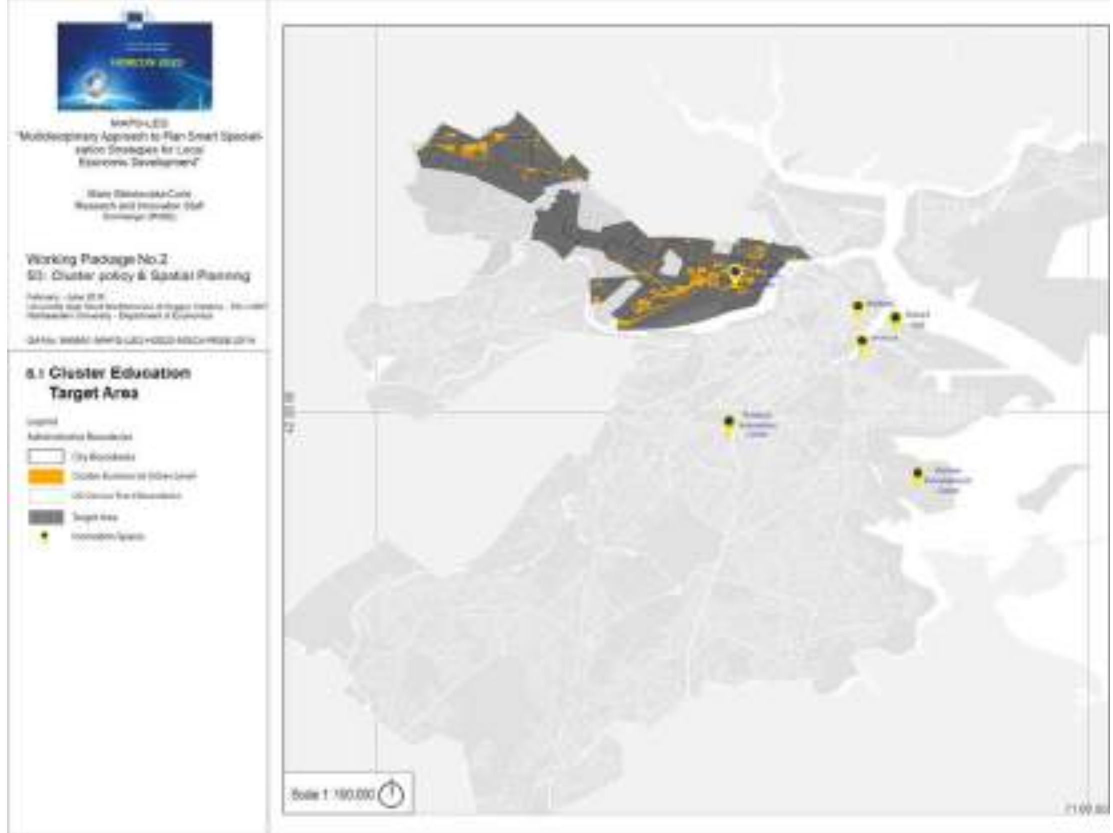
8.4 Planning Development Areas (PDAs-Boston) and Planned Unit Developments (PUDs-Cambridge)



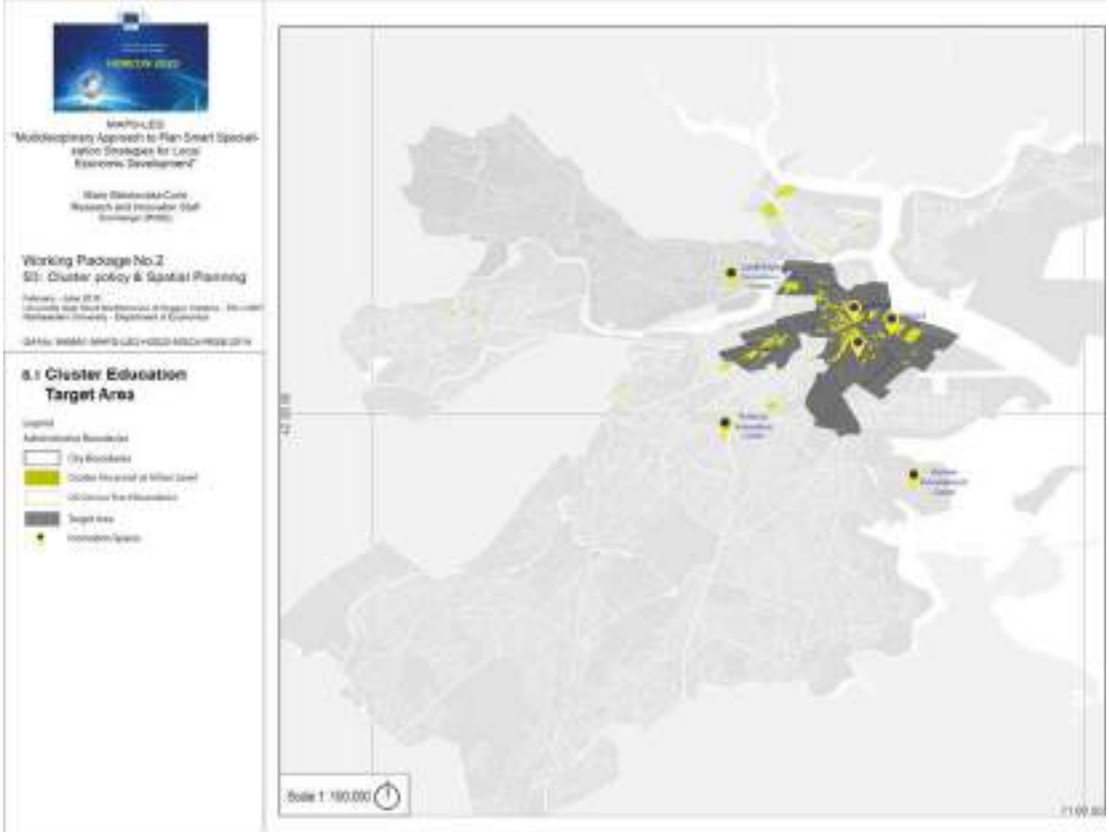
8.5 Target area analysis Education And Knowledge Creation



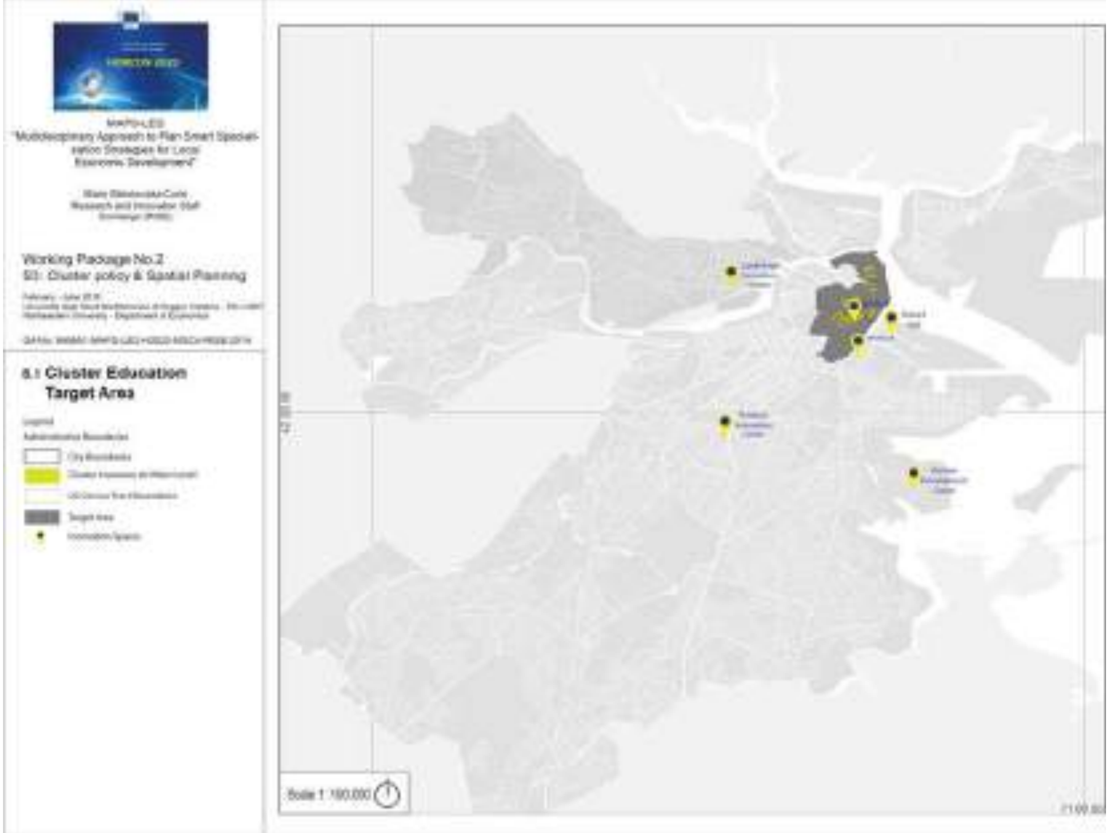
8.4 Target area analysis Busness Services



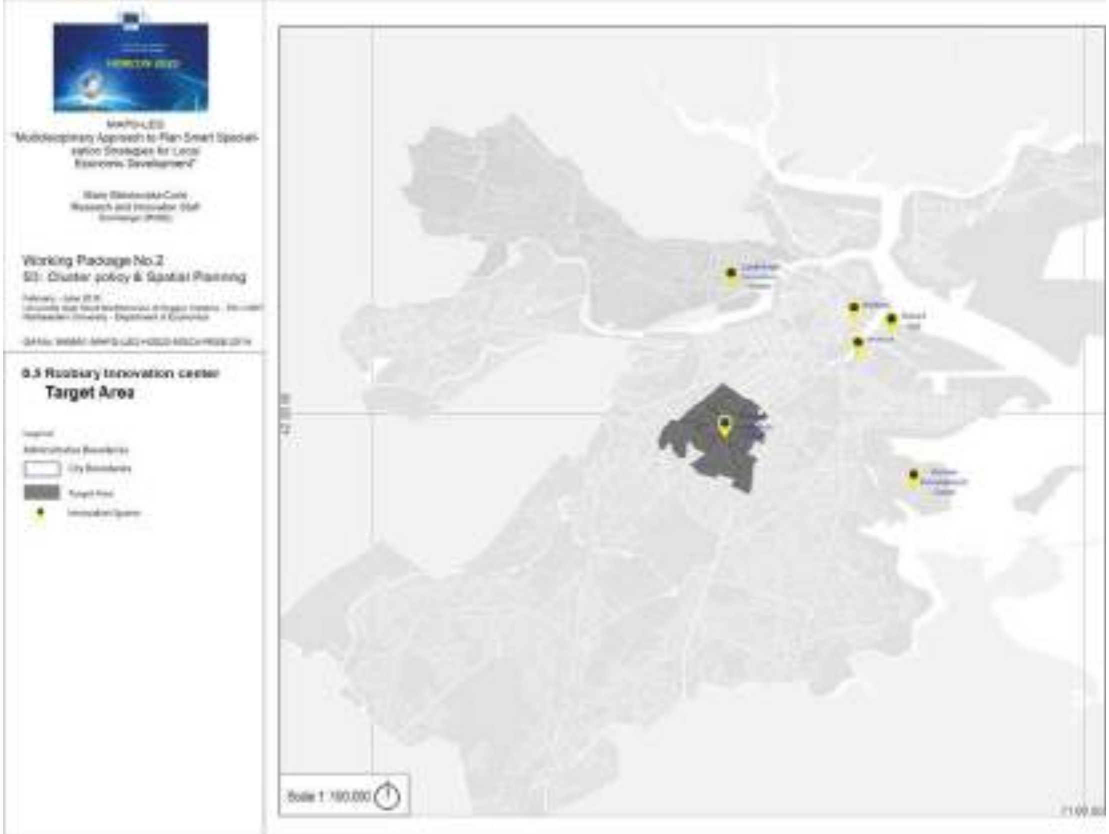
8.5 Target area Analysis Financial Services



8.6 target arae analysis Insurance



8.7 Target area analysis Roxbury Innovation Center



8.8 Target Area Analysis Venture Development Center