FOREWORD

Welcome to the 13th International Postgraduate Research Conference (IPGRC 2017) hosted by the School of the Built Environment at University of Salford, UK. This year’s IPGRC is organised as part of the International Research Week 2017- ‘Shaping Tomorrow’s Built Environment: Construction and Design for the Modern World’ and also the year we celebrate the 50th anniversary of Salford as a University, which makes this year’s conference very special. This conference creates a unique opportunity for researchers from Salford and other parts of the world to share their research interests, and outputs and to network and interact within a professional and friendly environment, with high profile academics and leaders within the built environment.

This year’s conference brings together participants from a number of countries including the UK, USA, Australia, New Zealand, Canada, Sri Lanka, Hong Kong, Iran, Italy, Ireland, Norway, India, Brazil, South Korea, Nigeria, Turkey, UAE, South Africa, Iraq, Ghana, Estonia, Saudi Arabia and many more. The conference received over 100 papers and posters covering the following themes:

- Business, Economics and Finance
- Property and Project Management
- ICT, Technology and Engineering
- People, Skills and Education
- Design and Urban Development
- Sustainability and Environmental Systems

Conference will provide a forum for novel discussions into the development and application of new and emerging practices to challenge current design and construction practice in the areas of people, process and technology issues. On behalf of School of the Built Environment, the conference co-chairs and organisers, we wish you an enjoyable and fruitful experience. We hope that you will obtain useful feedback to your research work, gain insight from work of others and forge connections for future.

Dr. Chaminda Pathirage
Conference Chair
Director of Postgraduate Research Studies
School of the Built Environment
University of Salford
United Kingdom
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Dr. Chaminda Pathirage

Conference Co-Chair

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Dr. Chika Udeaja
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KEYNOTE SPEAKERS

Professor Chris Harty – University of Reading

Chris Harty is Professor of Technology and Organisation and Head of the School of the Built Environment at the University of Reading. He has been the Director of two EPSRC Centres and since 2010 has been Principal Investigator / Lead Academic on over £3.5 million of research funding. He has authored over 50 refereed papers, is an Editor of Construction Management and Economics and reviewer for over 30 journals in areas of built environment, organisation and technology management. He is currently a visiting professor at Chalmers University of Technology in Sweden, and was previously Visiting Professor at Copenhagen Business School in Denmark. Chris has internationally recognised expertise in understanding cultural and strategic change in organisations, implementation of new technologies and working practices, future scenario development and the connection between physical space and working practices.

Title: The Futures of Construction Management Research

How do academic fields come about, grow and change and, more importantly, how do researchers shape and be shaped by them? Construction management today is a well-established academic area with departments and schools, conferences, journals, a broad community of researchers and PhD students and a diverse range of interests. It also has a history. One might argue that it was established in universities as a professional discipline, and has expanded from education and practice to include multi-disciplinary research, and to encompass researchers from a range of science, engineering and social science traditions. It has also, perhaps, expanded from interests in the operation of construction firms and projects to examine the effect of building and the built environment on societies and economics. However, the landscape of universities are constantly shifting. Current trends in individual and institutional performance measurement, new financial pressures and reprioritisation of research funding are leading to new dynamics for us all to navigate. This keynote will begin by outlining some of those dynamics and the effects they are having, in order to open up a discussion of the future of construction management research. Drawing on future scenario development, four possible futures are outlined - convergence, retrenchment, disappearance and hybridisation. These each speculate on possible futures for the community, on the kinds of research questions we might ask, and the research we produce.
Professor David Boyd – Birmingham City University
David Boyd is Professor of Construction and Director of the Centre for Environment and Society Research, based at the School of Engineering and the Built Environment. He teaches on the MSc Construction Project Management course. David has a background in engineering, but is better known for his management insights of the industry. He has researched and designed solar heating schemes for housing estates, as well as developing a model of projects in the industry as complex adaptive sociotechnical systems. He has completed research on construction clients, which was then published as a book and adopted by the Construction Clients’ Group. He has been PI on funded knowledge management and expertise-in-practice projects which explored perceptual knowledge, developing inquiry techniques and inter-disciplinary communications approaches. Currently, he is investigating digital construction focusing on the better use of Building Information Modelling within practice as an engagement tool between disciplines.

Title: Problematisation in Construction in a Post Truth era
This keynote will explore the implication of the way we problematise issues in construction research particularly in our post-truth era. Construction is particularly difficult to research as it operates with uncertainty because of its inherent complexity and with conflicting viewpoints because of its interdependence between multiple organisation and tasks. We, as researchers, have a challenge about what viewpoint to adopt and what narratives to promote. We must ask why some viewpoints are prioritised over others and the implications of this for our results and the industry. Are we as researchers then promoting a deception and if so to whose benefit? Thus, we, as construction researchers, need to understand the implications of our problematisation and its implications for our methodology as part of our work.
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Abstract: There seems to be a political inaction and stagnating local socio-economic development (LSED) in rural and peri-urban areas of Calabria Region in southern Italy. In response, this paper, based on literature review and case study, seeks to cast light on an innovative LSED pattern driven by emerging civic spaces. To this end, this paper carries out a case study of Riace so as to explore the dynamics, forms and socio-economic impacts of emerging civic spaces in relation to innovative LSED. By analysing the quantitative data collected from Istat and qualitative data collected from field studies and interviews of key stakeholders, it looks into the emerging multicultural civic spaces in Riace, focusing on their impacts on socio-economic innovation. Finally, based on the case study, the paper points out the viability of adopting a place-based and community-driven approach to LSED. It concludes that civic spaces, formed through the empowerment of local population and community collaboration, stimulates socio-cultural and economic innovation, which serves as a driver of LSED.

Keywords: Civic Spaces, Community Collaboration, Innovation, Local Socio-Economic Development (LSED), Territory.

1. INTRODUCTION
1.1. Literature Review

Civic spaces, where “civic entrepreneurship” occurs (Goldsmith et al., 2010), are perceived mainly in two ways within the academia. On the one hand, civic spaces are physical spaces with an embedded value system. While they serve as physical sites for civil society to organise and function autonomously, they represent a value system composed of place-making ingredients, such as identity, meaning, memory, history and linkages with the rest of the world (Daniere & Douglass, 2008). Without these place-making ingredients, which are in essence social and cultural capital, a place tends to lose its vitality due to community decohesion. On the other hand, civic spaces are also popularly seen as a social construct with a political economic implication. Therefore, they are inclusive social spaces with a high degree of autonomy from the state and corporate economy (Daniere, 2003). According to Abrahamson (2008: 3), they describe “the social processes of defining membership and exclusion, rules of interaction, and the desired image of the civic process”. Indeed, inclusiveness of civic spaces is vital to the well-being of society, in that it contributes to “the social and political life of cities through public participation in place-making and governance” (Douglass & Daniere, 2008: 1).

In fact, a participatory planning process accompanied by a decentralisation process is commonly acknowledged as indispensable for the formation and functionality of civic spaces (Daniere, 2003; Balassiano, 2011). Meanwhile, civic spaces are important contexts to have a precise understanding of participation and the underlying processes of empowerment (Huq,
In terms of local development, participatory approach is believed to contribute to sustainable development (Strzelecka, 2011). As contributing factors for the formation of a participatory community, community empowerment and institutional autonomy are principal preconditions for alternative approaches to local development—decentralised sectoral, local government, and community support approaches (Serrano et al., 2010). To guarantee a quality community empowerment, Aswad proposes a combined approach that incorporates procedural justice in planning development and social learning in its implementation (Kolo, 2002; Aswad, 2013). The procedural justice implies a process of community involvement in policy making and implementation. In this process, social learning contributes to policy making and implementation by providing context-based evidence and building relationships among stakeholders (Cundill & Rodela, 2012). It is obvious that community involvement is impossible without community empowerment achieved with a participatory approach.

According to Daniere (2003), civic spaces emerge as a response to globally-linked economic growth and access to information. However, the existing literature does not overtly touch upon the relationship between civic spaces and LSED. Besides, their socio-cultural and economic impacts are barely discussed. As for Riace in Calabria Region in southern Italy, emerging civic spaces are more of a response to unfavourable external political-economic environment and resulting endogenous place-based local socio-economic development (LSED) led by the civil society. Just as Abrahamson (2008: 3) remarks, civic spaces represent “the role of the citizen in the operation and oversight of the government”. Taking into account the realities in Calabria Region and the limitation of the existing literature, the authors pose such questions as:

1) How do emerging civic spaces contribute to innovative LSED?
2) Do civic spaces also represent the role of the non-citizens, namely, immigrants?

The following sections dedicated to the case study of Riace will help answer these two questions.

1.2. Objective and Significance

As mentioned earlier, currently academic discussions on civic spaces seldom deal with the socio-economic impacts of civic spaces, especially in a multicultural community. That is to say, the role of civic spaces in LSED is not explicitly discussed. Therefore, this paper is aimed to explore the dynamics, forms and socio-economic impacts of civic spaces in relation to innovative LSED.

It is desirable that this research invite more future discussions on the socio-economic impacts of civic spaces in relation to local development. In addition, it is also hoped that policy-makers, will be more willing to adopt an innovative approach to local development which is driven by emerging civic spaces.

1.3. Methodology

This research carried out a case study of Riace so as to explore the dynamics, forms and socio-economic impacts of emerging civic spaces in relation to innovative LSED. For this purpose, it adopted both quantitative and qualitative methods. It first of all carried out a literature review to build up the theoretical structure of the entire research. Then
quantitatively speaking, it collected secondary baseline data of 1991, 2001 and 2011 from Istat, especially those on demography and economic performance, such as population, rate of foreign residents, old age index, young household with children rate, potential vacancy of buildings and unemployment rate of Riace and Roghudi (the latter was chosen as a contrast). By comparing these quantitative data, the regenerative effect of emerging civic spaces is indicated, in terms of community structure, population rejuvenation, reuse of abandoned buildings, job creation, etc. Qualitatively speaking, it undertook field studies\(^1\) so as to gather various visual observations with regard to the forms, functions, mechanism, etc. of civic spaces that appear in Riace. Besides, it administered semi-structured interviews with key stakeholders, especially the Mayor of Riace.

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2. CIVIC SPACES AND SOCIO-ECONOMIC INNOVATION IN RIACE

2.1. Background

Calabria Region boasts many minor historic centres (MHCs) of Greek origins, which are well-known for their strong territorial identity and rich cultural and landscape heritage. Often located in mountainous inner areas, they are isolated from the urban basin, which partly explains their delicate socio-economic conditions. Over the past three decades, these MHCs have gone through a continuous socio-economic decline due to aging population accompanied by outbound migration and low birth rate, changes in productive patterns, natural disasters, and demographic concentration in new settlements of the towns along the coast. While these new settlements keep the name of the towns, they are often differentiated from the latter with the word “marina”, since they are coastal. Riace (the new settlement of the town is called Riace Marina), the focus of this paper, is one of these MHCs.

The name of Riace probably came from the Greek-Byzantine “Ryaki” which means small brook. Since the refugee crisis in Europe, Riace has gradually earned an international fame because of its innovative approach to dealing with refugees. From 2004 until today, it has been the centre of immigration policy. In 2016 only, more than 800 immigrants were hosted by the local community, which helped revitalise the town itself.

As mentioned above, Riace, like many other MHCs, has suffered from aging population and depopulation since the 1980s. To better illustrate its “demographic crisis”, Roghudi\(^2\), having similar conditions, was chosen as a contrast. The geographic location of Riace and Roghudi is shown in the map below (see Map 1). The table below (see Table 1) shows their population, old age index, young household with children rate and potential vacancy of buildings in 1991, 2001 and 2011. While there is a constantly decreasing population and young household with children rate as well as a constantly increasing old age index in Roghudi, Riace saw an increasing population and young household with children rate as well as a decreasing old age index in 2011, which implies an increase of immigrants. This increase of immigrants is also confirmed by a significant decrease in potential vacancy of buildings in both towns.

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1 The co-author Antonio Errigo carried out all the field investigations and interviews.
2 As an ancient settlement, Roghudi owes its name perhaps to the ancient Greek “Rochûdios”. The Old Roghudi (Roghudi Vecchio) enjoys a breath-taking landscape: it is located on the top of a hill about 500 meters above sea level which stands right in the middle of the seasonal river Amendolea. Following the floods in the early 1970s, the old town was abandoned and all of its inhabitants were relocated to the newly constructed town called New Roghudi (Roghudi Nuovo, hereinafter referred to as Roghudi) in Melito Porto Salvo, very close to the Ionian coast.
It is worth noting that in Riace, inverse changes have been happening since 2001. For example, its old age index increased from 1991 to 2001 and decreased from 2001 to 2011. Meanwhile, its population and young household with children rate decreased from 1991 to 2001 and increased from 2001 to 2011. Since civic spaces have started to emerge in Riace since 1999, which is to be discussed in detail in the following section, the year 2001 was considered as a baseline year to catch the trend before and after with the emergence of civic spaces. It therefore can be concluded that emerging civic spaces have helped rejuvenate the population of Riace and regenerate the town.

The emerging civic spaces in Riace are mainly represented and fostered by autonomous NGOs (under the coordination of the institutional leadership, namely, the mayor) and collaboration between the host community and the guest community. In the following sections, the dynamics, forms and socio-economic impacts of emerging civic spaces in relation to innovative LSED are discussed in detail.

![Map 1: Geographic location of Roghudi and Riace](image)

*Source: Google Map (2017).*

Processed by A. Errigo.

<table>
<thead>
<tr>
<th>Town</th>
<th>Indicators</th>
<th>1991</th>
<th>2001</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roghudi</td>
<td>Population</td>
<td>1,530</td>
<td>1,365</td>
<td>1,172</td>
</tr>
<tr>
<td>Riace</td>
<td></td>
<td>1,694</td>
<td>1,605</td>
<td>1,793</td>
</tr>
<tr>
<td>Roghudi</td>
<td>Old age index</td>
<td>75.4</td>
<td>118.5</td>
<td>143.4</td>
</tr>
<tr>
<td>Riace</td>
<td></td>
<td>103.5</td>
<td>117.2</td>
<td>116.8</td>
</tr>
<tr>
<td>Roghudi</td>
<td>Young household with children rate</td>
<td>20.1</td>
<td>14.5</td>
<td>8.1</td>
</tr>
<tr>
<td>Riace</td>
<td></td>
<td>18.1</td>
<td>11.3</td>
<td>13.5</td>
</tr>
<tr>
<td>Roghudi</td>
<td>Potential vacancy of buildings</td>
<td>NA</td>
<td>23.3</td>
<td>18.3</td>
</tr>
<tr>
<td>Riace</td>
<td></td>
<td>NA</td>
<td>11.7</td>
<td>8.2</td>
</tr>
</tbody>
</table>

3 The boundary in thick white line shows the metropolitan city of Reggio Calabria. The inner white boundaries are the administrative territorial divisions (i comuni).

4 Notes: Old age index: percentage of population aged 65 years old and over and that aged 0-14 years old; Unemployment rate: Percentage of residents seeking job in relation to active population (employed and job-hunting); Incidence of foreign residents: incidence of foreign residents per 1,000 Italian residents; Potential vacancy of buildings: percentage of unused buildings on total buildings.
2.2. Multicultural Community Building and Social Inclusion

Both Roghudi and Riace are hosting immigrants to rejuvenate their population and regenerate their urban fabrics, but it is Riace that has a longer tradition of being open to immigrants that dates back to the 1990s. As the table below (see Table 2) shows, the number of foreign residents is rocketing up in both towns, especially in Roghudi.

The drastically increasing number of immigrants, just like a double-edged sword, proves to be both an opportunity and a risk. Immigrants mean not only more labour force and cultural diversity, but also possible tension and even conflict between the host community and the guest community. When referring to the new patterns of migration to Pacific Asia’s metropolitan regions, Douglass (2003) maintains that whether the accompanying cultural diversity can be accomplished in a socially just, inclusive manner is among the most important issues of this century. Often times, a so-called “crisis of inclusion” happens when there is a troubled access to public and civic spaces (Daniere, 2003). Indeed, how to foster a multicultural community that is socially and economically inclusive to all community members is undoubtedly an important but challenging task for Riace.

Table 2: Rate of foreign residents in Roghudi and Riace

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<tr>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Town</td>
<td>Indicators</td>
<td>1991</td>
<td>2001</td>
</tr>
<tr>
<td>Roghudi</td>
<td>Rate of foreign residents</td>
<td>3.9</td>
<td>58.6</td>
</tr>
<tr>
<td>Riace</td>
<td>Rate of foreign residents</td>
<td>1.8</td>
<td>12.5</td>
</tr>
</tbody>
</table>

In Riace, grass-roots NGOs (under the coordination of the institutional leadership, namely, the mayor), such as associations and cooperatives, have played a significant role in promoting integration and inclusion of the immigrants, while building up the towns’ social capital. NGOs often have a significant role to play in decentralisation (Balassiano, 2011). This can be evidenced by the autonomy of local associations in Riace in planning and implementing cultural initiatives aimed at the integration of immigrants. In 1999, the association *Città Futura* (Future City), the first of its type, was founded in Riace, echoed successively by four other associations A Sud di Lampedusa, Girasole, Real Riace and Riace Accoglie. These associations have collaboratively planned and carried out a series of welcome projects for immigrants, which has finally become a national and international prototype, the “Riace Model”. In the following section, this paper will have a close look at the work of the leading non-profit organisation *Città Futura*, which is directed by the Mayor of Riace, Domenico Lucano.

*Città Futura* is aimed at promoting and managing the activities related to the integration of immigrants. It also serves as a research institution for ethnographic history and culture. Its major objectives are:

- facilitating the socio-economic integration of foreigners present in Riace;
- creating jobs for unemployed young people;
- improving the local economy;
- making sure that the history of Riace can continue to live by means of folklore, traditions and handicrafts.

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5 Currently serving his third term as Mayor of Riace, Domenico Lucano was listed by *Fortune* as one of the world’s greatest leaders in 2016.
Basically speaking, Città Futura is dedicated to promoting the integration of immigrants in four ways: housing provision, conscious urban design, amenities improvement and public spaces diversification. To begin with, Città Futura developed a project of hospitality called Global Village (Villaggio Globale). Through the project, now completed, more than 20 abandoned houses were reclaimed, generating a total of more than 100 beds. With this project, the organisation has successfully combined the need of social integration and urban regeneration. It is worth noting that the Global Village is a very innovative project, in that it is not only aimed at improving housing for immigrants, but also creating new jobs. A typical design based on mixed use, Global Village, besides housing, also established bars, taverns, shops, etc. Actually, the Global Village, through the reclamation of abandoned buildings, is probably the key to foster civic spaces according to the Mayor. The shops, which sell different kinds of handicrafts, have contributed to regenerate and revitalise the historic centre of Riace, stimulate the local economic activities and allow immigrants to learn local skills necessary for making a living.

Secondly, with conscious considerations of the need to promote social inclusion of immigrants in public spaces, Città Futura has helped design public signs (see Figure 1) and decorative structures (see Figures 2-3) that all convey the value of tolerance and cultural diversity.

![Figure 1: Public board showing nationalities present in Riace](image1)  
© A. Errigo (2017)

![Figure 2: “Welcome to Riace”, signs of welcome on the gate of Riace](image2)  
© A. Errigo (2017)

Thirdly, to help deliver better public services, Città Futura promoted the provision of various public amenities, such as theatre (see Figure 4), where performances and citizen meetings take place, and oil mill with stone grinders for the production of extra virgin olive oil (see Figure 5).
In addition, to make sure that different ethnic groups can interact and socialise with each other, Città Futura has realised a series of projects focusing on public spaces. Some of the existing squares in the historic centre were rehabilitated with considerations of social integration promotion (see Figure 6).

2.3. Community Collaboration and Economic Inclusion

It is acknowledged that people’s capabilities to participate effectively in local development are determined not only by individual resource endowments, but also by social capital that provides the basis for collective action (Serrano et al., 2010). As mentioned above, in Riace local NGOs have helped build up the community’s social capital by promoting integration and socio-cultural inclusion. This serves as a starting point for the host community and guest community to collaborate. In so doing, besides socio-cultural inclusion, economic inclusion is also achieved, since new jobs, especially jobs for immigrants, are created. As the table below (see Table 3) demonstrates, there was a constant decrease in unemployment rate in Roghudi. In contrast, Riace saw an increase in unemployment rate in 2011, which may be explained by the economic crisis across Europe.
Community collaboration is deemed as a rural restructuring strategy (Baker, 1993). According to interviews with key stakeholders, Riace has freed itself from an over-dependency on traditional agricultural economy and moved towards new economic sectors. Tourism is a good example. By adding value to the Heritage, both material and immaterial, the host community and guest community collaborate to help promote tourism development. In Riace, for example, various artistic laboratories were established where immigrants can work as apprentices to learn handicrafts (see Figure 7), just to name a few, laboratories of glassware, embroidery, weaving (with traditional wooden looms), jam, etc. The handicrafts normally bear strong territorial identity, and they are popular commodities on the tourism market (see Figure 8). Community collaboration of this kind has not only added value to local Heritage and promoted the territorial identity, but also generated income for both the host community and guest community. Needless to say, this has contributed to local economic development.

Apart from artistic laboratories, the host community and the guest community collaborate, under the guidance of Città Futura, to revitalise agricultural production by reclaiming abandoned farming lands. A good example is the “Didactic Farm” (see Figure 9) dedicated to immigrants. This “Didactic Farm” allows immigrants to take advantage of the tools and facilities needed for agricultural work. For examples, they are instructed how to raise domestic animals in the small buildings on the farm (as is shown on the picture below).

<table>
<thead>
<tr>
<th>Town</th>
<th>Indicators</th>
<th>1991</th>
<th>2001</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roghudi</td>
<td>Unemployment rate</td>
<td>44.5</td>
<td>15.3</td>
<td>7.4</td>
</tr>
<tr>
<td>Riace</td>
<td></td>
<td>39.4</td>
<td>19.8</td>
<td>22.9</td>
</tr>
</tbody>
</table>

Table 3: Unemployment rate in Roghudi and Riace

![Figure 8: Boutique selling local handicrafts while promoting fair trade concept](image1)  
© A. Errigo (2017)  

![Figure 7: Immigrant weaving in a laboratory](image2)  
© A. Errigo (2017)
3. CONCLUSIONS

As the literature available demonstrates, currently academic discussions on civic spaces seldom deal with the socio-economic impacts of civic spaces, especially in a multicultural community. This research found that the emerging civic spaces in Riace are mainly represented and fostered by autonomous NGOs (under the coordination of the institutional leadership, namely, the mayor) and collaboration between the host community and the guest community. The emerging civic spaces do contribute to the integration of immigrants, and at the same time, the promotion of an innovative local socio-economic development. The socio-economic development in Riace proves to be innovative mainly because, firstly, local NGOs, Città Futura in particular, play a proactive role in promoting social and economic inclusion by building up a cohesive multicultural community. Housing provision for immigrants, conscious urban design, amenities improvement and public spaces diversification are crucial contributing factors leading to the success of Riace. Secondly, according to the needs of all community members, the historic centre of Riace has been regenerated and revitalised by mobilising the idle physical capital, namely, abandoned buildings. During the regeneration process, mixed use strategy, as the project Global Village shows, has been an effective, innovative tool for Riace to achieve both social integration and inclusive job creation. This strategy finally contributes to increasing community cohesion and local economic development through a value-adding of its Heritage (handicrafts for instance). Last but not the least, collaboration between the host community and the guest community has not only helped build up Riace’s social capital which is vital for its emerging civic spaces, but also contribute to its economic development, as the artistic laboratories and “Didactic Farm” demonstrate.

It is desirable that the findings of this research serve as an empirical reference for policy-making, especially for other communities in Calabria Region which have similar socio-economic challenges. Policy-makers would integrate into local development initiatives an innovative approach to local socio-economic development which is driven by emerging civic spaces. Besides, it is equally hoped that the role of civic spaces in innovative socio-economic development would be popularly acknowledged by both the academia and policy-makers, and more importantly, brought into play locally.
Due to space limitation, the research didn’t discuss the role of the public sector in fostering the civic spaces, which is unarguably important in Riace. Future research may well fill this gap. In addition, it would be interesting to compare Riace to other minor historic centres which see emerging civic spaces as well. Finally, as Daniere (2003: 4) points out, that civic spaces “require rules of access and use if they are to function in an inclusive, fundamentally non-violent and civil manner”, one more question for future research is, how should these civic spaces be properly managed and regulated?

4. ACKNOWLEDGMENT

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5. REFERENCES


FROM BROWN-FIELDS TO INNOVATION DISTRICTS: A COMPREHENSIVE APPROACH TO SUSTAINABILITY

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Abstract: In the globalisation era, the future of older industrial cities will result from their expertise on investing into their underutilised assets in order to keep being competitive globally; it is therefore necessary to revitalise the land known as brown-field. An emerging urban model, the innovation district, puts forward ground breaking promises about its ability to cope with this specific challenge, standing as a driver for a sustainable and inclusive economic development. This paper aims to show the degree to which innovation is effective in giving a meaningful response to brown-field problems, first by considering a conceptual framework to assess the comprehensive approach aimed at improving the social, economic and physical issues inherent to post-industrial landscapes; then by testing it through empirical research work. To support the discussion with evidence, the Boston Innovation District case study will be investigated, pointing out the policies and planning initiatives undertaken in the Seaport area. Findings from this research highlight the innovative-led approach effectiveness in matching all the issues considered as relevant to sustainable brown-fields redevelopment, and useful lessons can be drawn in encouraging planners and policy-makers towards considering the role of innovation in urban regeneration initiatives targeting distressed areas.

Keywords: Brown-field Redevelopment, Innovation District, Local Economic Development, Sustainability.

1. INTRODUCTION

Deindustrialisation has left tangible traces on the territorial geography; thus, some of the areas where once vital industries used to thrive have been replaced by brown-fields (Bartsch & Collaton 1997). Nowadays, a wide consensus exists on the need to take actions - targeted at revitalising the stagnant economy in these distressed markets, while restoring a safer and uncontaminated urban environment, and ensuring environmental justice (Dernbach 1998; Ruthl 1998), within broader smart growth policies which promote compact development and land consumption reduction (Greenberg et al. 2001). Although several research studies attempted to face the challenge of how to plan, manage and assess brown-fields redevelopment complying with the principles of sustainability (Boer 1995; EPA 2015; RESCUE 2003), less emphasis has been placed on the potential key role of innovation, despite its recognised ability to foster economic growth (Katz & Wagner 2014). This paper puts the body of knowledge forward on the nexus between brown-field regeneration and innovation, by analysing the capability of the newly conceived “re-imagined urban areas” model to achieve the objectives of sustainable brown-field redevelopment. To do that, the paper investigates the Boston Innovation District case study, by focusing on the implementation process of the innovation-led strategy undertaken by the Boston Redevelopment Authority (BRA). Accordingly, the planning initiative sought to guide economic, social and physical changes in the Seaport area in order to create a neighbourhood consistent with the highly innovative Boston’s environment. This paper is organised in five
parts. Following this introduction, it provides a scientific background through an overview of theoretical approaches to brown-field redevelopment and prevailing assessment methodologies in terms of sustainability, introducing the concept of innovation in the sustainable development context. In the third part, the methodology that determined the objectives of each dimension for the sustainability assessment model is presented, followed by the description of the case study. Next, the Boston Innovation District achievements are analysed, and how these outcomes might affect the further planning practices is discussed. Finally, findings and conclusions are presented in the fifth part.

2. RESEARCH BACKGROUND

This paper aims to present one of the most common phenomenon lately facing communities in the Western countries: the land classified as brown-field, focusing on the outcomes of its regeneration process. Three issues of the growing literature, dealing with the abovementioned area of concern, focused on the United States perspective, make a significant contribution to the understanding of the topic: (1) the literature exploring the reasons brown-field regeneration is considered a strategy for local economic development, (2) studies examining the innovation district urban model as a powerful driver for a sustainable economic development, and (3) the literature attempting to assess the impacts of brown-field reclamation in heading towards sustainability.

2.1 Brown-field Redevelopment as a Local Economic Development Strategy

To set the context between brown-field redevelopment and urban regeneration, a preliminary investigation of the process which led to the creation of derelict land and sites is presented. Over the past few decades, the great economic powers, Europe and the United States, have experienced considerable processes of change in terms of spatial, social, environmental and economic arrangement. The glorious days of several industrial cities came to an end when the reallocation of many factories to foreign countries started the process of deindustrialisation. Even more significant in the context of globalisation, industrial activities have undergone substantial changes due to a shift from manufacturing to service economies, which has resulted in the downsizing of enterprises as well as the complete loss of whole production industries. These significant transformations have left tangible traces on the territorial geography; thus, some of the areas where once vital industries used to thrive have been replaced by vacant and most likely polluted land, strongly affecting the citizens who live close to them (Bartsch & Collaton 1997; Olivier et al. 2005; Adams et al. 2009). These sites are known as brown-fields. While individual nations hold independent definitions of brown-field sites, the American context commonly refers to “abandoned or underutilised industrial and commercial facilities where expansion or redevelopment is complicated by real or perceived contamination” (Knox & McCarthy 2012). In addition, “The Environmental Protection Agency estimates the number of brown-fields located in the U.S. to be between 500,000 and 1,000,000” (EPA 2012).

Given the impressive figures, the presence of brown-field sites across the country represents a significant urban management problem; additionally, it has been documented that beyond the scale and spatial configuration, the existence of brown-fields has multiple adverse effects, not only over the environment, but also on the economic and social health of an entire region (COBRAMAN 2009). These sites have been held up as “blights of the neighbourhoods, able
of discouraging economic development and undermining local [government] tax bases” (Preston 2003); moreover, they often serve as gathering sites for the downtrodden citizens of a community, which inevitably leads to neighbourhoods in greater decline in pure economic terms (Sirmans & Macpherson 2003). Beside the economic and societal impacts, the concept of brown-field as an environmental issue has to be highlighted, due to the increasing number of abandoned areas with real or plausible hazardous contamination, representing a heartfelt public concern.

As a consequence of the afore mentioned reasons, in the last decades, federal, state, and local governments redirected their priorities to regenerate unproductive lands. As a matter of fact, brown-fields redevelopment is considered the preferable method to fight the decaying phenomenon of core inner urban areas, enhancing the quality of inner cities environments (Dixon et al. 2010); and a powerful smart growth policy which promotes compact development and significantly reduces land consumption (Greenberg et al. 2001). In support of this, it has been demonstrated that “putting clean land back into productive use brings with it a range of social and economic benefits that will strengthen those communities for years to come” (EPA 2015) by providing a remarkable opportunity for the redevelopment of the social equity, economic stability, and environmental equilibrium. Traditionally, brown-fields remediation results in a deep community economic revitalisation and job creation, significant neighbourhood restoration, not to mention the meaningful reduction of the development pressures on green-fields through the reuse of urban space (PCSD 1998). Moreover, cleaning up abandoned industrial sites leads to a twofold advantage in terms of economic opportunities and investments: on the one hand, the private sector benefits from the convenient chance to purchase properties at below market price and make profits thanks to the financial and technical assistance they obtain to clean them up; on the other hand, state and local governments create economic viability through a variety of financial incentives and fiscal exemptions which facilitates and accelerates the development process (Verbit 2001).

However, for years now, brown-fields run up against the increasing scepticism towards the revitalisation of neglected sites; strict environmental and economic policies are commonly considered to be a major barrier to redevelopment, combined with the expensiveness of assessment and rehabilitation practices, and the difficult management of such a significant scope projects (BenDor & Metcalf 2005). To overcome these obstacles, it is worth evaluating to what extent brown-field redevelopment programs "pay for themselves" by generating economic (jobs, wages, increases in property values) and fiscal (increased tax revenues without increasing tax rates) benefits (Frank 2014). The attempted literature highlights the potentially remarkable results of investments in the distressed areas, as emphasised by the United States Conference of Mayors report (2008), which provided data relative to a compilation of a questionnaire responded by more than 200 US cities - belonging to more than 41 different states - that have been involved in a brown-field redevelopment project. The cities were asked to identify the four most important benefits as a result of the regeneration: neighbourhood revitalisation was the most frequently cited benefit, along with job creation, and an increase in city’s tax base and environmental protection. On the same line, the Chicago Metropolitan Agency for Planning (2008) gives credit to the wide-ranging benefits of bringing a site back to active use, focussing on the opportunity for businesses to thrive creating new jobs and attracting private investments. In sum, a single site intervention entails remarkable spill-over effects on the quality of life for people living in neighbourhoods with brown-field sites and on the economy of the entire region (Chilton et al. 2008).
2.2 Innovation Districts: a driver for a sustainable economic development

One sound argument in response to the challenge of post industrial sites comes from a new urban and economic redevelopment strategy: the creation of innovation districts. Innovation districts have been considered an emerging urban model, a product of the shift in the spatial geography of innovation occurred over the last few years in several cities and metropolitan areas in the United States and other countries (Feldman 1994). A growing number of talented workers and innovative firms chose to move from the spatially isolated suburban corridors - places best exemplified by the Silicon Valley in the San Francisco Bay Area - and cluster spatially in compact and more desirable areas in the inner city; at the same time, an increasing share of citizens is drawn to these districts, given the shifted location preferences toward more vibrant and amenity rich places to live and work (Audretsch & Feldman 2003).

The purposes behind the rise of innovation districts are clear: to create a dynamic place where entrepreneurs and knowledge-intensive businesses can share ideas, and benefit from the impact of proximity on learning and knowledge spill overs, increasing their competitive advantage (Boschma 2005). Nevertheless, the trend is still recent and, lacks a univocal definition due to its multi-dimensional nature. As stated in the influential Brookings Institution report, edited by Bruce Katz and Julie Wagner (2014), the term innovation district is mostly used to identify “geographic areas physically compact, transit-accessible, and technically-wired where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators. They also offer mixed use housing, office, and retail.” As the afore mentioned explanation suggests, these districts perfectly embody the comprehensive concept of “cityness” coined by Saskia Sassen (1991): the complex intersection of differences embedded in these urban spaces produces something new; proximity and density, together with diversity of people, subcultures, practices, lead to innovation indeed. The affirmation of this concept is translated into reality in “new or improved ideas, products, services, technologies, or processes creating new market demand or cutting-edge solutions to economic, social and environmental challenges” (Katz & Wagner 2014).

Additionally, innovation district urban forms and functions cannot be defined a priory; given their ability to leverage the economic strengths of the specific metropolitan area in which they locate, they significantly vary by type and size, but also differ in specializations for growth - some of them slant toward life sciences, while others are focused on the information technology sector or different highly creative industries (Read 2016). Whether the districts have been strategically planned or represent the spontaneous response to the market forces, they all contain a powerful and unique combination of economic, physical, and networking assets (see Figure 30) which, brought together in geographic proximity, stimulate the idea generation facilitating the entrepreneurial activity (Giuffrida et al. 2015).
Al of these observations highlight how this new approach to economic development takes place. Under the assumption that innovation districts have the unique capabilities to foster an inclusive and sustainable economic development, they contribute to address three of the modern-day plagues: the stagnant economy of the post-recession period, the growing inequality that is damaging today’s social structure, and the environmental threat due to the extensive sprawl. To this end, the most convincing line of evidence supporting this theory, are observations drawn from the “re-imagined urban areas”, one of the three general models of District (Katz & Wagner 2014; Montini 2014). Accordingly, historic waterfronts and de-industrialised areas are the subject of physical and economic transformations charting a new path of innovative growth (Clark & Moonen 2015).

### 2.3 Assessing the Sustainability of Brown-field Redevelopment

As the first sub-section suggests, brown-field land use strategies clearly fit in the sustainability paradigm; brown-field revitalisation became one of the main issues to take into account to achieve a sustainable development indeed (Boer 1995; Dorsey 2003). On this matter, the number of references the literature makes is relevant, as demonstrated by the several federal agencies’ initiatives targeted at the promotion of brown-fields “sustainable reuse” (EPA 2015). These actions aim for economic growth in the distressed property market, while improving the living conditions of neighbouring residents - as known as environmental justice communities, extremely affected by economic, social and environmental inequalities. (Dernbach 1998; Ruthl 1998).

Although the idea of sustainable development has significantly changed over the past decades and it can be defined in many ways, broad consensus is reached on the triple bottom line framework (Elkington 1998). The comprehensive approach rests therefore on “three pillars: economic growth, social progress and protection of the environment and natural resources”(Annan 2002), representing the core of the sustainability vision of the widely cited Brundtland report (WCED 1987) that refers to the potential of meeting the “needs of the present without compromising the ability of future generations to meet their own needs.” A particularly important milestone in the attempt of translating the sustainability concept into a “solid basis for decision making at all levels” (Capello & Nijkamp 2002), was the drafting of two documents: the Rio Declaration on Environment and Development (United Nations 1992b) and the Agenda 21 (United Nations 1992a); within the afore mentioned, a well structured framework has been defined, providing recommended actions and detailed activities the governments should undertake in order to achieve sustainable development practices, accordingly to the desired performances. From then on, several frameworks have been developed in the attempt of providing an exhaustive assessment of the sustainability
threefold component, but not without disputes over the choice and suitability of the aspects to be covered and their proper calculation (Hueting & Reijnders 2004).

However, in order to point out the uniqueness of a brown-field redevelopment effort, distinguishing it from a conventional urban redevelopment initiative, it is deemed necessary to properly define a sustainable brown-field redevelopment process as “the management, rehabilitation and return to beneficial use of brown-fields in such a manner as to ensure the attainment and continued satisfaction of human needs for present and future generations in environmentally sensitive, economically viable, institutionally robust and socially acceptable ways within the particular regional context” (RESCUE 2003). The complex combination of planning policies, public and private initiatives, diverse stakeholder interests and technical skills, have an impact not only on the implementation process, but above all on the sustainability of the outcomes.

In support of the findings raised above, a great deal of uncertainty, regarding the measurement of the intended and unintended spill over effects of brown-fields regeneration, generated an impressive theoretical debate on the construction of sustainability frameworks in order to manage and assess the revitalisation of distressed areas. Some authors claim that, to successfully achieve a sustainable brown-field development, the holistic principle of sustainability has to be embedded in the entire process. One sound argument in support of this theory comes from the Model Framework devised by the Environmental Protection Agency (1999), that aims at guiding the stakeholders to properly structure the planning and development process, in order to direct their efforts towards a viable and sustainable brown-field redevelopment. Nijkamp et al. (2002) likewise propose a qualitative impact assessment model to provide a detailed description of the procedures to be followed, ensuring the critical success factors for a sustainable brownfield rehabilitation. According to this train of thought, the Redevelopment Assessment Framework provides a procedure that “informs stakeholders about the sustainability performance in a practical way” (Pediaditi et al. 2005) guaranteeing that sustainability is addressed and monitored across the life cycle of a brown-field site. Other scholars consider the evaluation a priori crucial to fulfil the sustainable brown-field development objectives. Specifically, the adoption of a decision-support system is seen as crucial to significantly reduce the uncertainties and the complex decision making process concerning the sustainability values of different land use scenarios for brown-fields. The computer-based module proposed by Bleicher & Gross (2010) deals precisely with this theory, as well as the approach chosen by Schädler et al. (2011). According to these assessment methods, through a comparative analysis of alternative brown-field rehabilitation options, the degree of sustainability is calculated, and the optimal redevelopment option is chosen. Still other authors place the emphasis on the methodology to be applied in order to measure the performance of brown-field regeneration processes according to sustainability principles. In this regard, the Principle - Criteria - Indicators framework approach describes the attempt to capture the complexity of the measurement starting from the definition of the three main sustainability dimensions, moving to the identification of specific objectives that have to be assessed through properly chosen indicators (Worrall et al. 2009). The Sustainability Assessment Tool is another good illustration of a three steps methodology which provides a wide range of qualitative and quantitative criteria to evaluate how sustainable a brown-field regeneration project is, on the basis of objectives, indicators and best practices (Franz et al. 2006). Accordingly, the framework built by Sardinha et al. (2013) consists in validating the achievement of six sustainability dimensions - environmental reconversion, cultural regeneration, social revalorisation, economic revitalisation, community reinforcement and strategic reframing - through the identification and application of some
categories for action. Furthermore, the measurement of sustainability is in many cases subject to a preliminary and well structured selection of indicators. This practice is well exemplified by the indicator based approach, applied by Hemphill et al. (2004), where the complex procedure of choosing the potentially relevant indicators is broken down into rigorous steps and followed by a points scoring phase, ensuring a comprehensive and transferable framework to quantify the sustainability of brown-fields revitalisation. Other researchers apply a similar methodology to select indicators capable of measuring the brown-field redevelopment success in terms of environment-health, finance, livability, and social-economic sustainability through a partially automated tool (Wedding & Crawford-Brown 2007), while still others consider the definition of economic and environmental performance indicators instrumental for measuring the unequivocal recognition of the sustainability achievements (Bacot 2006).

Despite the above mentioned debates, it appears commonly recognised that sustainability calls for context sensitive evaluation criteria, given its strict reliance on temporal, spatial and thematic context; thus, the selection of the most appropriate indicators lie with the local stakeholders and are tailored to reflect the site specific situation (Franz & Nathanail 2005; Olsson 2009). Hence, the local context dictates the specific sustainability needs, as defined by the local authorities and decision-makers’ expectations. This implies that, on the one hand the stakeholders involved in the land reuse play a key role in the sustainability achievements, having a direct impact on whether the development is sustainable (Williams & Dair 2007); on the other hand, it determines the impossibility to apply a standardised list of indicators to measure “some unspecified type of sustainability brownfields” (Bleicher & Gross 2010).

In sum, while evaluating the current state of the art for the body of knowledge reviewed, it became clear that innovation, through the “re-imagined urban areas” model in particular, is potentially able to give a meaningful response to the problems shown by de-industrialised areas, leveraging the assets already present within the existing city limits. However, a gap in research about the nexus between brown-field and innovation district multiple positive effects (over the environment, on the economic and social health of the entire region) has been found. This paper puts forward the application of an objective-led framework designed to assess the sustainability of brown-fields development in order to capture the above mentioned relationship.

3. RESEARCH METHODOLOGY

In the light of the findings raised above, the inclination to measure brown-fields redevelopment sustainability according to specific indicators is quite misleading. A better understanding of the innovation multiple response can be achieved by approaching the research from a more comprehensive perspective, thus, by taking into consideration criteria that illustrate the general values recognised by the society.

The objectives-led approach adopted by Williams & Dair (2007) provides a framework broad enough to embrace the diverse contexts of brown-field redevelopment and the multidimensionality of impacts. It allows the author to effectively assess the sustainable development in the context of land reuse through a better insight of cause and effect; in addition, it also leads to the derivation of general principles from it, since it facilitates the transposition of abstract concepts - such as economic, social and environmental sustainability, into tangible practices. According to the method, all the range of potential key
stakeholders should be first identified in order to investigate what can be achieved in terms of sustainability by their participation in land reuse. Subsequently, the objectives-led model is devised, which relates to the development of several precise sustainability objectives, deducted from a sound knowledge of the state of the art, regarding the economic, social and environmental systems (see Table 7).

Table 7: Sustainability objectives to be met in brown-field developments (Source: Williams & Dair, 2007)

<table>
<thead>
<tr>
<th>Economic sustainability objectives</th>
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</thead>
<tbody>
<tr>
<td>1. To enable businesses to be efficient and competitive</td>
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<tr>
<td>2. To support local economic diversity</td>
</tr>
<tr>
<td>3. To provide employment opportunities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Social sustainability objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To adhere to ethical standards during the development process</td>
</tr>
<tr>
<td>2. To provide adequate local services and facilities to serve the</td>
</tr>
<tr>
<td>development</td>
</tr>
<tr>
<td>3. To provide housing to meet local needs</td>
</tr>
<tr>
<td>4. To integrate the development within the locality</td>
</tr>
<tr>
<td>5. To provide high quality, liveable developments</td>
</tr>
<tr>
<td>6. To conserve local culture and heritage, if appropriate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental sustainability objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. To minimise the use of resources</td>
</tr>
<tr>
<td>2. To minimise pollution</td>
</tr>
<tr>
<td>3. To protect biodiversity and the natural environment</td>
</tr>
</tbody>
</table>

First, as far as the sustainable economic development is concerned, the perspective adopted in the model reflects the prevailing approach of the last 20 years considering the brown-field revitalisation as an opportunity to foster sustainable economic growth through the objectives spelt out within the framework. Second, the model confirms its proper assessment methodology with regard to the social issue as related to the environmental conditions; hence, the factors affecting individuals and human well-being have been considered, together with the aspects associated with the development of social capital. Third, when it comes to environmental sustainability, the brown-field redevelopment is deemed to be, according to the well developed literature, a successful strategy to restore the natural ecosystem by the implementation of the objectives set out in the model.

By taking the abovementioned criteria as a starting point, an attempt of a qualitative evaluation of the impact of innovation on brown-field redevelopment sustainability is carried out. Therefore, the empirical research, developed on a purposely selected US area, aims to apply a methodology to examine to what extent the main sustainability outcomes have been achieved, through a qualitative direct analysis.

The conceptual model is tested on a case study that has been analysed in the framework of the wider international MAPS-LED Project, designed to investigate the spatial dimension of Smart Specialisation Strategies, with the purpose of exploring the key role of S3 implementation in placed-based regeneration policies. Accordingly, through a spatially-led approach, the urban dimension ability to foster knowledge dynamics promoting innovation within the Greater Boston area has been investigated. Thereby, the physical localisation of innovation within an urban territorial scale has resulted in the identification of several case
studies, among which the Boston Innovation District planning initiative has been chosen -
given the outstanding implementation of an innovation-led brown-field redevelopment
initiative. Therefore, this study adds an additional element to the original research, to allow a
deeper understanding of how the Boston Innovation District fostered the process of brown-
field revitalisation from a sustainable development perspective, with the aim to provide
transferable instruments and recommendations.

The empirical analysis has been conducted with a research methodology based on a two-step
approach. Initially, secondary data have been the subject of an in-depth analysis: the main
urban attributes and key socio-economic indicators were collected in order to improve
knowledge on the specific features of the context; in addition, qualitative planning and
financial documents were gathered to retrace the urban development activities undertaken in
the Boston Seaport area over the last few decades. A direct analysis of the case study, mostly
based on field work and interviews, has been performed at a later stage: an active
participation during meetings and events held in incubators was ensured, multiple valued
visual analysis of the urban environment was carried out and supported by photographic
evidence, as well as the organisation of semi-structured and informal interviews with key
informants conveniently sampled. Finally, in order to test the conceptual model, each
sustainability objective has been mapped on the findings of the extensive qualitative
observations and data collection.

3.1 Case Study Description

The Boston Innovation District provides an outstanding case study of brown-field
revitalisation project (Cohen 2014). The underused Boston’s South Waterfront has been
converted into a centre of knowledge economy: an urban environment that fosters innovation,
collaboration, and entrepreneurship (Menino 2010b). The geographic area dates back to the
19th century when it was a hub of fast-growing industrial development, serving as home to
rail yards and manufacturing companies for Boston’s working port until about 1955.
Successively, the development of transportation infrastructure, with the construction of the
elevated Central Artery highway and the Interstate 93, made it hardly accessible, isolating the
district and marking its decline. A radical change took place when the Seaport District has
been integrated into Downtown Boston again, with the completion of the Big Dig project.
Inspired by the successes of 22@, the world's first innovation district located in Barcelona,
Mayor Thomas Menino, in the Inaugural address (2010a), announced his vision of
redeveloping the large declined industrial waterfront, calling for a “more deliberate and more
experimental approach” in order to create a “hub for knowledge workers and creative jobs.”
As in Barcelona, the Boston Innovation District has employed an economic development
strategy where government operated as the regulatory and administrative gatekeeper, working
collaboratively with cross-sector private enterprises to enhance the chances of succeeding and
affecting such a large scale change. Key private-sector players have been personally engaged,
and the public sector openly advocated for financial incentives in order to spur established
companies and emerging entrepreneurs to move into the District, creating new jobs and
providing tax revenues to fund public services. Hence, a dense community of innovators and
entrepreneurs has been created increasing proximity and density, according to the notion that
“people in clusters innovate at a quicker rate, sharing technologies and knowledge easier”
(Muro & Katz 2011). In line with Brookings Institution researchers’ thought, the Boston
Innovation District represents a remarkable example of sustainable economic development
aimed at revitalising an underutilised parcel of land. It provides a favourable environment for
the launch and growth of firms by helping entrepreneurs and investors, universities and researchers generate new findings for the market; at the same time, it fosters employment expansion through a massive job creation phenomenon densifying the employment patterns; additionally, it facilitates the repopulation of an influential urban area, encouraging a dense residential structure and strengthening mass transit.

4. CASE STUDY RESULTS AND DISCUSSION

The objective-led model has been used as a research tool in the case study of the Boston Seaport regeneration. An extensive analysis, carried out between April 2016 and today in the Boston metropolitan area, allowed the author to assess the brown-field redevelopment against the above mentioned criteria related to the threefold sustainability objectives. The main purpose was to advance the body of knowledge on the nexus between brown-field and innovation, by assessing the degree of sustainability achievements and giving credit to the trend that considers innovation as a comprehensive strategy that invests on the cities underutilised assets in order to boost an inclusive and sustainable growth. The findings from the investigation are summarised and discussed in the following sub-sections.

4.1 Economic sustainability objectives

The South Boston Waterfront Public Realm Plan (BRA 1999), followed by the Municipal Harbour Plan (BRA 2009), have been issued with the specific purpose of supporting businesses to be efficient and competitive through the Seaport physical environment adaptation. Specifically, the underutilised land was the planning context for the development of a 24-hour neighbourhood providing a place for business expansion, supported by an attractive open space network and a strong urban design character. Furthermore, the construction of the Central Artery Tunnel Project, the Silver Line completion, and the strengthening of the MBTA buses have been instrumental in providing a convenient system of transport infrastructure, ensuring links from the site to the main transport corridors. Another success factor for the sustainable economy of the area is represented by the willingness to welcome every kind of industries; the area is indeed characterised by a broad inclusivity of established companies and small enterprises providing a wide range of economic activities which maximise job opportunities for local workforces. “More than 5,000 new jobs have been created in the Innovation District since 2010, as over 200 startups have set up shop in the area. From software and digital marketing to manufacturing and design, the Innovation District’s young firms span a wide array of industries and business models. The support infrastructure that these young companies need to grow, including incubators and accelerators, as well as law, design, advertising, and other professional services firms, has also moved to the District, providing a healthy ecosystem for innovative companies to thrive” (TIP 2014). Moreover, to ensure an adequate accommodation for companies, maximum flexibility for the use of the buildings is assured; most of the buildings are therefore designed to accommodate different types of groups and gatherings, concept best exemplified by the District Hall (see Figure 31) and the Innovation & Design Building.
4.2 Social sustainability objectives

The factors affecting individuals and human well-being, together with the aspects associated with the development of social capital are at the core of the strategic plan that identifies key actions and initiatives to transform the Seaport area into a healthy, thriving and innovative district. Expanding Opportunities stands for the citizens’ vision coupled with the Mayor’s priorities and research, guiding the growth of the district towards creating a liveable neighbourhood for all residents and generations to come (Image Boston 2016). At the same time, Boston Creates strives to encourage the city’s arts and culture sector in order to make it more inclusive and equitable (Boston Creates 2016). The Go Boston 2030 (2015) initiative actively engages the community envisioning a bold transportation system. A high quality architectural design and a master plan well integrated with the context, capable to attract people and businesses to live, work and play, are the result of the InnovationBoston vision (BRA 2010). The liveability is achieved by a diverse and dense complement of offices, retail, restaurant, residences and entertainment uses - as highlighted by the newly conceived Seaport Square (SSDC 2017), in order to meet people’s needs for education, healthcare and leisure, but also to help communities develop social capital by providing space for formal and informal social interaction. Numerous cultural and civic institutions are located in the Innovation District, including the Children’s Museum and the Institute for Contemporary Art, while numbers of experimental event landscape, such as The Lawn On D and the Fan Pier Park, have been successfully realised to bring together different communities, encouraging social interaction and fostering creativity (see Figure 32).

The Boston Innovation District also provides a mix of housing types including residents’ apartments, condominiums, and micro-unit options - without ignoring the affordability issue. With the specific purpose of providing flexible housing options to meet the needs of local people and entrepreneurs, the Boston Redevelopment Authority launched the Innovation Housing Unit Experience (BRA 2010a) allowing developers to build 300 micro apartments to help young professionals collaborate more effectively; such units can be found just in the
Seaport area at buildings like Pier 4, Flats on D, Watermark Seaport and Factory 63. The efforts of meeting the growing and changing transportation needs of the Seaport, while ensuring good connections to the rest of the city led to the South Boston Waterfront Sustainable Transportation Plan (BRA 2015). The mobility and access to local services for all has been improved, relying on a development design that considers a wide range of users including children, people with disabilities and older people (BRA 2017). Furthermore, the local culture and heritage related to the historic harbour have been firmly preserved (see Figure 33), as demonstrated by the Seaport World Trade Centre, as well as the Massachusetts Port Authority efforts towards the Boston Fish Pier conservation - a social and culturally significant space that still represents the epicentre of Boston’s seafood industry after more than a century; the original buildings’ structures are currently home to fishing vessels and seafood processing businesses, several maritime industrial office tenants, and the Exchange Conference Center (Massport 1976). Other historic brick warehouses are equally subject to rehabilitation in order to host the headquarters of resonant companies, such as General Electric (BRA 2016).

![Figure 33: Boston Fish Pier and General Electric site (Author’s picture)](image)

### 4.3 Environmental sustainability objectives

Minimising the use of resources and pollution throughout the life cycle of the brown-field redevelopment has been one of the main concerns of the innovation-led strategy. Indeed, with the Boston Zoning Code Article 37 (BRA 2015a), the city requires that all large-scale projects meet certain LEED certification standards. Accordingly, the Seaport District is home to several green building best practices - such as the Fraunhofer Centre, Boston Design Centre, District Hall, Waterside Place Apartments, The Boston Convention and Exhibition Centre, which awarded high LEED ratings for their commitment in minimising negative environmental impacts because of the way they were planned, designed, constructed, and managed (USGBC 2017). Compliance with the environmental sustainability objectives is ensured by the Seaport Square development project in which energy efficient building design are complemented by infrastructure encouraging people to walk and cycle, direct access to public transportation, and thoughtful consideration to open and green spaces that connect with pathways to the waterfront.

### 4.4 Discussing the BID innovation-led brown-field redevelopment

The nexus between brown-field and innovation district has been proven through the application of a robust and theoretically grounded objective-led model for assessing the sustainability of brown-fields redevelopment. Based on the investigation of the secondary data collected and the direct analysis performed, the planning initiatives and development
projects put in place within the Boston Innovation District have been slotted into the three sustainability dimensions, as required by the structure of the framework proposed. As illustrated above, innovation was able to physically and economically revitalise a disused post industrial landscape, creating an attractive place and a vibrant ecosystem for wide-ranging business expansions and job opportunities maximisation. Moreover, it provided adequate housing, facilities and local services to meet individuals’ needs - thanks also to a fruitful collaboration with the community, fostering social capital development and contributing to residents well-being. Finally, regardless of the massive intervention, a particular attention to the use of resources and pollution minimisation has been paid, together with a thoughtful protection of the harbour as a shared natural resource. Hence, the case study proved evidence of the effectiveness of innovative-led approach in matching all the issues considered as relevant to the redevelopment of brown-fields. Useful lessons can be drawn in encouraging planners and policy-makers towards considering the role of innovation in urban regeneration initiatives targeting distressed areas, given its capability to turn an underutilised property into an economic and environmental asset that yields dividends for the entire region.

5. CONCLUSIONS

The research is grounded on the widely recognised principle that older industrial cities have to invest into their underutilised assets to become globally competitive again; therefore, the effectiveness of the “re-imagined urban areas” model has been analysed according to the objectives of sustainable brown-fields redevelopment. Thus, a purposely chosen methodology to assess the Boston Innovation District sustainability has been applied, highlighting how innovation is experimented with within a brown-field revitalisation context. This study confirms the cities current propensity to issue innovation-oriented urban policies which, in the specific case of Boston, seek to rehabilitate urban distressed areas operating as main development driver after the economic downturn.

However, some findings raise legitimate questions about transferability issues. The Boston Innovation District took shape in a geographically privileged area - the core of the historical harbour, open to the surrounding urban grid and easy to be connected and integrated with it; moreover, the Seaport area was not affected by relevant contamination problems, as well as significant social deprivation issues. Also the significant critical mass played a key role; the Greater Boston area, indeed, has been repeatedly mentioned as one of the most innovative hubs within the US context, supported by the conspicuous presence of companies, educational institutions, business incubators and accelerators that boost the innovative ecosystem. Another relevant component that might have influenced the innovation-led strategy was the strong continuity in the planning and management policies, despite a change in the local administration and the long lead times for the project implementation; as a matter of fact, the experimental framework characterised by high planning flexibility and expedited decision making keeps being the leitmotif of the intervention.

In this respect, further research studies could attempt to provide a quantitative evaluation regarding compliance of innovation with brown-fields redevelopment in terms of sustainability achievements, by creating a set of indicators to both give a weight and prioritise the objectives, so as to grade the performance, allowing the comparison with other cases. It would be also worthwhile to explore other case studies, in order to observe the potential of innovation as a driver for a sustainable economic development in brown-fields characterised
by real hazardous contamination and social decline, as well as to examine further areas where the innovation component is less ingrained in the economic structure of the city.

6. ACKNOWLEDGEMENTS

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PUBLIC-PRIVATE PARTNERSHIPS FOR THE KNOWLEDGE ECONOMY: THE CASE OF INNOVATION CENTERS

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Abstract: In the late 2000s, new spaces—such as co-working, maker spaces, and co-living spaces—have been emerging in the knowledge-based post-industrial cities. The paper investigates the emergence of innovation centers through the use of public-private partnerships. The research methodology is based on a multiple case-study approach in which three cases were selected: Barcelona Growth Center in Barcelona (Spain), District Hall in Boston (USA), and Edney Innovation Center in Chattanooga (USA). Innovation centers, which consist of widely diverse creative and knowledge-based activities located within the same building, participate in the urban regeneration of downtown areas through the promotion of entrepreneurship. The paper finds that the local governments, which adopt public-private partnerships to create innovation centers, are entrepreneurial and are aligning their actions and visions with those of the entrepreneurs they are trying to attract. For the entrepreneurial local governments, innovation centers are anchor spaces incorporated in a broader vision of making “innovation districts”.

Keywords: Creative City, Innovation Districts, Public-Private Partnership, Knowledge Economy, Urban Regeneration.

1. INTRODUCTION

In the late 2000s, new spaces—such as hacker spaces, maker spaces, Living Labs, Fab Labs, and co-working spaces—have been emerging in concert with the rise of the knowledge and collaborative economy (Botsman & Rogers, 2011; Capdevila, 2015). Civic and innovation-driven entrepreneurs are the main beneficiaries of these new spaces. Entrepreneurs and outsiders are the engine of creative destruction, job creation, economic growth, and the initiators of radical innovations (Christensen, 1997; Kane, 2010; Saxenian, 1994; Schumpeter, 1942). Entrepreneurs have also become, for local governments, the center of attention since the publication by Richard Florida (2002) of The Rise of the Creative Class. Chatterji, Glaeser, and Kerr (2013) point out that place-based policies to attract and retain entrepreneurs and startups are positively seen by economists who can be skeptics to the ability of policymakers in picking winners but believe in their ability of picking winning sectors.

Local and regional governments are promoting policies, like the creation of innovation centers, to promote their local entrepreneurial ecosystems. Since 2000, local and regional governments are implementing policies to create innovation districts, which are place-based initiatives that aim to regenerate downtown districts through the promotion of innovative companies and startups, to accelerate their cities’ transitions into the knowledge economy (Katz & Wagner, 2014; Morisson, 2014). Innovation centers are anchor spaces in innovation districts that aim to accelerate the innovation process through promoting collaboration, serendipity, proximity, face-to-face interactions, and the exchange of tacit knowledge between diverse actors through different activities.
The paper investigates the creation of innovation centers through public-private partnerships. Three case studies have been selected: Barcelona Growth Center in Barcelona (Spain), District Hall in Boston (USA), and Edney Innovation Center in Chattanooga (USA). The research conducted for this paper is based on three sources of data: semi-structured interviews, secondary data, and direct observation. Innovation centers are the outcomes of innovative private-public partnerships between entrepreneurial public organizations, entrepreneurial mayors, and private partners (see table 1. for an overview of each case-study). Innovation centers align the vision of local governments with the vision of the entrepreneurial community. As a result, the creation innovation centers through innovative public-private partnerships contribute to reinforce local governments’ entrepreneurial spirits.

2. KNOWLEDGE ECONOMY AND PUBLIC-PRIVATE PARTNERSHIPS

In the 1990s, capitalist countries started to undergo an economic transition towards post-Fordism or knowledge-based economies (Amin, 1994; Drucker, 1998). The knowledge-based economy recognizes the importance of knowledge as the driver of productivity and economic growth, emphasizing the role of information, technology and learning in economic performance (OECD, 1996). In the knowledge economy, technological innovation is essential for economic prosperity. The academic literature provides, both across nations and over time, a solid theoretical background linking technological innovation to the progress of countries, regions, cities, and firms (Fagerberg, 1988; Freeman, 1987; Rosenberg, 1982, 2004; Schumpeter, 1934; Solow, 1957).

In this economic transitions, with the rise of the global economy and the revolutionary nature of ICT, metropolitan areas are the key units to produce technological innovations (Castells, 1989; Florida, Adler, & Mellander, 2017). Indeed, patents and innovations are heavily concentrated in space (Acs & Audretsch, 1988; Carlino, 2001; Jaffe, Trajtenberg, & Henderson, 1993). In introducing the concept of knowledge-based urban development, Knight (1995) correctly recognized that as the economic structure becomes more knowledge-based, the basic nature of urban development changes. Building the “next Silicon Valley” and knowledge-based development initiatives that involve public institutions, universities, and private firms are the epitome of contemporary economic development strategies due to their strong multiplier effect (Etzkowitz, 2015; Moretti, 2012; Sturgeon, 2000).

Metropolitan regions are seen as the most appropriate entity for designing supportive competitive and innovative environments for companies compared to nation states, which in an increasingly borderless world, are increasingly becoming dysfunctional (Cooke, 1997; Krugman, 1995; Ohmae, 1995). In the European Union and the United States, central governments are devolving power and regulatory tasks to subnational institutions, which are becoming more entrepreneurial in order to deliver public services and foster economic growth (Brenner, 2004; Hall & Hubbard, 1996).

One of the tools that local governments are increasingly embracing are public-private partnerships (PPP). Indeed, since the 1990s, public-private partnerships have been used as a key tool of the new public governance for delivering and implementing public policies around the world (Osborne, 2002; Osborne, 2006). In the United States and in the European Union, local and regional governments are taking advantage of private-public partnerships as a way to innovate in times where Federal funds and central governments subsidies are
declining (Sagalyn, 2007). Public-private partnerships are defined as “cooperation of some sort of durability between public and private actors in which they jointly develop products and services and share risks, costs and resources which are connected with these products” (Van Ham & Koppenjan, 2001, p. 598).

In the United States, public-private partnerships have extensively been used in urban development, most notably for the regeneration of Central Business Districts (CBDs) and downtown areas (Harding, 1990; McQuaid, 2000). The limited resources at the disposal of local governments have forced them to take advantage of multiple sources of funding and to work with a wide range of actors, such as the central or federal government, the regional government, the private sector, and the local community, in order to deal with multifaceted local economic development challenges (McQuaid, 2000; Newman & Verpraet, 1999). Lately, local governments are promoting knowledge-based activities out of the desire of generating high-growth activities and high-quality jobs in their cities. Local governments use public-private partnerships to deliver knowledge-based policies and programs, like innovation centers, in very entrepreneurial and innovative manners. Indeed, public-private partnerships can be used in a variety of ways since Mayors and local development offices are only limited by their “imaginations” (Lyons & Hamlin, 1991, p. 55).

3. TACIT KNOWLEDGE AND COLLABORATION

Innovation centers are spaces whose objectives are to promote collaboration and face-to-face interactions between diverse organizations, stakeholders, and innovative actors. Innovation centers aim to accelerate the diffusion of tacit knowledge by being open to external and diverse sources of knowledge and to reinforce as a result, the innovative capacities of startups, individuals, and innovative companies located in the building and the district.

In The Tacit Dimension, Michael Polanyi (1966) disseminates the concept of tacit knowledge, when he famously observed: “we can know more than we can tell”. Tacit knowledge, in opposition to codified knowledge, refers to the knowledge, ideas, concepts, or insights that individuals possess but cannot be fully expressed. Tacit knowledge is largely transferred through repeated face-to-face, formal and informal, interactions that can only take place at the level of the city or even the district, and is as a result, highly localized. The academic literature widely recognizes the importance of tacit knowledge in the innovation process and in the clustering of high-technology companies (Bathelt, Malmberg, & Maskell, 2004; Gertler, 2003; Howell, 2002; Morgan, 2004, Rodriguez-Pose, & Crescenzi, 2008; Von Hippel, 1994). The general assumption is that by its difficulty of being codified and its dependence on context-specificity, tacit knowledge is more difficult to transfer through distance, and thus, more ‘sticky’ (Von Hippel, 1994). Indeed, while codified knowledge can be disseminated globally at a low cost, due to the process of ubiquitification, tacit knowledge becomes even more critical for competitiveness (Maskell & Malmberg, 1999). Proximity—geographical, cognitive, organizational, social, and institutional—affects the quality of face-to-face interactions and the diffusion of tacit knowledge (Boschma, 2005).

The concepts of the national innovation system (Lundvall, 1992), the sectoral innovation system (Breschi & Malerba, 1997) the regional innovation system (Braczyk, Cooke, & Heidenreich, 1998), the learning region (Florida, 1995; Morgan, 1997), the innovative milieu (Aydalot & Keeble, 1988), and the industrial district (Becattini, 1992), all point out the importance of intraregional networks and interactions in enhancing industrial innovativeness
and regional competitiveness. Collaboration is thus, seen as an important driver in accelerating the innovation process. The interactions between companies and organizations not only in similar economic sectors but also diverse ones can be beneficial to the innovation process thanks to knowledge spillovers (Jacobs, 1969). The concept of open innovation acknowledges the importance of inflows and outflows of ideas and tacit knowledge in the process of innovation (Chesbrough, 2003). Interactions and cooperation between university-industry-government and the civil society are necessary preconditions for regional competitiveness in the context of the knowledge economy (Carayannis & Campbell, 2009; Leydesdorff & Etzkowitz, 1996).

4. METHODOLOGY

The research methodology is based on a qualitative multiple case-study approach, using primary and secondary data. The author uses case studies “out of the desire to understand complex social phenomena” (Yin, 1994, p. 4). Indeed, this research investigates in an exploratory manner a contemporary phenomenon in which the researcher has no control on the actual phenomenon (Eisenhardt, 1989). Moreover, the investigation of public-private partnerships for the creation of innovation centers has not been fully examined. A qualitative approach is as a result, the most appropriate method (Eisenhardt, 1989). The researcher uses a comparative exploratory multiple case-study approach in order to generalize findings on the new concept studied. The three innovation centers selected are located in three different cities in developed countries, they are: Barcelona Growth Center in Barcelona (Spain), District Hall in Boston (USA), and Edney Innovation Center in Chattanooga (USA).

The research conducted for this paper is based on three sources of data: semi-structured interviews, secondary data, and direct observation. The semi-structured interviews were conducted for each innovation center in person and over the phone with the key stakeholders who have directly participated in the innovation center’s design and/or implementation. In total, seven interviews were conducted: three interviews for Barcelona Growth Center, two interviews for District Hall, and two interviews for Edney Innovation Center. The persons interviewed were: the District Hall’s director, Chattanooga’s strategic planner, 22@ Barcelona’s employees and director, university professors, and the City of Boston Mayor’s Office. The stakeholders were selected according to their strong knowledge and diverse perspectives on the phenomena studied (Eisenhardt & Graebner, 2007). The secondary data that were used for the research are, but were not limited to: innovation centers’ websites, namely District Hall, Edney Innovation Center, and 22@ Barcelona; the municipal organizations’ websites, namely Boston Redevelopment Authority, The Enterprise Center, and 22@ Barcelona; the government websites of the City of Barcelona, Boston, and Chattanooga; real-estate developers’ websites such as WS Development, Consorci de la Zona Franca de Barcelona; articles in news websites, newspapers, and magazines such as nooga.com, New York Times, Boston Globe, La Vanguardia, and Boston.com; annual reports from The Enterprise Center, and official planning documents from 22@ Barcelona and Boston Redevelopment Authority. The direct observations involved non-participatory observations in each of the innovation center. In total, the researcher conducted about 6 hours of formal and informal observations. The data were then, converged in a triangulating fashion in order to “assure that the right information and interpretations have been obtained” (Stake, 2013, p. 36).
5. CASE-STUDIES
5.1 Barcelona Growth Center - Barcelona, Spain

The Barcelona Growth Center, previously known as the MediaTic building, is at the center of the innovation district—22@ Barcelona. In 2000, under Mayor Joan Clos, the City of Barcelona launched the innovation district, 22@ Barcelona, in order to accelerate the city’s transition into the knowledge economy (Barceló & Oliva, 2002; Trullén, 2001). The innovation district is located in the district of Poblenou, a former industrial district, used to be known as the “Manchester of Catalonia” (López, Romani, Sagarra, & Piqué, 2011). The objectives of 22@ Barcelona were: to redevelop the district of Poblenou, to promote industries in five clusters—media, ICT, medical technologies, energy, and design—and to accelerate Barcelona’s transition into the knowledge economy (Trullén, 2001; López et al., 2011). A municipal company, 22 ARROBA BCN S.A., was created by Mayor Joan Clos with the sole purpose to transform the Poblenou district into an innovation district.

The Barcelona Growth Center is a nine-story and 15,000-square-meter building located in the center of the district—22@ Barcelona. The users and activities of the innovation center are: a business support office; the Cibernàriu, a public-sponsored program that offers training for professionals, students, and residents; the Mobile StartUp Barcelona, a co-working space for entrepreneurs and startup accelerators; the Mobile World Capital Barcelona, a public organization that organizes the Mobile World Congress in Barcelona; the GSMA, which is the global trade association for mobile phone operators, manufacturers and suppliers; Accenture Mobile Knowledge; Deloitte; the Technological Circle of Catalonia (CTecno), a foundation that unites companies and professionals in the Information and Communications Technology sector; Softonic, a software company; previous tenants included the Open University of Catalonia; the Internet Interdisciplinary Institute (IN3); and an eLearning Center. The Barcelona Growth Center is today a hub and meeting point for entrepreneurs, accelerators, public institutions, students, and private companies in the sectors of ICT and Media (Barcelona Activa, 2012).

The Barcelona Growth Center was opened in 2010 to serve as the center for 22@ Barcelona’s Media and ICT clusters (Barceló & Guillot, 2013). The public-private partnership that led to the creation of the innovation center followed a complex two-step process. In the first step, the land, which was privately-owned, was transferred to the municipal company, 22 ARROBA BCN S.A., due to the compulsory land transfer in the innovation district. In 22@ Barcelona, the zoning laws were modified in 2000 to give an incentive for real estate developers to build more by providing them additional zoning rights under certain conditions. First, real-estate developers were obliged to dedicate twenty percent of the total built area to “@” activities, which are knowledge-based activities as defined by the OECD (Barceló & Guillot, 2013; Barcelona, 2000). Second, real estate developers had to transfer 30 percent of the built land to 22 ARROBA BCN S.A. (Barceló & Guillot, 2013; Barcelona, 2000). The municipal company was then allocating the land to provide parks, public housing, and “7@ amenities” like the Barcelona Growth Center, which are spaces to accommodate knowledge activities and diffuse new technologies (Barcelona, 2000). In the second step, a joint-venture was created between the municipal company, 22 ARROBA BCN S.A., and a quasi-public real estate developer, the Consorci de Zona Franca de Barcelona, in order to build “7@ amenities” on the land transferred by a private real estate developer to the municipal company. The joint-venture negotiated to determine the architectural aspects, the activities, and uses of the building. It was agreed that the Consorci de Zona Franca de Barcelona would finance the construction of the Barcelona Growth Center and would have the right to use the
building for a period of 70 years before transferring back the right to use the building to the city. The city would have the right to use three floors of the building to promote knowledge activities for the same period of 70 years.

In Barcelona, the public-private partnership that led to the creation of the innovation center consisted of a joint-venture and negotiations between 22 ARROBA BCN S.A. and the Consorci de Zona Franca de Barcelona. The municipal company, 22 ARROBA BCN S.A., consisted of public entrepreneurs who had a certain degree of autonomy and flexibility to form innovative public-private partnerships in order to transform the district into an innovation district. The local government in Barcelona through its entrepreneurial spinoff, 22 ARROBA BCN S.A., was using the codes of the entrepreneur community to create a space dedicated to entrepreneurship and innovative activities.

5.2 District Hall - Boston, United States

The District Hall is a flagship program at the center of Mayor Menino’s vision to build an innovation district in the South Boston waterfront, a former industrial district in Boston. Boston’s Innovation District was the outcome of a negotiation between real-estate companies and the City of Boston (BRA, 2010). The Boston Redevelopment Authority (BRA) negotiated with Gale International, Morgan Stanley, and W/S Development Associates, to include, in their plans for developing the Seaport Square, a real estate megaproject, a range of public benefits consisting of “Innovation Uses”, civic and cultural spaces (BRA, 2010). The Innovation Uses include: laboratories, small business incubators, public event spaces for exhibitions, rooftop gardens, the District Hall, retail businesses, hotels, innovation transportation and energy, and public, common, or shared spaces within innovation/workforce housing (BRA, 2010).

The District Hall is a single-story and 1,115-square-meter located in the heart of Boston’s Innovation District. The innovation center claims to be “the world’s first free-standing public innovation center and a dedicated civic space where the innovation community can gather and exchange ideas” (www.districthallboston.org). The activities located in the innovation center are: a restaurant, a coffee shop; a lounge, which is completely open to the public; a large and flexible conference room; and 3 flexible meeting rooms. The users of the innovation center are: startups, entrepreneurs, students, nonprofit organizations, local associations, local residents, and corporate companies.

The District Hall was opened in 2013 to serve as an anchor institution that contributes to the visibility of Boston’s Innovation District. The District Hall was created as a public benefit through Boston’s incentive zoning rights. In Boston, the Boston Redevelopment Authority, Boston’s urban planning department, which is supervised by the Mayor’s office, confers property rights, such as additional density, to real estate developers in exchange for public benefits to the community. The innovation center is the outcome of a yearlong negotiation between real estate companies that asked for additional density in the Seaport Square’s project, the largest real estate development in Boston’s history, and the Boston Redevelopment Authority that requested for specific public benefits, namely innovation uses (BRA, 2010). In the public-private partnership, the real estate companies built the District Hall and granted a lease to Boston Redevelopment Authority for $1 per year for a minimum period of 5 years with renewable rights for an additional period of 5 years (BRA, 2010). The Boston Redevelopment Authority transferred the right to use the building to a nonprofit
organization, Venture Café Foundation, which was created in 2010 by Timothy Rowe, the founder of the Cambridge Innovation Center in Kendall Square. In exchange, the Venture Café Foundation agrees to organize programming and events in the innovation center. The Boston Redevelopment Authority evaluates on a quarterly basis the activities of the innovation center. The funding to operate the innovation center comes from corporate sponsors, corporate events, and the rents given by a restaurant and a coffee shop located in the building that are operated by the Briar Group. Additionally, Venture Café Foundation doesn’t pay taxes to the City of Boston for innovation-related events and activities.

In Boston, the public-private partnership that led to the creation of the innovation center consisted of a yearlong negotiation between Boston Redevelopment Authority and real estate developers. The Boston Redevelopment Authority then partnered with a nonprofit organization, which is funded through the rents given by the restaurant and coffee shop located in the building, in order to run events and operate the innovation center. The Mayor’s office used multidimensional and creative partnerships in order to spur the creation of its innovation center.

5.3 Edney Innovation Center - Chattanooga, United States

Chattanooga is a mid-sized city located in Tennessee in the United States. Since the 1970s, Chattanooga has reinvented itself from being “America’s Dirtiest City’ into becoming an emerging innovation hub (Motoyama, Fetsch, Jackson, & Wiens, 2016). The city has built upon its capacity to generate successful public-private partnerships with philanthropic foundations, entrepreneurs, and public organizations, to redevelop its waterfront and its Central Business District. In 2010, the Electricity Power Board (EPB), a public-owned utility company owned by the City of Chattanooga, launched the fastest fiber-optic Internet network in the United States, dubbed as the “Gig”, that provided residents with one gigabit speed Internet (Motoyama et al., 2016).

In 2015, Mayor Berke announced the creation of an innovation district and an innovation center in downtown Chattanooga that was to be piloted by the Enterprise Center. The Enterprise Center is a nonprofit public-private partnership that focus on promoting the innovation economy in Chattanooga. The Enterprise Center was created in 2014 to build upon the the opportunities that could be leveraged from the Gig upon the recommendations of the Chattanooga Forward Gig, Entrepreneurship and Technology Task Force Report.

The Edney Innovation Center is a 10-story and 8,360-square-meter building located in the heart of Chattanooga’s innovation district. The tenants of the innovation center are: CO.LAB, a nonprofit startup accelerator; Tech Town, a technology learning center; Society of Work, a co-working space; private companies, and the Enterprise Center. The building includes a community space open to the public, a rooftop gathering space, and proximately a restaurant, a coffee shop, and an open space on the ground floor. The users of the building are: entrepreneurs, community and nonprofit organizations, private companies, and students. The Enterprise Center, which is located on the fifth floor, organizes networking events, workshops, and public and private events in its community space. The innovation center aims to become the catalyst connector for Chattanooga’s entrepreneurial ecosystem.

The Edney Innovation Center was opened in late 2015 and is at the center of Mayor’s Berke’s vision to establish an innovation district in Chattanooga. The creation of the innovation center
was the outcome of negotiations between a wide range of different actors. The building was owned by the Tennessee Valley Authority (TVA), a Federally-owned utility agency. Mayor Berke and Harold DePriest, the CEO of the Electricity Power Board, facilitated the purchase of the building to the Enterprise Center for favorable terms due to EPB’s and the City of Chattanooga’s historical partnerships with TVA on the condition that the building be used as an innovation center (The Enterprise Center, 2015). The Mayor’s office funded the inspection of the building before the purchase by the Enterprise Center. In early 2015, the Enterprise Center issued a Request for Proposal (RFP) in order to identify a real estate developer to retrofit the building into an innovation center (The Enterprise Center, 2015). The Request of Proposal stated that Co.Lab was to lease the eastern section of the first floor of the building and the Enterprise Center was to lease the western section of the first floor and an additional floor at market rate for a period of 5 years, with a 5 year option (The Enterprise Center, 2015). Co.Lab and the Enterprise Center would assist the real estate developer in the creation and programming of the innovation center. The real estate developer selected was to become a full partner in supporting the innovation center’s vision by selecting tenants and promoting uses relevant for the knowledge economy (The Enterprise Center, 2015). In 2015, a local real estate developer, DEW Edney LLC, was selected to retrofit the building (Motoyama et al., 2016).

In Chattanooga, the Enterprise Center played the role of coordinating, planning, and implementing the Mayor’s vision of an innovation center in the city. The Enterprise Center is a nonprofit public-private partnership that receives its funding from the City of Chattanooga, Federal grants, foundations, and private companies (The Enterprise Center, 2016). The Enterprise Center is to some extent, the entrepreneurial arm of the Mayor’s office. The public-private partnership that led to the creation of the innovation center consisted of a Request for Proposal and negotiations between the Enterprise Center and the local real estate developer, Dew Edney LLC.

6. DISCUSSION

Innovation centers are being created in diverse cities around the world to accommodate entrepreneurs and knowledge workers. While innovation centers are often built with private funds by entrepreneurs, this paper shows that innovation centers can also be the outcome of public-private partnerships in which local governments act as public entrepreneurs. Innovation centers are innovation districts’ anchor institutions that participate in knowledge-based development and the urban regeneration of previously industrial or manufacturing urban districts. Local governments that build innovation centers aim to provide their local entrepreneurial ecosystems with the required informal infrastructures to facilitate face-to-face interactions, collaboration, and the exchange of tacit knowledge in order to accelerate the process of innovation. As Peter Hall (1998) showed, innovative city-regions not only have few, if not any, barriers to the diffusion of innovations, but have also strong but informal structures for exchanges of ideas and knowledge. Local policymakers are more and more keen to embrace innovation policies for their cities. Innovation centers are not however, a “one-size-fits-all” innovation policy. Indeed, innovation centers participate in the making of an innovation district and as a result, should only be promoted when an existing innovation ecosystem already or potentially exists.
Table 1. Overview of the Case-Studies

<table>
<thead>
<tr>
<th>Name</th>
<th>Innovation Centers</th>
<th>Location</th>
<th>Creation Date</th>
<th>Type of Partnership</th>
<th>Lead Coordinating Organization</th>
<th>Floor Area</th>
<th>Purpose</th>
<th>Key Actors</th>
<th>Activities in the Innovation Center</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edney Innovation Center</td>
<td>District Hall</td>
<td>Chattanooga-Tennessee-USA</td>
<td>2015</td>
<td>Public-Private Partnership - RFP-Legal Agreement</td>
<td>The Enterprise Center; The Mayor's Office; Private Foundations; Real Estate Developer; Tennessee Valley Authority</td>
<td>8,360</td>
<td>Anchor space for Chattanooga's Innovation District</td>
<td>The Enterprise Center; The Mayor's Office; Real Estate Developers; The Venture Foundation; Briar Group</td>
<td>Coffee Shop (opening soon), Restaurant (opening soon), Co-Working Spaces, Accelerators, Collision Space, Office Space, Public and Private Events</td>
</tr>
<tr>
<td>District Hall</td>
<td></td>
<td>Boston-Massachusetts-USA</td>
<td>2013</td>
<td>Public-Private Partnership - Public Benefit</td>
<td>Boston Redevelopment Authority</td>
<td>1,115</td>
<td>Anchor space for Boston's Innovation District</td>
<td></td>
<td>Coffee Shop, Restaurant, Conference Rooms, Meeting Rooms, Open Co-working Spaces, Public and Private Events</td>
</tr>
<tr>
<td>Barcelona Growth Center</td>
<td></td>
<td>Barcelona-Spain</td>
<td>2010</td>
<td>Public-Private Partnership - Joint Venture</td>
<td>22 ARROBA BCN S.A.</td>
<td>15,000</td>
<td>Anchor space for 22@ Barcelona's Media and ICT clusters</td>
<td>22 ARROBA BCN S.A.; The Mayor's Office; Barcelona Activa; Consorci Zona Franca de Barcelona</td>
<td>Conference Rooms, Co-Working Spaces, Accelerators, Cibernarium Training Center, Business Support Office, Office Spaces, Parking, Public and Private Events</td>
</tr>
</tbody>
</table>

6. CONCLUSIONS

The paper finds that an innovation center can be the outcome of creative and innovative private-public partnerships as it was the case in Barcelona, Boston, and Chattanooga. In each case-study, the local government had a strong direct or indirect leadership role in negotiating or providing resources and incentives to build their innovation centers. More importantly, Mayors were critical in communicating their visions for the creation of an innovation center to a wide range of potential partners. Mayors took advantage of or created entrepreneurial organizations, such as 22 ARROBA BCN S.A. in Barcelona, the Boston Redevelopment Authority in Boston, and the Enterprise Center in Chattanooga, in order to gain in flexibility and to remove bureaucratic processes, and thus, facilitated the implementation of their entrepreneurial visions.

Entrepreneurial mayors support the creation of entrepreneurial organizations to endorse public-private partnerships in order to rapidly and efficiently create innovation centers and accelerate their cities’ transition into the knowledge-based economy. In endorsing creative and innovative public-private partnerships, local governments are adopting the codes of the entrepreneurial community. In doing so, this new wave of public entrepreneurialism enhances the legitimacy and signals the local governments’ commitment to improving their local innovation ecosystems to the entrepreneurial community. The new wave of entrepreneurial mayors and public organizations participate in the current debate of the supposedly superior local government’s advantages in finding innovation solutions to local economic development challenges (Pike, Rodríguez-Pose, & Tomaney, 2017). The paper has however, a limited scope since it deals with the creation of innovation centers through public-private...
partnerships in developed and relatively large cities with efficient public institutions, and as a result, offers little relevance to urban policymakers in lower-income countries.

7 REFERENCES


Abstract: Enhancing economic performances of regions is currently perceived as a priority. Given these needs, the role of regional clusters has been recently coupled with the concept of Smart Specialization Strategy (S3). This paper aims at contributing to the debate on the role of clusters in the arduous implementation of S3, towards investigating the potentials of the clusters life cycle (CLC) and spatial analysis to guide the Entrepreneurial Discovery Process (EDP). This argument is theoretically discussed on the base of literature evidence. Firstly, the concept of U3, its relation to clusters and the emerging EDP gaps are presented. Secondly, the potentials of CLC and spatial analysis are investigated by (i) studying the literature and selecting a set of indicators, accounting for clusters stage-specific and spatial attributes. (ii) framing the indicators into a model and providing a qualitative judgment of their strength at each stage of the CLC (iii) interpreting the model towards testing whether the CLC and spatial analysis display the potential to input EDP. The authors find that CLC and spatial analysis can play a significant role towards supporting EDP operationalization. This finding calls for the consideration of policymakers as a valuable source of information towards tackling EDP gaps.

Keywords: Clusters, Design, Maps-Led, Policy, S3.

1. INTRODUCTION

During the last decades, the concepts of competitiveness and innovation, at the regional level, gained a growing consideration becoming key topics of both academic and political debates. The urge to enhance regional economic performances, through the creation of appropriate context-conditions, is perceived as a priority, which would enable territories to tackle the challenges posed by globalisation (Farrell et al., 1999; Doloreux and Parto, 2005; Foray et al., 2009; Camagni and Capello, 2013). Given these emerging needs, the role of regional clusters has become progressively more significant (Porter, 2000, 2003; Martin and Sunley, 2003) and recently it has been coupled with the policy concept of Smart Specialization Strategy (S3). The latter is a relatively new academic idea, which has enjoyed a fast success towards suddenly turning into a crucial element of the EU 2020 innovation plan (Dominque Foray, David, and Hall, 2011). S3 brings into prominence an innovative territorial development policy framework, which enhances the place-based approach. S3 policies are mainly advocated in EU regions. The attention is pushed on whether the core toolkit provided by the experience with clusters and cluster policies could potentially guide the challenging design and implementation of S3. As much research confirms, while Cluster policy and S3 are not completely corresponding, it is still reasonable identifying many synergies between the two policy constructs (Foray, David, and Hall, 2011; Foray et al., 2012; Aranguren and Wilson, 2013; Castillo, Paton and Saez, 2013; Ketels et al., 2013). Notwithstanding the valuable contribution of many scholars on the subject of Cluster and S3, the academic debate still falls somewhat short of addressing some issues. In particular, various scholars observed that one of the S3’s policy principles, the so-called Entrepreneurial Discovery Process (EDP), is affected by significant implementation gaps (Hermosa and Elorduy, 2015; Rodriguez-Pose
and Wilkie, 2015; Gheorghiu, Andreescu, and Curaj, 2015; Capello and Kroll, 2016). The emerging issue, mentioned above, calls attention to the need to disclose new perspectives on the relationship between Cluster and S3.

This work aims at exploring new perspectives on the role of clusters in S3 design and implementation, with a focus on EDP. The theoretical constructs, presented in the following sections, are meant to provide policymakers with valuable insights to adequately tackle EDP-related challenges. The authors believe that S3 and, particularly, EDP implementation could highly benefit clusters' stage-specific and spatial analysis. Considering the research purpose, the article structure is the following. The second section reflects on the concept of S3, its relation with clusters and the emerging EDP gap. The third section investigates the potential role of the clusters life cycle (CLC) and spatial analysis in the way of EDP. The fourth section presents the conclusions.

2. A BACKGROUND ON S3 AND CLUSTERS: CONCEPTS AND CHALLENGES

The discussion on S3 has originated from the work of the Knowledge for growth experts group, which highlighted the need for re-thinking EU regional development policies to bridge the so-called transatlantic gap. Accordingly, the academic concept of S3 defines an innovative, place-based development policy framework. S3 primary objectives pertain to (i) production of smart, sustainable and inclusive growth, (ii) promotion of research potential, and (iii) maximisation of the usage of innovations (Foray et al., 2009, 2012; Foray and Goenega, 2013). This strategy also emphasises the urge to prioritise policy initiatives by operating with a vertical logic and defining methods to “identify (...) desirable areas for (...) intervention” (Foray and Goenega, 2013: p.1). Since its birth, the concept of S3 has had an extraordinary career and rapidly became a crucial element of the EU 2020 innovation plan. However, translating such academic idea in practice is not a trivial matter and poses many implementation barriers. In the way of facilitating the operationalization of S3, the EU Commission has produced a sort of implementation handbook, entitled “Guide to Research and Innovation Strategies for Smart Specialization (RIS3)” (Foray et al., 2012). This guide sets a quite demarcated implementation framework, including six steps (Foray et al., 2012): (i) analysis of the national/regional context and the potential for innovation, (ii) set-up of a sound and inclusive governance structure, (iii) production of a shared vision for the future of the country/region, (iv) selection of a limited number of priorities for national/regional development, (v) establishment of suitable policy mixes, and (vi) integration of monitoring and evaluation mechanisms (Foray et al., 2012). Besides the implementation steps mentioned above, the work of Foray et al. (2012) also offers an important reflection on the relationship between clusters and S3. Clusters are intended by the authors as a valuable source of knowledge, which has to be cautiously deployed in the way of S3. EU Regions' experience with clusters and cluster policies is seen as an essential "building block" to implementing S3 policies. The importance of clusters’ contribution to S3, is particularly acknowledged for: (i) identifying regional competencies and assets, (ii) meeting the objectives of S3, and (iii) reinforcing local and international cooperation (Foray et al., 2012). Comparable arguments are later recalled in the EU Commission’s report on "The role of clusters in Smart Specialisation Strategy" authored by Ketels et al. (2013), which defines similarities and differences between clusters and S3. This report claims that, while both clusters and S3 focus specifically on productivity and innovation as drivers of competitiveness and aim to foster regional embeddedness, there are still many differences in emphasis between the two policy constructs. Clusters, it is said, focus more on: (i) the critical mass of economic activities, ii)
the performance of a set of linked companies (iii) the external effects through shared infrastructure and input markets, and (iv) the groups of companies operating in related industries (Ketels et al.; 2013). Instead, S3 refers to (i) the exploration of emerging market opportunities, (ii) the facilitation of knowledge spillovers between knowledge domains, (iii) the exploitation of related variety, and (iv) the generation of structural changes in regional economies (Ketels et al.; 2013). After comparing clusters and S3, the report of Ketels et al. (2013) streamlines clusters’ potential support to S3 implementation, through a six-leverage-point framework. The latter includes: (i) prioritization process (ii), design of integrated policy mixes, (iii) evidence-based policy-making, (iv) multi-level governance, (v) cross-border dimension, and (vi) stakeholders engagement (Ketels et al., 2013: p.5). Finally, the report on "The role of clusters in Smart Specialisation Strategy" provides some early suggestions on the need to take into consideration the level of clusters development as an element potentially supportive to S3 implementation. On a similar line of thoughts, Araguren and Wilson (2013) observed correspondences and distinctions between Cluster and S3. The latter authors report three key differences between the two policy constructs, namely (i) scale, (ii) focus and (iii) tools. Araguren and Wilson noticed that cluster policies usually aim at supporting cooperation among distinct groups of agents, focusing on the enhancement of competitiveness at the cluster level by employing relatively narrow tools. Instead, S3 has a broader scope than cluster policies and aim at fostering processes of economic prioritisation which will eventually lead regions towards economic restructuring. However, Araguren and Wilson (2013) still affirm that there are potential synergies between clusters and S3. Indeed, the two scholars observed that both the policy constructs have a place-specific feature, seek to promote cooperation among actors that develop complementary economic activities and aim to support the existent and building new competitive advantages. In conclusion, Aranguren and Wilson (2013) actualize the study about clusters and S3 on the case of the Basque country. In contrast with the studies mentioned above, an on-field analysis conducted by Perlo (2015), in the Polish regions, reveals that "the development of clusters with smart specialisations (...) proves that it is difficult to detect a practical correlation between these concepts" (Perlo, 2015: p.107).

Despite the extensive literature on the subject, the operationalization of S3 remains arduous. The difficulties are due both to the experimental nature of the concept, and the complexity of the policy construct itself. The most severe challenges seem to concern the EDP, which is discussed in the next subsection.

2.2 EDP: process and gaps

EDP is undoubtedly the peculiar element of S3 policies. According to Foray's perspective, EDP is the key engine enabling the success of S3 by disclosing regions' hidden potential to specialise (Foray et al., 2009, 2012; Foray and Goenega, 2013; Bevilacqua et al., 2015). Foray stresses that the key EDP inputs are "framework conditions for innovation", "relational density", and "diversity of economic actors" (Foray, 2015: p.61). These inputs should drive EDP towards the (i) integration of entrepreneurial and economic knowledge, (ii) engagement of stakeholders, and (iii) exploration of new economic domains at the regional level. Tersely, EDP is meant to territorially detect economic priorities, by engaging a broad group of local stakeholders (entrepreneurial agents, policy makers and the remainder of the society), to enlarge the local knowledge-base and produce relevant information to S3. Given these considerations, it has to be observed that EDP requires a bottom-up approach, which implies a paradigmatic shift in the traditional conception of "administration and politics [as]
omniscient planners” (Foray, 2015: p.3). Accordingly, the significance of administrators' role is downscaled, while the position of other local actors (particularly, entrepreneurial agents) is enhanced. Because of its very nature, EDP is as much essential as challenging to S3. Foray first, observed that the identification of entrepreneurial discoveries “is not an easy empirical investigation” (Foray, 2015: p.61). Since then, various academics noted the difficulties associated with EDP implementation. Recently, Capello and Kroll (2016) extensively discussed the barriers limiting S3 implementation. The same academics highlighted that, among other factors, “the lack of concrete elaboration of the entrepreneurial discovery process (...) c/o/fme/s] to play a hindering factor” (Capello and Kroll, 2016: p.6). Gheorghiu, Andreescu, and Curaj (2015) offer a similar finding, by lamenting the lack of a “functional blueprint for the entrepreneurial discovery process” (p.2). The pieces of evidence, mentioned above, call for consideration from both scholars and practitioners to tackle such EDP-related issues. It reasonable to affirm that disclosing new perspective on the relationship between clusters and S3, could potentially contribute towards resolving EDP implementation gaps.

3. EXPLORING NEW PERSPECTIVES: CLUSTERS’ LIFE CYCLE AND SPATIAL ANALYSIS

The processes of policy design and implementation are rarely concerned with the different phases of the clusters life cycle. However, considering that clusters dynamics and spatial configurations change over time, it is expectable "that different policy measures vary in their effectiveness over the clusters life cycle" (Brenner and Schlump, 2011: p.1364). The latter idea seems to apply, to some extent, also to S3. Consistently, it is reasonable to suppose that some clusters’ stage-specific attributes (in term of innovative dynamism, cooperation among firms, diversity of knowledge and actors, and spatial significance) can be considered, much then others, suitable to support the operationalization of S3, and in particular of EDP. This theoretical argument, which is the core of the present study, is tested through the methodological approach that follows. Firstly, the study of the literature on the CLC allows the authors to understand which are the leading indicators accounting for the evolution of clusters. Secondly, the indicators drawn from the literature study, are used to build a theoretical model, and a qualitative judgment is assigned by the authors to each indicator at every stage of the CLC. Thirdly, the discussion on the model logically compares stage-specific features (in term of innovative dynamism, cooperation among firms, diversity of knowledge and actors, and spatial significance) of clusters with key inputs and characteristics (according to Foray) of EDP, in order to test if and which stage of the CLC display a potential towards inputting EDP.

3.1 Literature study

While the academic literature has plenty of studies dissecting the functioning of clusters, there are still relatively few pieces of work adequately explaining the dynamics of clusters evolution. Various academics claim that clusters evolve through a precise life cycle consisting of different stages. However, such stages are not univocally identified yet. The literature indeed, offers different models, which treat clusters' evolution according to three-stage- (Bianchi, Miller and Bertini, 1997; Mario A Maggioni, 2004; Maskell and Kebir, 2006), four-stage- (Press, 2006; Bergman, 2008; Menzel and Fornahl, 2009; Handayani et al., 2012) or even five-stage-based frameworks (Andersson et al., 2004; Brenner and Schlump,
This article describes the CLC, according to a three-stage taxonomy, including the phases of (i) emergence, (ii) development and (iii) maturity of clusters. This study does not consider the stage after maturity as it is not precisely predictable whether clusters are going to transform or decline after reaching the mature stage.

Emergence. This stage is usually triggered by an exogenous economic shock, caused by the introduction of a process- or product- innovation (Mario A. Maggioni, 2004). The exogenous shock induces the take-off of the clustering process and consequently drives a limited number of small companies to agglomerate in certain geographical areas (Bianchi, Miller, and Bertini, 1997; Andersson et al., 2004; Maggioni, 2004; Menzel and Fornahl, 2009). Such early agglomeration phenomenon presents a scattered spatial configuration and lacks consistency because the locational benefits are not evident yet (Mario A Maggioni, 2004). However, the more the innovation, which sparked the clustering process, spreads out, the more firms enter the cluster being encouraged by involuntary knowledge spillover. Indeed, the flow of knowledge and information at this stage is mainly involuntary and informal as it does rely nor on structured networks neither on consolidated partnerships. Despite the lack of sharpened inter-firm organisational forms, nonetheless, a stock of heterogeneous knowledge circulates among insider businesses. At this stage, it is reasonable to identify four key factors potentially leading the new-born cluster to success, namely: (i) number of start-ups and imitative businesses entering the market (Brenner and Schlump, 2011; Suire and Vicente, 2014); (ii) heterogeneity of accessible knowledge which “facilitates continuous adjustment to changing external circumstances” (Shin and Hassink, 2011: p.1390); (iii) local political/institutional context, in terms of policy environment and the presence of high quality Public Institutions, Universities and research centres (Menzel and Fornahl, 2009); (iv) local industrial context, in terms of the presence of related industries (Porter, 1998). The two former factors function actively to support clusters development. Instead the two latter play a background role (Brenner and Schlump, 2011). This explorative stage of the CLC is also characterised by significant Venture Capital (VC) and Research and Development (R&D) investments. To summarise, the emergence is a very early, upstream and explorative phase of the CLC and it is featured by a marked tendency of firms towards innovativeness. The role of start-ups, as well as the values of creativity, and willingness to risk added by entrepreneurs, are crucial to further the prosperity of clusters. The benefits deriving from network activities and knowledge spillovers are somehow available, and the stock of accessible knowledge is highly heterogeneous.

Development. In this stage clusters expand through both a substantial proliferation of the companies entering the market and a significant increase in employment. The locational benefits become incredibly high towards fostering up the spatial agglomeration phenomenon. Accordingly, the profitability of insider businesses rises, reaching its peak. In this phase, the agglomeration economies, theorised by Marshall, are the key engine enabling the endogenous growth of the cluster (Mario A Maggioni, 2004). Consequently, many positive externalities take place, including (i) specialised labour pooling; (ii) interactions among stakeholder, and (iii) knowledge spillovers. In addition to the Marshallian externalities, another factor contributing to the cluster prosperity is the medium/high level of heterogeneity of available knowledge within the clusters’ environment (Shin and Hassink, 2011). Tersely, the success of clusters at this stage seems boldly rooted in regional self-reinforcing processes (such as networking activities, interactions, and cooperation) occurring among local firms and institutions. The number of Start-ups and entrepreneurs is still relevant but no longer crucial. The R&D and VC investments remain significant as well as the level of heterogeneity of accessible knowledge.
Maturity. In this stage clusters reach a stable configuration, towards focusing on specific business segments, consolidating networks’ structure and acquiring cooperative routines (Menzel and Fornahl, 2009; Brenner and Schlump, 2011). This state of quasi-equilibrium of clusters is featured by a severe decrease in frequency and number of entries, which in turn makes the clusters’ growth rate dropping down. At this point, while locational benefits and self-reinforcing effects are still somehow accessible, they tend inevitably to attenuate and slowly dissolve (Mario A. Maggioni, 2004; Brenner and Schlump, 2011). Moreover, clusters at this stage are usually featured by a tendency towards high specialisation (if not over-specialisation), which narrows the variety of economic activities as well as the heterogeneity of available knowledge (Shin and Hassink, 2011). To sum up, in the maturity clusters reach the maximum size, have a well-shaped network structure, and a precisely-defined core business. In this context, the entry of Start-ups in the clusters becomes irrelevant, R&D and VC investments decrease, and the knowledge accessible becomes homogeneous.

In conclusion this literature study provides a description of clusters stage-specific attributes, allowing the authors at deducing that clusters evolution can be explained, to some extent, by variations in the following indicators: R&D investment; VC investment, new firms (start-ups) birth rate (Bergman, 2008; Brenner and Schlump, 2011); intensity of network activities (Brenner and Schlump, 2011); heterogeneity of available knowledge (Menzel and Fornahl, 2009; Shin and Hassink, 2011); specialization and agglomeration (Maggioni, 2002; Maggioni, 2004). These elements will be deployed to outline a theoretical model which is ultimately meant to present the potential of CLC and spatial analysis in inputting EDP.

3.2 Theoretical model

Outlining such a theoretical model presents some difficulties. Firstly, because the lack of established conventions on indicators for the study of clusters makes the selection of the variables a relatively arbitrary process. Secondly, because nor clusters neither the CLC can be satisfyingly explicated through a single model. Given these premises, while the model cannot fully explain the CLC and the related spatial dynamics, it can still adequately present the potential of CLC and spatial analysis in inputting EDP. Accordingly, the model is designed as follows: (i) a set of indicators is selected by drawing insights from the literature study (see subsection 3.1). This set includes: R&D investment, VC investment, new firms birth rate as indicators of clusters dynamism (Bergman, 2008; Brenner and Schlump, 2011), intensity of network activities as indicator of cooperation (Brenner and Schlump, 2011), heterogeneity of available knowledge (Menzel and Fornahl, 2009; Shin and Hassink, 2011) specialization and agglomeration (Maggioni, 2002; Mario A Maggioni, 2004); (ii) the strength of each indicator at each stage of the CLC is qualitatively scored. The scores are assigned by the authors on the base of the insights drawn from the literature. For the scoring, the authors used a scale based on five degrees of intensity: low, medium/low, medium, medium/high and high.

Tersely, the model both systematises clusters' stage-specific and spatial attributes, and opens to a discussion.

<table>
<thead>
<tr>
<th>Table 1: Strength of the indicators by CLC stage</th>
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<tr>
<td><strong>DYNAMISM</strong></td>
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### 3.3 Discussion on the model

The model presented in Table 1 opens to a discussion: firstly, provides an interpretation of the indicators and their variation in strength over the CLC stages, and secondly, highlights the relevance of clusters stage-specific and spatial features relatively to EDP’s key inputs and characteristics (according to Foray). The finding emerging from the discussion are summarised in Table 2.

#### Table 2: Findings

<table>
<thead>
<tr>
<th></th>
<th>DYNAMISM</th>
<th>COOPERATION</th>
<th>VARIETY</th>
<th>SPATIAL SIGNIFICANCE</th>
<th>COMP ARISON TO EDP</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>R&amp;D investm</td>
<td>VC investm</td>
<td>Start-</td>
<td>Intensity of</td>
<td>Heterogeneity of</td>
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<tr>
<td>Emergence</td>
<td>high</td>
<td>high</td>
<td>up-birth</td>
<td>network activities</td>
<td>available knowle</td>
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<td></td>
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<td></td>
<td>dge</td>
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<tr>
<td>Development</td>
<td>medium/h</td>
<td>medium/h</td>
<td>medium/</td>
<td>medium/hig</td>
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<tr>
<td></td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td>Maturity</td>
<td>low</td>
<td>low</td>
<td>low</td>
<td>medium/hig</td>
<td>low</td>
</tr>
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</table>

R&D investments target a broad range of creative activities, including “basic research, applied research, and experimental development” (OECD, 2013: p.1). These activities aim at expanding “the stock of knowledge (...) and the use of this knowledge to devise new applications” (OECD, 2013: p.1). According to the literature R&D investment is considered as a reliable indicator of clusters innovativeness (Davis et al., 2006), and as a determinant of entrepreneurship (OECD, 2013, 2016). Tersely, R&D catalyses the generation and diffusion of new knowledge, towards creating a vibrant entrepreneurial environment and supporting inventions. The benefits of R&D spread over regions by availing entire groups of firms. However, it has been found that R&D seems to play a particularly prominent role “during the
early life course of (...) firms” (Stam and Wennberg, 2009: p.79). Furthermore, new-born firms (such as start-ups) tend to use the innovative inputs (investment on R&D) more efficiently than the old ones. Consequently, clusters featured by a high number of start-ups, attract and call for R&D investment, which in turn generate remarkable innovative outputs. Given these considerations, it seems logically more convenience to operate R&D investments during the initial phases of the CLC, namely emergence and development. These two initial stages appear to be more suitable for entrepreneurial discoveries, because of a high start-ups' birth rate (which will be discussed in the next paragraph) within a flourishing innovative environment. Conversely, clusters in their maturity rely on aged firms, which operate according to consolidated, if not stagnating, industrial practices. Henceforth, envisioning that EDP is meant to “(...) logically identify (...) the domains where new R&D and innovation projects will (...) create future domestic capability” (Dominque Foray, David and Hall, 2011: p.4), it is reasonable to conclude that emergent and developing clusters offer optimal context conditions for EDP implementation. The same conclusion is also valid when taking in consideration Venture Capital (VC) investments. VC investments refer to “a form of equity financing particularly important for young companies with innovation and growth potential but untested business models and no track record” (OECD, 2016: p.142). This funding system is seen both as a marker of clusters innovative potential, as well as an essential factor nourishing clusters’ entrepreneurial environment (Breschi and Malerba, 2005). Indeed, VC is especially advocated in, and attracted by, highly pioneering territorial contexts (Bevilacqua, Pizzimenti and Maione, 2017). Such setting coincides with those of emerging and developing clusters. Therefore, VC investments, by focusing especially on the explorative stages of the CLC (Bergman, 2008), trigger potential innovations which could be intercepted in the way of EDP. Both the indicators discussed so far, R&D and VC investments, are tightly related to the presence of entrepreneurs and new businesses within the clusters’ environment. Specifically, the incidence of start-ups birth rate, within clusters’ environment, seems to be particularly relevant. Start-ups include all newly born firms that are up to two years old (OECD, 2016). Such “young” and usually small-sized businesses, because of their very explorative, and potentially innovative nature, are crucial endogenous drivers of territorial development. Indeed, start-ups birth rate is an important indicator signalling both the dynamism of clusters (Davis et al., 2006) and the overall goodness of the entrepreneurial environment (OECD, 2016). High values of the indicator start-ups birth rate also mean that entrepreneurial actors (the holders of entrepreneurial knowledge) are particularly active. To sum up, there is a positive correlation at the territorial level between high values of the indicator start-ups birth rate (which usually attributes emerging and developing clusters), high density of entrepreneurs and high availability of entrepreneurial knowledge. Given that EDP has a “(...)special focus on the regional entrepreneurial environment, assessing whether it is lively and can generate a significant flow of experiments, innovation ideas (...)” (Foray et al., 2012: p.20), it is reasonable to deduce that emerging and developing clusters could provide valuable inputs in the way of entrepreneurial discoveries. As already stressed, high values of the indicator start-ups birth rate are a marked feature of clusters’ emergence and development stage. Instead, the entry of start-ups, and their importance in the functioning of the cluster, drastically decreases during maturity. This theoretical evidence suggests that EDP can be effectively supported by the bold entrepreneurial, innovation-oriented, cross-sectoral environment manifested at the two initial stages of clusters’ evolution.

Networks activities embrace the broad range of actions aiming at generating or nourishing "organisational forms of economic activities that may allow firms to cope with market failures (...).” (OECD, 2004: p.20). The intensity of network activities provides a measure of knowledge exchange and firms connectedness, within certain geographic boundaries (which
are mutable and permeable). Empirical studies demonstrate that increases in network activities are positively correlated with the rise of firms' innovativeness (OECD, 2001). However, the same studies also prove that the willingness to engage in knowledge-based networks has a negative correlation with firms' size. These two latter pieces of evidence, suggest that network activities are more intense in the presence of new-born, small-sized firms (such as start-ups). The latter (usually concentrating in emergent or developing clusters) orientate towards more flexible, sometimes informal, network forms. On the contrary, big firms (usually concentrating in mature clusters) rely on routine-based, formally-regulated networks. These differences in the structure and willingness to engage in networks make small firms' more innovative, more adaptable and less sector-specific than big ones. The features of networks are also tightly tied to Marshallian spillovers. In a life cycle perspective, one should consider that networks and the related knowledge spillovers evolve over the different stages of the CLC. As previously highlighted (see subsection 3.1), networks are mostly informal, and spillovers often happen involuntarily during clusters' emergence. This is due both to the scattered configuration of the spatial agglomeration of firms and to the explorative nature of the businesses entering the market (mainly start-ups). When clusters move on to the development stage, networks get gradually more structured and spillovers more formal. This condition evolves further on during the maturity stage. At this point clusters are composed mainly of big firms, there is no start-ups entry, and consequently, networks become rigid and spillovers significantly decrease. Given these considerations, it is reasonable to affirm that EDP should focus on emergent and eventually developing clusters, which are featured by the “relational density” postulated by Foray. Indeed, the significant density of start-ups and entrepreneurs, the marked attitude of firms towards innovative activities and knowledge sharing, make emergent and developing clusters an exceptional source of various entrepreneurial and economic knowledge.

The heterogeneity of knowledge (Shin and Hassink, 2011), indicates the variety of the available knowledge-stock inside clusters. Considering that knowledge is detained by entrepreneurial actors, the variety of accessible knowledge seems also indicating, to some extent, the assortment of entrepreneurial actors. The more such assortment is diversified, the more clusters manifest a marked attitude towards adjusting to changing conditions. It has been said (see subsection 3.1) that the heterogeneity of knowledge and actors evolve over the CLC. Specifically, while the initial phases of the CLC are featured by high and medium heterogeneity of accessible knowledge, during maturity, this variety tends to attenuate toward homogenization. This shift from heterogeneous to homogeneous knowledge is due both to a decrease in the number of diverse entrepreneurial actors entering the clusters and to an increase in specialisation. Considering that EDP calls for a diversity of economic actors and knowledge, the best match in the way of EDP operationalization seems to be manifested by the features of emerging and developing clusters.

Specialisation is expressed through a location quotient. The latter defines the share of regional employment in a sector, relative to the national context. This indicator is widely endorsed in literature as a marker of spatial concentration of industries (Mayer, 2003; Mario A Maggioni, 2004; Maggioni and Riggi, 2008). The discourse on specialisation presents a split-screen view. On the one hand, low specialization: (i) prevents clustered firms from exploiting the full potential of competitive advantages and (ii) allows clustered firms to benefit a vibrant, cross-sectoral and diversified entrepreneurial environment (typical attribute of emergent and developing clusters). On the other hand, high specialisation leads clustered firms to exploit competitive advantages fully, while eventually leading to stagnation and lock-in (a common attribute of mature clusters). Tersely, high specialisation can lead towards
flattening clusters' economic vibrancy and innovativeness as well as losing the positive effects of the variety externalities theorised by Jacob. Once again, the best fitting ecosystem for EDP is expectedly the one provided by emergent and developing clusters. Indeed, considering that EDP pertains to the detection of potential domains for future regional specialisation, targeting already specialised clusters would mean pointing out traditional industrial sectors instead of S3-type domains. Another indicator accounting for the spatial configuration of clusters is the agglomeration. The latter indicates the number of firms concentrating in some geographical regions (Mario A Maggioni, 2004). This indicator's value increases as clusters get holder, till reaching its peak during the maturity stage. At this point, the mass of economic activities located in a specific geographic area reaches its maximum. As a consequence, the attractiveness of such areas starts decreasing due to a scarce availability of locational benefits (Mario A Maggioni, 2004). Conversely, in cases when spatial agglomeration presents a configuration not saturated yet, businesses from outside are encouraged to locate inside clusters because of potentially high locational benefits. These considerations reveal that the locational attractiveness should be found in clusters that have not reached the spatial agglomeration peak yet, namely: emerging and developing clusters.

In conclusion, this discussion theoretically confirmed that the CLC and spatial analysis have a potential to impact EDP operationalization. In detail, the authors find that emergent and developing clusters can provide a number of significant inputs towards implementing EDP: (i) the significant strength (medium and high) of dynamism and innovativeness (in terms of R&D and VC investment, and start-ups’ birth rate) signal high quality framework conditions for innovation; (ii) the medium and high strength in intensity of network activities indicates a significant relational density among clusters insiders and a tendency towards innovative, cross-sectoral cooperation; (iii) the medium and high heterogeneity of available knowledge, which also indicate the variety in the assortment of economic actors, enables the opportunity to enlarge the regional knowledge-base, gathering economic and entrepreneurial knowledge; finally, (iv) the low/medium levels of firms’ agglomeration and specialization suggest the existence of a territorially localized economic potential, which has not been fully exploited yet.

4. CONCLUSION

This article presented a theoretical discussion on the role of clusters and cluster policies to support S3 and specifically EDP implementation. Although a significant body of scientific literature confirms that EU experience with clusters and cluster policies is a crucial element towards supporting the implementation of S3, nonetheless many operational gaps keep standing out. One of the most problematic factors pertains to the operationalization of the EDP. Consistently the authors intended to test whether the CLC and spatial analysis could eventually guide the discovery of regional economic potentials. This problem is approached theoretically and discussed on the base of literature evidence. Firstly, the concept of S3, its relation to clusters and the emerging EDP gap is presented. Secondly, the potentials of clusters' life cycle and spatial analysis is tested by: (i) deducing from a literature study a set of indicators accounting for clusters stage-specific and spatial attributes. (ii) framing the indicators into a model and providing a qualitative judgment of their strength at each stage of the CLC, finally (iii) interpreting the model to test if and which stages of the CLC display a potential towards inputting EDP. The authors conclude that the EDP implementation could significantly benefit the framework conditions for innovation, relational density, and diversity of knowledge and actors provided
by some specific stages of the CLC. Moreover, the identification of the variations in the spatial configuration of clusters, during different phases of the CLC, can offer valuable information about the existence of a territorially localised economic potential. Particularly, the authors find that, according to the logical comparison of clusters' stage-specific attributes and EDP's key inputs and features, it is reasonable to target emerging and developing clusters as a suitable breeding ground towards favouring EDP implementation. These findings call for consideration of policy-makers, to reflect more consciously both on clusters' evolution and spatial configuration, to overcome EDP implementation issues, and consequently get to a fully effective implementation of S3.

5. LIMITATIONS OF THE STUDY

The main limitations of this study pertain to the theoretical model presented. Firstly, because the lack of established conventions on the indicators for the study of cluster makes the selection of the variables a relatively arbitrary process. Secondly because nor clusters neither their life cycle can be satisfactorily explicated through a single model. Given these considerations, some potentially influential factors are ignored (for example the propensity of the big companies to internalise the functions of R&D, the consequences of the global crisis on investment flows, and others), while the variables that are most frequently endorsed in the literature are included. Moreover, given that industries are not alike, and that different variables have different importance in the industries, it might be that the model does not represent the mechanism of some industrial sector (for example the industrial sectors controlled by monopolist holdings and others). However, the theoretical literature provides evidence that a detailed modelling of all relevant processes might not be of crucial importance. From this, it is reasonable to conclude that while the model is not fully explanatory, it still reflects appropriately the potential contribution of the CLC and spatial analysis in the way of S3 and EDP.

6. ACKNOWLEDGMENTS

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7. REFERENCES


THE URBAN DIMENSION OF INNOVATION POLICY: ROXBURY INNOVATION CENTER

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Abstract: The paper intends to explore a new paradigm of urban development process driven by the increasing demand of innovation. The aim is to demonstrate how innovation has become part of the urban settlement dynamics towards regeneration processes. Spurring innovation through knowledge-based economy has been driving the design of public development policies. Knowledge generates economic growth by stimulating the potential of entrepreneurship and innovation. In this context, cities are emerging as knowledge hubs, able to attract high-skilled workers, generate creativity and innovation and provide advanced services and infrastructures connected through formal and informal network systems. Findings from the MAPS-LED project (Horizon-2020) show how in specific urban areas the knowledge dynamics in activating the concentration of innovation generate spillover effects, which supported by urban planning tools, allow the expansion of innovation and the generation of physical transformations. Among the case studies of the MAPS-LED project, the Roxbury Innovation Center (Boston, MA) has been investigated as an emblematic case of public initiative to spur economic development and urban regeneration processes through innovation. The public authority of the city of Boston, through the creation of this public Innovation Center is trying to generate a positive impact on the local community by providing the necessary tools, workspaces, connections and programs to enhance the development of the knowledge-based economy and support startups and entrepreneurs.

Keywords: Cities, Innovation Ecosystem, Innovation Space, MAPS-LED, Urban Regeneration.

1. INTRODUCTION

In response to the past and the ongoing economic crisis, the primary challenge for National and Regional Government, both in Europe and in the USA, is to promote policies and actions focused on fostering creativity and innovation aiming at repositioning cities in a competitive scenario. New geographical, political, economic dynamics generated by the global crisis have reformulated the significance of Innovation, which becomes a process able to intercept the market opportunities based on the exploitation of endogenous resources and potential local assets.

In 2007, the OECD (Organization for Economic Co-operation and Development) sustained that new strategies to reduce the degree of social exclusion and improve the economic growth in deprived contexts should focus on promoting innovation as the main engine to enhance competitiveness and foster social and economic development (OECD, 2007). A few years later, the World Bank recognized innovation as a key factor for socioeconomic progress, generating wealth and skilled jobs, promoting the development of the urban systems, and increasing the level of competitiveness between cities (The World Bank, 2010).
“In the global knowledge economy, knowledge-intensive industries and knowledge workers are extensively seen as the primary factors needed to improve the welfare and competitiveness of cities” (Yigitcanlar, 2011a, p.22).

In order to support these dynamics, the public strategies are promoting the discovery of niches of innovation and knowledge hubs, in which the entrepreneurial phenomena can evolve towards a specialized diversification, by producing competitive advantages in urban contexts (del Castillo Hermosa, Elorduy and Eguia, 2015). According to the emerging change within the development and innovation policies, Smart Specialisation has been introduced in 2006 by Foray as a new innovation policy framework designed to promote an effective use of public resources by investing in the local assets to foster innovation and create competitive advantages. The goal is to make European regions able to achieve economic growth and prosperity to compete in the globalization era.

In order to reduce the increasing gap between the EU and the U.S. in terms of producing and using innovation for economic growth, the Smart Specialisation Strategies (S3) have gained relevance within the EU2020 framework. The Regional Plan for S3 became an ex-ante conditionality in the new Programming Period 2014-2020 (Del Castillo, Paton and Barroeta, 2015) in order to invest structural funds towards innovation strengthening.

S3s are considered as key factors for enhancing place-based innovation policies. In the report “Implementing Smart Specialisation Strategies: A Handbook” (2016), the European Commission recognized the Entrepreneurial Discovery Process (EDP) as a key driver of Smart Specialisation Strategies, considered as an inclusive and interactive process where the ‘entrepreneurial knowledge’ is at the core of the innovation-based development. Therefore, the EDP can be interpreted also as a learning process for regions. The involvement of entrepreneurs in the design and implementation of Smart Specialisation Strategies is crucial to recognize the competitive advantages of cities (Pinna, 2016).

In this context, cities have emerged as knowledge hubs (center of knowledge creation), since they are able to attract high-skilled workers, generate creativity and innovation and provide advanced services and infrastructures connected through formal and informal networking systems (Penco, 2011).

Cities stimulate innovation through the creation of favorable ecosystems, which boost competitiveness, foster knowledge production, innovation and socioeconomic development (Spinosa, Schlemm and Reis, 2015), being also able to revitalize urban distressed areas. In some cases, these ecosystems develop spontaneously thanks to existing conditions, such as the presence of strong anchor institutions and the proximity to infrastructures, while in some other cases they need a consistent push from the public or private sector.

The challenge for cities in today’s knowledge economy lies in creating and supporting innovation ecosystems, that consist of a set of complex relationships among different actors, entities, and intangible resources “whose functional goal is to enable technology development and innovation” (Jackson, 2011, p.2).

In order to understand how cities are facing this challenge, the MAPS-LED project (a Marie Sklodowska-Curie RISE research project funded by the European Union’s HORIZON 2020 program) has observed how innovation-oriented policy initiatives may affect the knowledge concentration process, considering also the exogenous dynamics acting on the specific
neighborhoods. For this purpose, the research activities focused on the investigation of different case studies in the cities of Boston and Cambridge (MA), identified by overlapping urban regeneration initiatives with the innovation-oriented policy initiatives, including the occurrence of the geographic concentration of interconnected firms (according to the definition of clusters by Porter, 1998). The innovation spaces have been investigated as physical facilities that provide workspaces, equipment and business services to innovators, hosting networking events, training and mentoring programs to increase workers’ skills and facilitate connections between the different actors involved in the innovation process.

The paper aims at pointing out how, in specific urban areas, innovation spaces stimulate knowledge dynamics in order to favor the concentration of innovation in generating spillover effects due to the implementation of specific urban planning tools. The phenomenon of innovation concentration in particular places characterized by the presence of mutual factors (anchor institutions, startupper centers, physical transformations towards the demand of innovation) has created a regeneration process in backward urban areas, by triggering a process that can be called ‘expansion of innovation’.

This contribution is articulated into three main sections: the first explores the role of the Innovation spaces as an expression of knowledge dynamics; the second investigates the main innovation policies spurring regeneration processes at the city level in the U.S.; the last section presents the results of the case study of the Roxbury Innovation Center, a public innovation space considered as an engine for the socioeconomic and urban growth of Roxbury, a deprived neighborhood of the city of Boston (MA). The paper further investigates the policy initiatives and tools implemented by the public authorities to support the creation of an innovation ecosystem.

The Roxbury Innovation Center represents an emblematic case study, since it is among the new generation of urban planning tools and initiatives focused on innovation that has been promoted to spur urban regeneration processes. The innovation center has helped to realize the willingness of the Local Administration to revitalize, economically and socially, the multi-ethnic and disadvantaged neighborhood of Roxbury. The public authority through the creation of this innovation facility aims to generate a ripple effect on the creation of jobs and the development of an innovation ecosystem that will spur the growth of the local economy.

The emphasis on Innovation Spaces, that is becoming common both in the European and the U.S. cities, highlights the need to focus on supporting interaction, cooperation and knowledge flows even with the support of urban planning tools and economic development measures. This approach could be crucial for the urban and economic growth and the development of the knowledge economy, especially where the innovation community is just beginning to evolve.

2. THE ROLE OF INNOVATION SPACES AS AN EXPRESSION OF KNOWLEDGE DYNAMICS

In the literature, from Alfred Marshall (1920) to Robert Park (1925), cities have been considered as melting pots of diversity and sources of creativity and innovation (Florida, 2003). Jane Jacobs (1969) has long pointed to the role of the urban environment as an incubator for creativity, innovation and entrepreneurship. Her theoretical approach, together with the one of Joseph Schumpeter (1934) about on the relevance of innovation and
entrepreneurship for cities, today stands again at the heart of the scientific and political debate. Urban areas, in fact, by offering proximity to services, density, variety, knowledge institutions and specialized labor force, facilitate the networking process (Athey, Nathan, Webber and Mahroum, 2008) and create the right atmosphere for spurring the knowledge dynamics, that involve higher research institutions, local organizations and communities, comprehending both entrepreneurs and citizens.

Both in Europe and America, cities are implementing a new urban innovation-oriented development paradigm, characterized by the creation of innovation ecosystems, supported by the urban policies and the spatial planning. The combination of the two has the potential to economically regenerate specific urban areas, promoting the existing local assets (material and immaterial) and identifying the new ones.

In this context, innovation spaces (innovation centers, co-working, research labs, accelerators, etc.) are emerging as important instruments to enhance local development and support the creation of innovation ecosystems by encouraging exchanges of knowledge between different actors, assisting entrepreneurs, and promoting cross-fertilization of ideas and cross-sectoral collaborations. They accomplish these missions by providing affordable offices, business services, networking events, training and mentoring programs for local startups, entrepreneurs and innovators.

Innovation spaces are attracting entrepreneurs, startups, innovators and investors in cities, generating new knowledge dynamics and spurring urban and economic development. They represent an emerging factor of the new demand of innovation-oriented physical transformations that recall the specific requirement of the Entrepreneurial Discovery Process about catalyzing the entrepreneurial knowledge dynamics.

In recent years, policymakers recognized the potential of these spaces as enablers of innovation and they are supporting them by stimulating a favorable environment for innovation (Rodriguez, Congdon and Ampelas, 2015).

3. THE PUBLIC POLICY EFFORT TO ENHANCE THE ECONOMIC DEVELOPMENT THROUGH INNOVATION

The City of Boston is actively enhancing the socioeconomic 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. Together with the urban planning, they have acted in a complementary way for supporting the knowledge dynamics and the regeneration of the local economy. A sample of these innovation-oriented policy initiatives are illustrated in Table 1.
Table 1: Innovation-oriented policy initiatives in Boston
Source: Authors’ elaboration, data from City of Boston (2013, 2015a) and Boston Redevelopment Authority (2013a).

<table>
<thead>
<tr>
<th>Geographical level</th>
<th>Innovation-oriented policy initiative</th>
<th>Main objective</th>
<th>Start Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Boston</td>
<td>LifeTech Boston</td>
<td>Foster the growth of Boston's life sciences and high technology sectors, support existing LifeTech companies and attract national and international businesses to join the main cluster areas in the City.</td>
<td>2004</td>
</tr>
<tr>
<td></td>
<td>Boston Innovation District</td>
<td>Transform the South Boston waterfront area in an urban environment that fosters innovation, collaboration, and entrepreneurship.</td>
<td>2010</td>
</tr>
<tr>
<td></td>
<td>Neighborhood Innovation District</td>
<td>Support neighborhood residents, existing business and startups in the creation of innovations by providing information, training, connections and physical locations for innovators and entrepreneurs.</td>
<td>2014</td>
</tr>
</tbody>
</table>

In 2010, the City of Boston together with the Boston Redevelopment Authority has promoted the renovation of a former industrial, underutilized area close to the city center, namely the Seaport District, launching 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 the infrastructures and creating a gathering spot to attract the community of innovators, including both consolidated and emerging companies. Over the past years, the Boston Innovation District has created over 4,000 new jobs and attracted 200 new companies (City of Boston, 2013), catalyzing 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, 2015a, para.1), the City explored the possibility to push the innovation dynamics spurring the development of either deprived or underdeveloped 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 investments” (City of Boston, 2015a, para.6).

The initiative aims to create different Innovation Districts across the city, which should promote an inclusive growth, invest on people (through training and mentoring programs) and provide the necessary infrastructures (e.g. affordable gathering spaces for innovators, access to public transportation, affordable housing, high-speed internet) to create a hub of creativity and innovation for enhancing the local entrepreneurship (City of Boston, 2015a).

Nevertheless, Neighborhood Innovation Districts are different from Innovation Districts, since they specifically target the local residents “from both a human capital perspective as well as a product perspective” (Maher, 2015).
4. THE CASE STUDY: ROXBURY INNOVATION CENTER

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 one of the poorest and most densely populated neighborhoods of the city, where the percentage of population below the poverty level is about 33%, compared to the 21% of Boston (City-data, 2013), while the unemployment level is 17% versus 10% of the whole city (Boston Redevelopment Authority, 2014).

It is a multiethnic neighborhood, representing the nucleus of the Afro-American community in Boston (The Boston Indicators Project, 2010, e.g. see Figure 1). 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 and Zhu, 2013).

The Dudley Square area (e.g. see Figure 2), belonging to the neighborhood of Roxbury, has been selected as the preferred location for the implementation of the pilot project “due to its economic vitality and the opportunity to use the infrastructure already established to create a hub of innovation and entrepreneurship” (City of Boston, 2015 a, para.8).

![Figure 1: Population Breakdown by Race. Source: Authors’ elaboration. Data from U.S. Census Bureau, 2016.](image1)

![Figure 2: Dudley Square area. Source: Authors’ elaboration.](image2)
Since the 2000s, Dudley Square has been the focus of several urban regeneration initiatives, aiming at providing new housing, commercial facilities and public services, including the enhancement of the transportation system. The following table shows the main urban planning initiatives that have been implemented in the last years to revitalize the area.

### Table 2: Dudley Square Planning Initiatives

*Source: Authors’ elaboration, data from the Boston Redevelopment Authority (2017a).*

<table>
<thead>
<tr>
<th>Target area</th>
<th>Planning Initiative</th>
<th>Planning Type</th>
<th>Description</th>
<th>Start Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dudley Square, Roxbury</td>
<td>Dudley Square Transportation &amp; Air Quality Study</td>
<td>Transportation Planning</td>
<td>The Dudley Square Transportation &amp; Air Quality Study provides a set of recommendations upon transportation network, environment and quality of life in Dudley Square outlining development options supported by the community.</td>
<td>2001</td>
</tr>
<tr>
<td>Dudley Square Vision</td>
<td>Dudley Square Vision</td>
<td>Economic Development</td>
<td>The planning initiative includes: real estate development; creation of a comprehensive Retail Strategy to enhance the commercial district; traffic improvements.</td>
<td>2007</td>
</tr>
<tr>
<td>Dudley Square Municipal Office Facility</td>
<td>Dudley Square Municipal Office Facility</td>
<td>Economic Development</td>
<td>Redevelopment of an historic municipal facility located in the hearth of Dudley Square. It will be the new Boston Public Schools headquarters, and will include retail and office spaces.</td>
<td>2012</td>
</tr>
<tr>
<td>Plan: Dudley Square</td>
<td>Plan: Dudley Square</td>
<td>Community Planning</td>
<td>The planning initiative will revisit the recommendations presented in the ‘Dudley Square Vision’ to align them with current community goals.</td>
<td>2016</td>
</tr>
</tbody>
</table>

In relation to the urban planning initiatives activated in the area, a gradual change in the explanatory variables of regenerative effects is observed: increases in the number of inhabitants, housing values and the number of adults with college degree (e.g. see Figures 3, 4, 5).
The engine of the Neighborhood Innovation District initiative has been the creation of the Roxbury Innovation Center (RIC), a civic innovation space which opened in 2015, providing business services, working spaces, networking opportunities and educational programs to the local community. This physical facility, located in the heart of Dudley Square, will represent “a catalyst for economic development” and will lift “the entire community”, as stated by Martin J. Walsh, Mayor of Boston (City of Boston, 2015 b, para.2).

The case study of the Roxbury Innovation Center has been investigated through a mixed methodology, comprehending both qualitative and quantitative approaches, in order to examine the link between innovation spaces, urban regeneration processes and local development. The research has been grounded on both on-desk and on-field analysis. In particular, the socioeconomic data have been collected for the years 2009-2014 from different official sources, while several exploratory visits and different targeted interviews to key informants have been carried out between April and July 2016. The main tools used to investigate the case study were the interview form and the survey form. The interview form allowed to gather information about the issues of governance, management and organization, territorial network and mission of the Roxbury Innovation Center. A specific Survey Form has further been developed in order to investigate in depth the social, economic and physical aspects of the area surrounding the case study. It focused, in particular, on: infrastructures, services, public and innovation-related facilities. The main sources considered for the on-desk data are: the City-data official website and the U.S. Census Bureau, which data have been used to perform a preliminary analysis of the local context and the websites of the City of Boston and the Boston Redevelopment Authority, useful for extrapolating the urban planning initiatives and tools investigated in this study.

In order to create the Roxbury Innovation Center and to seek out an operator of the facility, in 2014, a Request for Interest, Ideas and Innovation (RFI) and, subsequently, a Request for Proposals (RFP) have been launched by the Public Authority (City of Boston, 2014).
The City of Boston selected The Venture Café Foundation (VCF) to operate the Innovation Center as a “mission-driven not-for-profit gathering and event space to connect the innovation community, expand the definition of innovation, and build a more inclusive innovation economy” (Roxbury Innovation Center, 2015, para.1).

The Venture Café, besides running the space, organizes free networking events, mentoring and training programs for both adults and young people, and educational initiatives together with Public, Private and no-profit organizations to provide community-driven activities (Roxbury Innovation Center, 2015). As a matter of fact, the VCF is also focused on avoiding people’s displacement and maximizing the benefits of the local community. Private and public actors have been involved in the development of the space, demonstrating the willingness to create an ecosystem of innovation (and not simply a facility) that will enhance innovation and economic growth in this deprived area. The RIC will represent the anchor institution of this ecosystem. In particular, the Massachusetts Technology Collaborative (MassTech), a State-funded Agency supporting cluster development, has provided $150,000 grant funding to support the management and programming of the Innovation Center (City of Boston, 2014).

The 3,000 square feet of the RIC, offer free co-working areas, affordable private office spaces, flexible conferences and event rooms available for renting. In particular, the physical capital provided consists of: the Think Space (a large multi-purpose event room), the Learn Lab (medium-sized room for classes and workshops), the Team Room (a small room for meetings of 4/8 people). In addition to those renting spaces, RIC is equipped with a digital Fabrication Laboratory (FabLab) and an open co-working area, which are available to the local community. The Roxbury Innovation Center is a dynamic, interactive space, where innovators, investors, students, entrepreneurs and startups from different sectors (not just technology) can run into each other, share ideas and learn.

The Innovation Center is housed inside the Bruce C. Bolling Municipal Building, that hosts also the headquarters of the Boston Public Schools (BPS). The BPS and the Venture Café Foundation work together to support and connect people “so that every person with an idea can build it, grow it, [and] become a successful entrepreneur” (City of Boston, 2014, para.5).

Figure 6: Development Projects and Transportation system of the area. Source: Authors’ elaboration.
The building is near several innovation centers and education facilities (such as the Northeastern University) and close to two subway stations and the Dudley Square transportation hub (e.g. see Figure 6). This proximity helps to enhance the connection between entrepreneurs, students, graduates and academia, and encourages the access to the Innovation Center. The following maps illustrate respectively the transportation system with the main completed and planned development projects implemented by the Boston Redevelopment Authority (BRA) in the area (e.g. see Figure 6) and its built environment, including the research centers and labs, the academic institutions and the innovation centers (e.g. see Figure 7), detectable within half-mile radius (about 800m) of the Innovation Center.

![Figure 7: Map of the Built Environment. Source: Authors’ elaboration.](image)

The above-mentioned development projects are implemented through specific regulatory actions that are hierarchically organized as follows:

- Metropolitan Area Planning, which promotes Smart Growth and Regional Collaboration. The Metropolitan Area Planning Council (MAPC), the regional planning agency that is responsible for the Metropolitan plan of Boston, works towards “sound municipal management, sustainable land use, protection of natural resources, efficient and affordable transportation, a diverse housing stock, public safety, economic development, clean energy, healthy communities, an informed public, and equity and opportunity among people of all backgrounds” (MAPC, 2014);
- City Comprehensive Plan, that implements “ordinances, such as Zoning or subdivision” within the urban contexts (American Planning Association, 2017);
- Downtown districts, neighborhood districts, Harborpark District and Special Purpose Overlay Zoning Districts, among others (Boston Redevelopment Authority, 2017b).

Within the Roxbury Neighborhood District, the Article 50 of the Boston Zoning Code has established a specific Economic Development Area (EDA) in Dudley Square, called “Dudley Square EDA”, to encourage economic development and commercial activities, with a specific focus on the interests of the community (Boston Redevelopment Authority, 2013b). A particular attention is given to the promotion of innovation by requiring a certain amount of research and development uses in the area, intended the same way as the usual urban land use category of the zoning.
As a matter of fact, the amount of space dedicated to innovation acquires a sort of "service" implication, becoming a requirement of the zoning, like the spaces for commercial facilities, residential areas, education, etc.

According to the Article 50, the 30% of the gross floor area of any new development plan proposed within the area must be dedicated, or must support the following uses:

- “Research, development, and production of pharmaceutical and biomedical products;
- The design, development, fabricating, and testing of instruments for engineering, medical, dental, scientific, optical, or other similar professional use;
- Other scientific Research and Development Uses, including laboratories and facilities for theoretical, basic, and applied research, product development and testing, prototype fabrication, or production of experimental products” (Boston Redevelopment Authority, 2013b).

These spaces of innovation can be managed by either private, public, or governmental entities (Boston Redevelopment Authority, 2013b). The city of Boston is trying to push innovation through the above-mentioned tools and planning initiatives in Dudley Square, among which the Roxbury Innovation Center represents an interesting case. This facility, as a pilot project of the Neighborhood Innovation Initiative, aims to create a positive impact on the local community by providing the necessary skills, tools, workspaces, connections and programs to enhance the development of innovation and support new entrepreneurs to start and grow new companies. This, in turn, acts towards bridging the existing gap between the disadvantaged neighborhood of Roxbury and the rest of the city, by strengthening and expanding the innovation economy (Pagones, 2015). This is one of the most difficult challenges that the Boston administration is called to face, for bucking the trend of the traditional urban strategies, disrupting the patterns of inequality.

5. CONCLUSIONS

Quoted Yigitcanlar (2011b), 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. The case study of Roxbury Innovation Center is an example of how innovation policy supports urban 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 the U.S. and EU with a specific and recognizable connotation, the urban regeneration initiatives encompass also those planning activities that include innovation as a characterization of the area under zoning rules. More in particular, the case study is paradigmatic in the way in which innovation turns on urban regeneration planning initiative to transform a backward urban area into a vibrant neighborhood. The phenomenon of innovation concentration in particular places of Boston characyerized by the presence of mutual factors (anchor institutions, startupper centers, physical transformations towards the demand of innovation) has created a regeneration process in backward urban areas, like Roxbury, by triggering a process that can be called “expansion of innovation”.

“There has been a huge plan to connect Roxbury to the rest of the city. The Administration hopes that the neighborhood will be the next Innovation District, making sure that people go back there with their families attracted by the new opportunities that will arise” (personal
communication, June 30, 2016). Differently from the other innovation spaces spread all over the city, the Roxbury Innovation Center is more locally focused and represents a great opportunity for the specific deprived neighborhood to change its path (personal communication, June 25, 2016). As the Director of the Roxbury Innovation Center Alessandra Brown stated “we are hoping to assist the growth of entrepreneurship and helping people really to sustain themselves and their small businesses . . . We are giving them the ability to choose to stay in the community” (2016). One of the main aim of the Innovation Center is to provide a gathering point for people, providing them several local community outreach activities, so that “people can come in and feel engaged in very productive programs” (personal communication, June 25, 2016). The Boston Planning Authority contributed to the implementation of this innovation space in Roxbury by providing new public services and including specific requirements within the zoning code of the area to support local innovation, that, in turn, can spur the Urban Regeneration processes across the city. This public effort, sustained by specific planning tools, can be considered a good practice of how to trigger these processes and augment innovation also in the most lagging regions of Europe, bridging the existing “innovation gap”. As a matter of fact, Europe still presents deep differences: on the one hand, there are regions that are able to compete in the globalized market by focusing mainly on the high tech sectors (Borrás, 2011) and, on the other hand, regions with unsolved structural economic weaknesses. In these last ones, in fact, there are several barriers to innovation linked to the shortage of high-skilled workers, innovators, research and technological infrastructures, the poor cooperation between businesses, universities, and research centers, as well as the lack of support to startups and entrepreneurs. As in the case of Roxbury, one of the measures implemented by the Public Authorities to overcome these deficiencies and enhance innovation and competitiveness, is the creation of Innovation Spaces that can emerge as promoters of urban and economic growth, supporting the local communities to express their potential. At the city level, they are conceived to stimulate the knowledge convergence by endorsing the local organizations. It is interesting to observe how the urban policies supporting these initiatives, can be considered the input of these Knowledge concentration processes, which, in turn, trigger the Entrepreneurial Discovery Process (EDP), important for the implementation of the innovation ecosystem and the coordination of the efforts of different actors (public administrations, research institutions, entrepreneurs, communities). These measures can support the enhancement of the Smart Specialization Strategy (S3) for designing the changes of the Cohesion Policy 2014-2020, which aim is to reduce the disparities among the European regions (Barca, 2009). The S3 process needs to be translated into Regional Plans (RIS3), that can contribute to understand where innovation occurs and how to boost it in order to reach a smart, inclusive and sustainable growth. The major challenge for an effective RIS3 implementation is the territorialisation of the urban redevelopment strategies. Thus, the place-based approach allows to build virtuous regeneration projects, spurring the potential of the “territorial DNA” for identifying, recovering and increasing the values of the local specificities. For this purpose, the planning process has the potential to become a key-driver for enhancing innovation. The case study of the Roxbury Innovation Center emphasizes the importance of these factors that should be comprised within the public policies in order to foster the S3 in lagging regions, where the creation of an ecosystem of innovation can trigger the EDP, by overcoming the conventional barriers to growth.
6. ACKNOWLEDGEMENTS

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Abstract: The objective of this study is to investigate the linkages between economic development, innovation and environmental sustainability inside urban areas. To achieve this goal, this paper adopts a case study strategy, by drawing inspiration from an incubator located in the Boston metropolitan area, named Greentown Labs. The case study is discussed by analysing the different stages the Greentown Labs went through, relocating from Cambridge to Boston and then from Boston to Somerville. The present contribution will give some recommendations considering the creation of incubators as facilitator of growth of innovative start-ups that can be essential for spurring innovation and economic development within urban centres.

Keywords: MAPS-LED, Greentown Labs, Sustainability, Innovation, Incubator.

1. INTRODUCTION

Innovation is a procedure that brings to a result: this result is, by definition, new in the sense that it is a thing or a way of making something that before was not there (Godin, B., 2008). Innovation is a proxy of the generation of new knowledge and it happens by means of several causes: project and engineering activities, specialization courses organized by the production divisions, interactions with customers and contractors, re-utilization of existing knowledge coming from outside the firm (Katz, J., 2004). Innovation must be distinguished from invention. Many theorists have defended this argument over the course of the years. Innovation is essential to all economic activity: it is an invention, activity, market, source of supply or business group that is not only created, but put in action, utilized or promoted by a firm (OECD, 2005).

The incubator of Greentown Labs, in Somerville, MA (USA) has an important role for the innovation, being an incubator for start-ups with the mission of enabling a vibrant community of entrepreneurs to work on their visions and to provide access to the space, funding, a prototyping lab and co-located office space and other facilities to enable start-ups to rapidly grow their networks and their companies.

MAPS LED is a European research project aimed at examining how innovation happens spatially. This project has first mapped at the urban level the most performing clusters in the Boston metropolitan area and then identified within this area the initiatives, where creation and use of innovation happen. Figure 1 shows the initiatives selected for the project. Among them, Greentown Labs has been chosen for this paper, since it is focused on the Green tech sector, or more in general on the Green Economy. The case study will be discussed by analysing all the steps of its development, exploring the different locations where Greentown Labs was placed through the years. Finally, lesson learned will be discussed, lesson transfer,
justification for the case study selected, benchmarking across indicators, possible elements of
transferability, limitations and constraints.

2. GREENTOWN LABS

Green Town Labs (GL) is located in Somerville, inside the Boston Metropolitan Area. The
case study of Greentown Labs has been analysed under eight factors of success: Constant
City Leadership, Supportive National Policy, Focus on city specific issues, Intellectual
capital, Public engagement, Strong partnerships, History of global trading, Financial
incentives. These eight factors of success have allowed this case study to be successful in
attracting investment in the so-called “green tech” sector and in tackling key environmental
challenges. Some of these factors are a result of the city’s history and context, rather than
having been developed exclusively for the purposes of encouraging the green tech. These
factors are important for creating an ideal process to implement this sector in the city (Power,
S., 2015).

Greentown Labs is an incubator for start-ups that enables entrepreneurs to solve the world's
biggest energy and environmental challenges. The mission of this laboratory is to enable a
vibrant community of entrepreneurs to work on their visions and to provide access to the
space, resources, and funding that allows their early-stage companies to thrive. They offer
40,000 sq. ft. of prototyping lab and co-located office space, a shared machine shop,
immersion in a growing community of energy and clean technology entrepreneurs, and on-
site events and programs designed to enable start-ups to rapidly grow their networks and their companies. Most of the companies located into GL have already raised some money; they are not in their first phase. It is different than an accelerator like the other present in Boston, e.g. Mass Challenge. Companies located inside GL get some benefits from locating into the incubator, apart from knowledge sharing with other companies and casual networking, companies also get discounts for software purchasing and discount for shipping. GL does not have formal agreements with educational institutions and does not get money from them. GL has a good survival rate regarding start-ups. Among 102 total companies that have been incubated inside GL from 2011, just 18 did not make it until 2016. This means that the 82% of the companies after 5 years was still operating, and this rate is way higher than the one relative to the entire Finance/Insurance/Real Estate Industry which has in US 58% of start-ups still operating after 4 years, while the average rate of start-ups still operating after 4 years among all the industries in US is 50.5% (statisticbrain.com). To have a more general data on the average survival rate of establishments, after 5 years in US it was 56.3 % in the period 2011-2016, while the average survival rate of establishments after 4 years was 61,6% in the period 2010-2014 (Bureau of Labour Statistics, 2016). Other data say that in the U.S. the Percentage of firms that remained in operation through their first five years was 43.2 % in 2012, 45.95% in 2013 and 48.73% in 2014 (Kauffman Index, 2016).

The impact on job creation of GL is impressive, producing currently about 528 jobs. After incubating companies, the incubator tries to retain companies in Boston area, trying to struggle against the migration of the companies elsewhere, in order to keep on generating economic development in the area.

GL collaborates with several agencies and networks for improving its network and receiving funding:

- Mass Development, which is a quasi-governmental agency, supporting manufacturing in Massachusetts. Mass Development, is a state’s economic development and finance agency, works with businesses, non-profits, financial institutions, and communities to stimulate economic growth across the Commonwealth. Through these collaborations they help create jobs, increase the number of housing units, revitalize urban environments, and address factors limiting economic growth including transportation, energy, and infrastructure deficiencies.
- The Department of Energy, though it does not receive any money from it.
- The Incubate Energy Network, which is accelerating the transition to a sustainable economy through national coordination of incubator resources supporting entrepreneurs focused on clean energy innovation and deployment. The network has supported more than 500 companies to date and has a significant pipeline.

### 2.1 The relocations of Greentown Labs

GL started as a start-up in the Kendall Square Area in 2011, and then it grew until it needed more space for developing. To fulfil its needs of more space, it moved into the Boston Seaport district, where it remained for about six months and finally relocated again into Somerville, in a vibrant and large area, seat of already existing up and coming firms.

In order to have a brief idea of the first two areas in which has been located GL, will be provided a brief description. In the Boston Seaport district there has been a huge amount of
public investments by the city of Boston in the last decade, with the intention to regenerate the area and make the district more attractive for business and foster innovation. The Kendall Square area, located in the City of Cambridge, MA, U.S.A., very close to the Massachusetts Institute of Technology (MIT), is one of the most successful international innovation hubs where the integrated approach made possible to create a development processes in social, economic, and physical terms.

Three factors mainly caused the relocation of Green Town labs from South Boston to Somerville:

1) One of the factors that caused the relocation of GL from Boston Innovation District to Somerville is the price of the land. The rent went from 8$/sq. ft. to $52/sq. ft. in the Seaport district (South Boston) in a year and a half. The median home value in 2012 in South Boston was $374,000, while in Somerville in 2012 was $362,000 (Zillow.com). Now in 2017, the average office space price for sale in the neighbourhood of South Boston is about $650/ sq. ft. while in the city of Somerville is $ 535/ sq. ft. (Officespace.com). The Commercial Real Estate average rental rate now in South Boston is almost $37/ sq. ft., while in Somerville is $32/ sq. ft. (Loopnet.com). This means that still there is a gap in the real estate market between the two areas.

![Figure 2 - Median listing price comparison between Somerville (green curve) and South Boston (orange curve). Source: http://www.zillow.com/somerville-ma/home-values/](http://www.zillow.com/somerville-ma/home-values/)

2) Another important factor that emerged from qualitative research carried out by means of interviews was the investment into innovation done by the city of Somerville through “SomerVision”, the local plan utilized by the city for the economic development of the area in the long run. It was a flexible document about the new economy, encouraging the growth.

3) The last factor that caused the relocation of the incubator into Somerville was the intention from the city of moving the laboratories much closer to the places where the young professional lived, since the creative class that worked into the incubator stayed in Somerville. By relocating GL into the community, the intention from the city was to create a vibrant community, much more liveable for the workers, that in this way had the possibility to commute to work in shorter time, by walking or bicycling.
At that time, next to the location where GL would have moved, Artisan Asylum was located, a non-profit community fabrication centre including workspaces for local craftsmen. On the other side, there was Brooklyn Boulders, a community space for climbers. The warehouse was a former envelops factory.

![Map of Boston innovation districts]

**Figure 3 - Greentown Labs Locations over the years: A (Cambridge), B (Boston Innovation District) and C (Somerville)**

### 3. DISCUSSION

In this section it will be analysed the lessons learned from the GL case study, the lessons transfer, the justification of the case study selected for lesson transfer and the possible elements of transferability, limitations and constraints.

In terms of lessons learned from the GL case study, it can be highlighted that the presence of an incubator related to a growing sector like the green tech can work as an attractor for investments, both at the local level and at the national level. The success of this initiative has been favoured also by the presence of significant anchor institutions such as important universities like the MIT and Harvard. These two universities, with the other universities present in the Boston area, played a key role not only because of the high supply of skilled and educated workforce which they furnish, but also because of their essential role in the local community and their strategic influence to the local economy and the consistent relationship which they form together with the local government and the philanthropic sector.

In terms of lesson transfer, the analysis will be conducted by referring to Rose (1991), i.e. under what circumstances and to what extent can a programme that is effective in one place transfer to another.

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Moreover, Rose (2005) proposed ten steps that policy makers could undertake in order to deduce lessons from foreign experience:

1) Learn the key concepts;
2) Catch the attention of policymakers;
3) Scan alternatives and see where to look for policy lessons;
4) Learn by traveling abroad;
5) Theorize a generalized model of how a program or policy works;
6) Turn the model into a lesson fitting your own national context;
7) Decide whether is a good lesson and if it should be implemented;
8) Decide whether the lesson should be applied;
9) Simplify the means and conclusions for a greater chance of succeeding;
10) Evaluate a lesson’s outcome prospectively as it evolves over time.

Policymakers can draw lessons from the GL. The collaboration among different actors and stakeholders can be taken into account as a positive example for lagging regions. The fertile innovation ecosystem present in the Boston area has favoured the rise of several innovation hubs, like GL. The justification of the choice of the GL is briefly explained. This is an exploratory study and implements a case study research of a green tech incubator and it helps in the process of decisions making for the implementation of innovation hubs and incubators in lagging regions, trying to draw possible elements that can be transferred and less positive elements that should be analysed more in depth before being transferred in lagging regions. The benchmarking process across the context indicators of the two cases consists of comparing indicators and it can be used as a tool to understand if GL can be considered as a positive case study.

In the period 2011-2016 the 82% of the companies incubated in GL after 5 years was still operating. This survival rate of the companies is impressive if compared with the U.S. average rate of start-ups still operating after 4 years among all the industries, which is 50,5%, and with the average survival rates of establishments in the U.S., which was 61,6% in the period 2010-2014. In Europe the average survival rate of firms after 4 years in the period 2010-2014 was 50,6%, while in Italy the survival rate for companies after 4 years in 2014 was 50% in the same period (Eurostat, 2017). These data show that the survival rate for firms in Europe and in Italy are lower than the U.S. average and way lower than the Greentown Labs survival rate. The higher survival rate of firms incubated can represent a success factor due to a better supply of services for the firms inside the incubator, and a better source of investments for entrepreneurs who decided to place their firm inside an incubator in the green tech sector.
Another indicator for the benchmarking is the entrepreneurship level. The success of GL can be explained also as the effect of a high level of entrepreneurship in the United States in general, advantaged by all the aforementioned factors. The United States have the highest Global Entrepreneurship Index, resulting first in the 2017 Global Entrepreneurship Index rankings, which considers data on entrepreneurial attitudes, skills and aspirations of the local population. This resulted in a GEI Score of 83,4 for the U.S. versus lower GEI Scores for all the other countries, comprising European countries from Switzerland (GEI score 78) to Bulgaria (GEI score 22,7) (GEDI, 2017). Moreover, it has to be taken into account an historical American tendency to entrepreneurship.

The installation of more incubators like GL could spur the entrepreneurship level and the number of start-ups in lagging behind regions, especially in a growing sector like the green tech. This kind of incubators work well if there is a highly educated workforce and if there is
the presence of anchor institutions. To some extent the presence of incubators or accelerators could exploit the high number of educated people in lagging regions, functioning also as a brake to the persistent phenomenon of out-migration, which is strangling some lagging regions like the European peripheral regions.

In order to understand the possible elements of transferability of the model in a different context like the one of lagging behind regions, the Italian start-ups environment will be analysed. Following this rationale, we do not assume a policy or an investment in a specific sector to be transferred like an emulative process from one place to another without social and historical background, and institutions being taken into account.

In Italy, at the end of September 2016, the number of innovative start-ups (entered in the special section of the Register of Companies in accordance with Decree-Law 179/2012) amounted to 6,363 with an increase of 420 units respect to the end of June (+7,07%). Start-ups represent 0.4% of the Million and a half active capital companies. Moreover, in Italy at the end of June the incidence of the phenomenon was equal to 0.38%, while it represented a 0.35% in March (Union Camere et al., 2016).

These data show how an innovation led entrepreneurial ecosystem is growing according to national wide indicators, although important gaps are still existing among the North and the South of the nation, where the lagging regions are mostly located, both in terms of economy and innovation. For example, the total share of start-ups of the Southern regions and Islands (Campania, Basilicata, Puglia, Calabria, Sicily and Sardinia) does not even reach the National share of start-ups of Lombardy region alone, which is by far the most innovative region (20,27% of the south versus 21,82% of Lombardy) (Union Camere et al., 2016).

<table>
<thead>
<tr>
<th>Classifica</th>
<th>Regione</th>
<th>Valore assoluto</th>
<th>% rapporto sul totale nazionale startup</th>
<th>% rapporto sul totale società di capitale della regione</th>
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<tbody>
<tr>
<td>1</td>
<td>LOMBARDIA</td>
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<td>0,35</td>
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<tr>
<td>2</td>
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<td>501</td>
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<td>0,49</td>
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<tr>
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<td>VALLE D'AOSTA</td>
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<td>0,21</td>
<td>0,48</td>
</tr>
</tbody>
</table>

Figure 6 - Number of start-ups per region in Italy and regional density - regional ranking. (Union Camere et al., 2016)

Possible element of transferability can be represented by the collaboration among all the different actors, so as to create a vibrant innovation ecosystem that can favour the growth of several business and innovation hubs. The success of GL in the Boston area would not have been possible without a cooperative environment among anchor institutions, local government, third sector and private investors.
In order to understand where it is possible to find resources for the implementation of innovation hubs, the potential of some European Funds will be assessed, by considering the Calabria region as a sample amongst lagging behind regions. Some important actions can be undertaken at local level by means of European Structural Funds, coordinated by the region.

The European Regional Development Fund (ERDF), in the framework of the cohesion policy, in furtherance of the economic growth and attractiveness of the regional territory, represents the principal investment instrument of the European Union. The targets arranged by the Europe 2020 strategy are Job creation, competitiveness between enterprises, economic growth, sustainable development and improvement of the quality of life of citizens. For the 2014-2020 period, almost one third of the EU investments, amounting to 352 billion euro, are dedicated to this strategy, which is applied by means of three principal funds: European Regional Development Fund, European Social Fund, Cohesion Fund which, in common with European Agricultural Fund for Rural Development and European Fund for Maritime Affairs and Fisheries, compose the EU Structural & Investment Funds. European Regional Development Fund (ERDF) intends to reinforce regional economic and social cohesion, by subsidizing projects to increase competitiveness and generate jobs. ERDF invests also in integration projects among member nations, with the European territorial collaboration.

Within the axis 1, the objective 1.1 has the goal of increasing the companies' innovation activities, especially increasing the indicator of researchers working in enterprises in the total number of employees, representing the specialization rate of the lagging regions. In 2012 the indicator was the 0,05%, and has to increase to the target value of 0,32% by 2023 (Regione Calabria, 2015).

Another important action is the Action 1.4.1, which aims at supporting the creation and consolidation of innovative start-ups-intensive application of knowledge and the spin-offs of research initiatives. This action supports the development and qualification of the regional production system through the promotion and creation of innovative enterprises (spin off of the research, innovative start-ups and micro-enterprises), in S3 innovation areas. This action aims at increasing the incidence of innovative specialization in application perimeters with high knowledge intensity. The actions of the European development funds have the objective of increasing the indicators. In particular, the action 1.4.1 aims at increasing the indicator of the birth rate of enterprises in knowledge-intensive sectors. This indicator is rather low in Calabria, if compared to other southern Italy regions. It was 10,6% in 2011 (Istat data) and by means of European Funds it is intended to rise to 18% by 2023 according to the Regional plan.

4. CONCLUSIONS

The case study of GL has shown how the cooperation among different actors such as innovation spaces, governmental agencies, non-profits, and private investors can bring more people to participate to the innovation process, inside a growing sector like the green tech. The case study has revealed also that innovation centres, incubators, and co-working spaces can increase the innovation level and the employment within urban areas, if there are some favourable conditions promoted by the implementation of the right actions in the right time in the right locations.
All the urban processes and actors involved can be summed up in a term: Innovation Ecosystem (IE). The IE is defined as the assorted array of members and capitals that contribute to and are essential for on-going innovation in a contemporary economy (World Economic Forum, 2016). GL represents a space where all the aforementioned actors converge and can meet in order to share knowledge, create innovation and contribute to economic growth. These innovative structures embedded within the urban framework, can increase the level of engagement of people, who can be empowered to actively participate by means of a collaborative innovative process, helping to leverage the innovation capacity.

The presence of an incubator in a growing sector like the green tech can work as an attractor for investments, both at the local level and at the national level. The success of this initiative has been favoured also by the presence of significant anchor institutions such as important universities like the MIT and Harward. These two universities, with the other universities present in the Boston area, played a key role not only because of the high supply of skilled and educated workforce which they furnish, but also because of their essential role in the local community and their strategic ability to influence to the local economy and the consistent relationship with the local government and the philanthropic sector. GL also mirrors the high level of entrepreneurship in the Boston area, advantaged by all the aforementioned factors. Reasonably, the presence of incubators or accelerators could also take advantage of the high number of educated people in lagging behind regions, working as a brake to the persistent phenomenon of out-migration, which is suffocating some lagging regions like the European peripheral regions.

5. ACKNOWLEDGEMENTS

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