Towards the societal system of innovation: The case of metropolitan areas in Europe

Document status and date:
Published: 01/01/2014

Document Version:
Publisher's PDF, also known as Version of record

Please check the document version of this publication:

• A submitted manuscript is the version of the article upon submission and before peer-review. There can be important differences between the submitted version and the official published version of record. People interested in the research are advised to contact the author for the final version of the publication, or visit the DOI to the publisher's website.
• The final author version and the galley proof are versions of the publication after peer review.
• The final published version features the final layout of the paper including the volume, issue and page numbers.

Link to publication

Download date: 19 Apr. 2024

UNU-MERIT Working Paper Series

#2014-040

Towards the societal system of innovation: The case of metropolitan areas in Europe

Serdar Türkeli and René Wintjes

UNU-MERIT Working Papers intend to disseminate preliminary results of research carried out at UNU-MERIT and MGSoG to stimulate discussion on the issues raised.

Towards the Societal System of Innovation: the Case of Metropolitan Areas in Europe[1]

Serdar Türkeli (UNU-MERIT/MGSoG, Maastricht University), turkeli@merit.unu.edu

René Wintjes (UNU-MERIT, Maastricht University) r.wintjes@maastrichtuniversity.nl

Abstract

Innovation serves many purposes. In this paper we study new varieties of innovation and innovation policy which address societal challenges in the largest cities in Europe. These metropolitan areas consistently show resounding characteristics in terms of multiplicities of innovation, governance and societal challenges. They serve as 'living labs' and 'lead-markets' for solutions to societal challenges. The identified and analysed cases of social innovation initiatives in these metropolitan areas organize for new resourceful interactions between the demand for social innovations and the capacities to generate multi-domain solutions. It is the context dependencies of these cases of social innovation that open up diverse interest-based possibilities. In this daily life-world context a multiplicity of actors select local-interactive processes. The broad range of actors includes: government research labs, public sector, creative and other service industries, social entrepreneurs, intrapreneurs, student platforms, and profession-linked open communities. Such interactions represent emerging transformative capabilities for addressing societal challenges, turning local-societal (political/administrative; economic/ financial; technological/social) solutions into multi-level (regional, national, global) opportunities, and a wider range of benefits. In metropolitan areas, these multi-domain and multi-level potentials are activated by organizing societal synergies between "social participative creativity" and "economic innovative efficiency" for any level. Existing concepts of innovation systems do not capture and explain these unique societal synergies, because they only focus on one specific type of innovation and one specific type of sectoral, technological, socio-technical, social or spatio-organizational (national, regional) system of innovation. It requires acknowledging that innovation and innovation systems are not only instrumental for economic benefits in a system-technocratic sense, but also for addressing societal challenges in a grassroots-communicative sense. Therefore we construct an overarching yet deepened concept: "the societal system of innovation", a theoretical-analytical framework based on empirical background. We do not add yet another type of innovation system, but acknowledge the overlaps and linkages between the existing types of innovation systems. The existing types are the special cases of the societal system of innovation with respect to the presence/absence of organizations, where organizational rules and interactional play between them. Over-embedded or lacking interactions among these special-case innovation systems cannot capture evolving contextuality (life-world) for innovation. This shortcoming provides a complementary policy rationale for being critical in the organization of widened interactions (S2S, system-to-system; G2G, grassroots-to-grassroots) and deepened contextuality (S2G, systems-to-grassroots; and G2S, grassroots-to-systems) under the concept, instruments, measurement/assessment of the societal system of innovation.

1. Introduction

Social innovation initiatives to address societal challenges often originate in metropolitan areas but these initiatives often do not have a prominent place in the current, conventional regional innovation strategies and systems. In the past, the attention has been paid mostly to the advantages of spatial agglomeration for technological and economic development, but these spatial agglomerations also introduced concentrating societal problems and environmental concerns through time. Increasingly, innovation and innovation policy is not

---

only seen as instrumental but also communicative for addressing societal challenges, mainly to communicate impulses between multiple levels and domains. Some of the concerning challenges are referred to as global challenges. However, emerging local initiatives and dynamics (of political, administrative, economic, financial, technological and social capabilities) in metropolitan areas manifest pertinent and emerging interactions for generating, testing and diffusing multi-domain and multi-level solutions for these societal challenges.

Figure 1 - Multi-dimensional Prerequisites: Societal Challenges, Governance, and Innovation

Figure 1 above is discussed through its component and levels as follows: For *research and innovation* activities, the agglomeration advantages remain quite strong (See also Figure 4). Many regions which host a metropolitan area have a higher level of RTDI performance than most of the other regions in the same country. Also the *societal challenges* are often of a specific and place-based nature. Some aggregated problems can often be addressed more easily, because of the expected fact that the social rate of return from some policy investments can easily be higher in metropolitan areas (or specific parts of the concerning cities) since many people benefit e.g. from a reduction in pollution or access to certain public service innovations. Also in terms of *governance* (decentralization and regionalism), these largest cities are often in a particular position, serving as a core in relation to other regions in the country, and as attraction nodes in international networks of core-regions. Some metropolitan areas are governed by many *local* administrative units; others have special autonomy. Concerning governance, there are also disadvantages from agglomeration in the form of overlapping governance levels, with multiple jurisdictions, since it complicates policy making and delivery. For instance, the discussion on *functional regions* has led to the Localism Act in the UK concerning City Deals and Local Economic Partnerships. Metropolitan areas have large public government sectors because they often host the *regional* and *national* governments and institutes. Also the branches of multi-national companies and *global* non-governmental organizations are engaged in multiple domains and at multiple levels, including local initiatives.

This situation suggests that metropolitan areas are multiplex, multi-layered networks, not monoplex networks such as standard networks where nodes and links are only of one special-case system, say regional, technological system, etc. Figure 2 demonstrates this network sophistication in a stylized form with overlapping actors. For mathematical details of *Multiplex Networks* please refer to Mucha et al., (2010); Gomez, S., et al. (2013).

Figure 2 – Stylized Interactions in Multi-scale Multiplex Networks
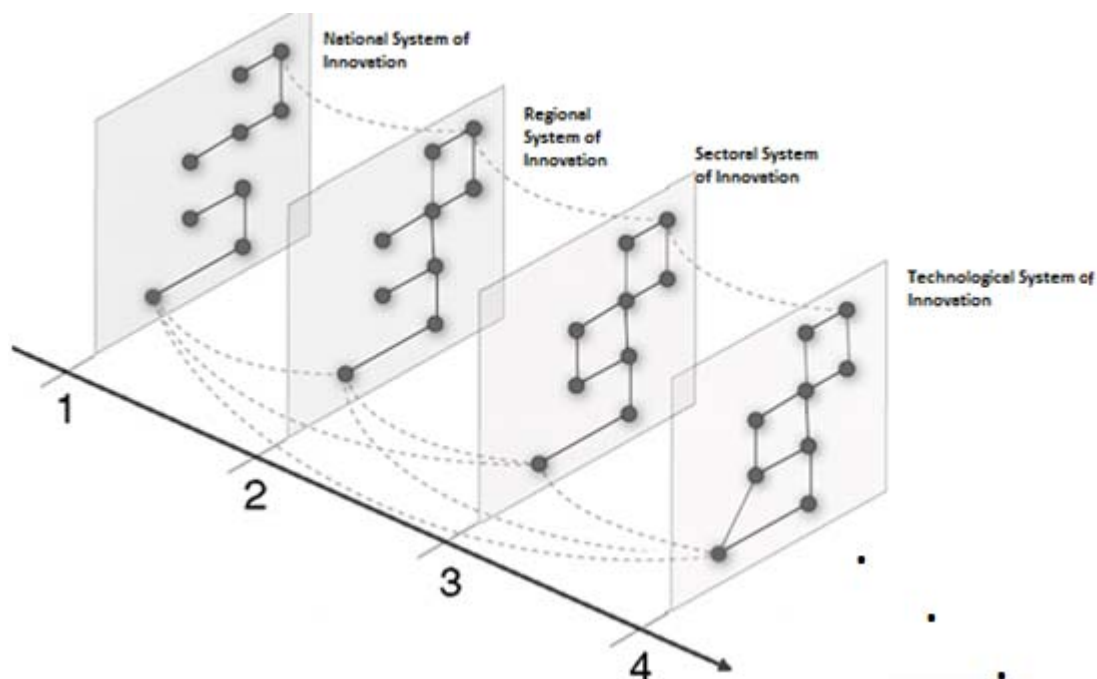
Image source: Science 2010, adapted for Systems of Innovation by authors

The combination of the above mentioned characteristics make these metropolitan areas have specific innovation and innovation policy design and delivery opportunities to address specific societal challenges, e.g. concerning environment, energy, communication and transport, health, and exclusion-related challenges. Each of the challenges represents different aspects of threats and opportunities for governments, businesses, knowledge centres, intermediaries, and citizens, while each actor (and the multiple networks and innovation systems in which they fulfil a context-based, level-based role) have different degrees of strengths and weaknesses in bringing about multi-domain, societal solutions.

Therefore, our empirical questions are *do we face a new phenomenon? Are the emerging technological, socio-technical, financial solutions in regions characterized by new types of resourceful interactions (structures and processes) that bring about multi-domain and multi-level benefits and impacts?* To answer that question, the empirical part of this paper analyses metropolitan areas as 'lead-markets' and 'living labs' through cases of social innovation initiatives, which are of place-based innovation policy initiatives addressing societal challenges. Social innovation initiatives are analysed for the largest metropolitan areas in the EU (the 29 metropolitan areas that have more than 2 million inhabitants, see Appendix A). In regional innovation strategies, policies for social innovation are not mentioned very often[2].

---

[2] See RIM Annual Report 2011, accessible:
 http://www.rim-europa.eu/index.cfm?q=p.reportDetails&id=16006

Policies for social innovation includes innovation policies which promote: *social entrepreneurship; smart city initiatives; living labs; smart-grids; public sector innovation; energy-efficient building; services innovation; ICT projects for health, unemployed and elderly; innovative public procurement, eco-innovation*, etc. Such policies are often designed and implemented at the local level and less often at the regional level. Since social innovation is very context dependent (meaning they are embedded in 'place-based' interactive processes between a diversity of actors), these policy initiatives are based on locally specific rationales. The diversity of the involved actors goes beyond 'triple helix' partners, also citizens and public and non-profit organizations are involved. Since many social innovations and policies are at an early life-cycle phase[3], many regions might learn from local pilots and 'prototypes', which might be diffused and exploited after scaling-up. Therefore, our theory-oriented question is: *do we have adequate conceptual frameworks to further exploit and explore this new empirical phenomenon which depends on the organization of interactions[4] within and between different special-case systems and contextuality?* The theoretical contribution of our study is in constructing and applying the concept of the 'Societal System of Innovation'. The various conventional theoretical concepts of innovation systems need to be critically adapted in order to incorporate societal perspectives. The societal system of innovation embraces its special-case systems, including: regional innovation systems (Cooke, 2010), national innovation systems (Freeman, 1987), social innovation systems (Amable, 2001), technological innovation systems (Carlsson and Stankiewicz, 1995), sectoral innovation systems (Malerba, 2002) and socio-technical systems (Geels, 2004). As a system of systems, the emphasis is on the interactions, and organization of interactions between these different special-case systems of innovation. Furthermore, over-embedded or lacking interactions are the failures which provide a complementary policy rationale for organizing interactions between these special-case systems. These interactions carry locally-applicable, temporally-bounded, specific rationales which extend the core/immediate concerns and rationales of the actors involve. The interactions between different special-case innovation systems accommodate exploitative and activate explorative capabilities needed for responsiveness to the evolving contextuality for innovation. Bringing about multi-domain and multi-level benefits and impacts then depends on the scalability of the new technological, socio-technical, financial solutions that emerge from these multi-domain and multi-level interactions.

In section 2, we first provide insights from literature on metropolitan areas in terms of innovation, governance, and societal challenges, before constructing a first framework of the Societal System of Innovation. Section 3 analyses the selection of metropolitan areas and their strategies in terms of governance, innovation and societal challenges, and describes a selection of social innovation initiatives. By applying our framework in section 4 to these policy initiatives we empirically widen and deepen the concept of the societal system of innovation. In section 5 which we provide its generalized framework, instrument design and logic of measurement and assessment. We also provide an agenda for further research.

2. Integrating the concepts of governance, innovation and societal challenges: towards the societal system of innovation

---

[3] European Commission (2012), 'Strengthening social innovation in Europe; Journey to effective assessment and metrics', A social innovation Europe publication. Available at:
http://ec.europa.eu/enterprise/policies/innovation/files/social-innovation/strengthening-social-innovation_en.pdf

[4] For instance: interactions between local and regional systems of innovation, sectoral and regional, technological and social systems of innovation, and interactions between systems and grassroots initiatives etc.

2.1 Governance: An evolving construct

Analysis of the scientific literature around the keyword "governance" empirically shed light on the buzzword "governance": how it has evolved through time and how the dominant sub-research areas of governance have changed. This quantitative and qualitative analysis empirically characterizes what governance actually is and into what it is evolving. We used Thomson Reuters Web of Science data services to trace and extract these sub-research areas to constitute a framework to analyse the fit of theories and practices in metropolitan "governance". Basically, this perspective is of science of sciences. Objects of discussion here are the scientific sub-research areas as constituents of the construct and meaning "governance" through time (Turkeli and Erdil, 2013).

Turkeli and Erdil (2013) shows that in the year 1988, governance is studied under the main sub-research areas of "Government Law", "Business Economics", "History," "Arts Humanities Other Topics", "Social Sciences Other Topics", "Engineering", "International Relations", "Psychology" and "Public Administration". Authors indicate that one year after, in 1990; the "Urban Studies" and "Area Studies" started to characterize governance research and what governance actually is and what it is evolving into. Through time, some of the sub-research areas have declined or vanished. New sub-research areas have emerged, and others have strengthened in terms of their shares in the governance literature that characterize what governance means (21 research areas in 1988 expanded to 126 research areas in 2012). Turkeli and Erdil (2013) presents this process of evolution and structuration dynamics of 'governance' as a concept: "Environmental Science Ecology" has gained place (16 per cent in the year 2012) in governance research, as well as Geography (7 per cent). In the last 20 years and for the last three years, governance research has mainly characterized by the same, 9 research areas. "Urban Studies", "Geography" are the topics directly related with metropolitan governance (Turkeli and Erdil, 2013).

A new perspective emerges by substituting "governance" in "metropolitan governance" with respect to these 9 sub-research areas. The sub-research areas can basically indicate the main dimensions of metropolitan governance. These dimensions are revealed as i) metropolitan areas and *business economics*, ii) metropolitan areas and *environmental ecology*, iii) metropolitan areas and *government law*, iv) metropolitan areas and *public administration*, v) metropolitan areas and *international relations*, vi) metropolitan areas and *geography*, vii) metropolitan areas and *social aspects*, viii) metropolitan areas and *urban aspects*, and ix) metropolitan areas and *sociological aspects*. Turkeli and Erdil (2013) states that earlier approaches of bureaucratic planning (before and during 1950s), public choice theory (1960s-1970s) and its structuralist critiques (1970s-1980s) (for a detailed review see Brenner, 1999; Mollenkopf, 1992, Hutchinson, 2010) became incomplete to grasp all of these 9 dimensions of metropolitan governance.

The concept "New Regionalism" (literature entry 1980s-1990s) intends to portray these various emerging dimensions in metropolitan governance through stressing 4 points:

- *Economic Competitiveness* (Sub-research area: Business and Economics; *development of economic networks; business (technological/sectoral) innovation systems*)
- *Social Equity* (Sub-research area: Sociological and social aspects; *socio-economic disparities among regions and social exclusion; social innovation systems*)
- *Environmentally Sustainable land use and infrastructure development* (Sub-research areas: Business and Economics, Public Administration, Government Law, Environmental

Sciences and Ecology, Urban Aspects, Geography; *public–private partnerships for urban development, debating or a bargaining mode between public and private actors; national, regional, socio-technical, technological, sectoral systems of innovation*) (Wallis, 2010).

- *Political/administrative restructuring/establishment* of l*ocal governments* (Sub-research areas: Public Administration, Government Law, *decentralization, project-based decision-making processes other than bureaucratic planning, local/regional and national systems of innovation*), *Allocation of the sovereign authority with supra-national organizations* (Sub-research areas: Government Law, International Relations, *the collaboration among the state and non-state (domestic, foreign, supra-national) actors, multi-level governance; local/regional and national systems of innovation*), *Construction of new actor groups* (Sociological and social aspects, *inclusive and participatory forms of governance with opening up to new actors, the complexity of new forms of citizenship; social system of innovation*) are in the conceptual framework of New Regionalism (Mayer 1994; OECD, 2000; Boudrea, 2010).

Similarly, the OECD (2000) underlines these economic, social, environmental and political/administrative dimensions of metropolitan governance under "competitiveness" and the "liveability" conditions and indicates the need for "adaptation and promotion of use of new technologies for the benefits of whole society, the mobilization of social, political and economic resources in a coherent institutional framework and the strategic planning in order to support sustainable urban development" (OECD, 2000). Turkeli and Erdil (2013) control for what these new technologies are, through research areas related to "science and technology" in the field of "governance" in 2012, and the analysis gives us insights about these new technology fields which are candidates for technological and social innovation projects in metropolitan areas for they have already introduced governance as a concept. Besides general engineering, these technologies are: *Information Communication Technologies (ICT), Environmental / Energy Technologies, Transportation Technologies, Health Technologies, Food Technologies*. These scientific research areas are indeed in line with the societal challenges defined by Horizon 2020, Inclusive, innovative and secure societies (ICT, e-governance technologies), Secure, clean and efficient energy; Smart, green and integrated transport; Climate action, resource efficiency and raw materials; Health, demographic change and wellbeing; Food security, sustainable agriculture, marine and maritime research & the bio-economy (please see Appendix B).

2.2 Innovation: The new low, medium and high technology

Innovation has been widely recognized as being instrumental to economic development. The concept of Innovation Systems is one of the most widely adopted concepts. It started with the concept of 'national systems of innovation' as it was developed in the 1980s by Freeman (1987), Lundvall (1992), and Nelson (1993). For a long time most of the attention was on the supply-side of innovation, emphasizing the importance of research and technological development as input for generating business innovation. Soete et al. (2009) state that one of the shortcomings of these systems of innovation concepts is the limited attention for the increase of innovations which do not need 'particular leaps in science and technology': the combination, use and diffusion of known practices has become more important for innovation and its economic impacts. Also Iizuka (2013) point out some limitations; she calls for a

framework that incorporates globalization, societal perspectives, end-users, service innovation and the public sector.

After the development of the concept of 'national systems of innovation', various special-case variations of the innovation system concept have emerged, e.g. regional innovation systems (Cooke, 2010). Focusing on firm performance and getting away from a linear view, the systemic view is still very much supply-side, technology, or sector-focussed. Innovation system concepts have emerged that focus on specific sectors (sectoral systems of innovation, e.g. Malerba, 2002) or on a specific technologies (technological innovation systems; e.g. Carlsson, 1991). As stated by Foray et al. (2012, p.1697) scholars writing about science and technology policy have largely focussed on measures intended to stimulate overall economic growth.

Other innovation system approaches have a focus on impacts in the environmental or social domain: e.g. socio-technical systems (Geels, 2004) or social innovation systems (Amable, 2001). However, distinguishing ever more specific-case innovation systems may lead to more fragmented views which challenges seeing contextuality, the new low, medium or high technology, and which challenge organizing for new combinations, use and diffusion of knowledge and innovation.

The formulation of 'new mission-led approaches' (Gassler, Polt & Rammer 2008), setting directions for 'transformative change' (Weber and Rohracher, 2012) calls indeed for an innovation policy approach which differs from the conventional innovation systems approaches, applied in one of the sub-systems of the overarching one. According to Kallerud et al. (2013) the activity of turning innovation towards societal challenges should incorporate "frameworks as transition management, multi-level governance and co-evolution of social, institutional and technological systems".

Innovation is such a societal phenomenon that has historical and geographical path-dependent or path-creating influence over national, regional, sectoral, technological, socio-technical, and social special-case innovation systems, as well as the interactions between these special-case systems. We claim that an over-arching innovation system approach, considering widened (interactional) and also deepened (contextual) challenges of "societal" kind is especially being manifested.

2.3 Societal Challenges: Scaling interactions within and between systems and grassroots

Diversification and integration of innovation as an instrument for addressing societal challenges has called for revised system approaches, especially those that have been developed to understand how environmental objectives can be integrated, such as Technology Innovation Systems (Carlsson 1991; Coenen and Diaz López 2009). Geels (2004) for instance speaks of socio-technical systems and points out that developing new technologies (e.g. an electric car) and 'strategic niche-management' (Kemp et al. 1998) could take a long time to bring about a whole system transformation ('regime-change'). Addressing environmental challenges asks for a broadening of the concept of Innovation Systems (Foray et al. 2012; Weber & Rohracher 2012), and for new policy models (Mowery et al. 2010). Literature on social innovation (Murray et al. 2010) shows how innovation can also be instrumental for societal challenges, other than these 'green' challenges. For addressing grand/global challenges the attention also shifted beyond the national and regional system-borders (Kallerud et al., 2013). But does it make the regional or even local level less relevant? Our answer to that question is basically no, for we can observe "glocality" of metropolitan areas in terms of global localization of challenges, governance and innovation. Moreover, Krause

(2011) shows that local-level characteristics are the dominant drivers of cities' decisions to commit to climate protection.

A new innovation systems approach should not include merely one type of innovation or one type of societal challenge, so it should benefit from existing insights from several of these innovation system models which are tailored to a specific type of innovation, a specific technology or sector, or tailored to a specific societal challenge. However, there is a gap in the policy literature concerning the commonalities, linkages, and overlap between the currently fragmented fields and systems. This situation calls for an integrated innovation system approach which is widened in variety of interactions and (therefore able to be) deepened in variety of contexts.

3. Empirical Background: Governance, innovation and societal challenges in Metropolitan Areas

3.1 The complex governance of functional regions as a challenge

In Appendix A the largest metropolitan areas in Europe are listed. This list is based on ESPON: "Study on Urban Functions"[5], which defines cities according to the criteria of a functional urban area. The study defines a core urban area on the basis of population density, plus the surrounding labour pool, defined on the basis of commuting. As a result of this definition, the borders of the metropolitan areas do not necessarily accord with the administrative borders and therefore deviate from the level at which regional innovation strategies are often formulated (e.g. NUTS1 or NUTS2 levels). This also implies that the metropolitan areas and the concerning administrative region as a whole, may have different spatio-organizational aspects and innovation strategies.

In the case of *Bayern*, the administrative region is much larger (both in terms of inhabitants and km^2) than the metropolitan area of *Munich* and parts of *Bayern* do not have metropolitan but rather peripheral characteristics. This situation also holds for the *Province Noord-Holland*, in which a large part of *the Amsterdam Metropolitan Area* is located. Redefining metropolitan areas by focussing on functionality is an issue for many of European largest cities. In the UK the discussion has led to the abolishment of development agencies at the regional administrative level, in favour of institutions at a lower scale, closer to functional economic areas. As part of the Localism Act, which provides for a new "general power of competence" for local government, the idea is to decentralize power and construct City Deals and Local Economic Partnerships (LEPs) in order to boost the economic performance of eight English core cities.[6] Another governance problem for metropolitan areas is apparent when one realizes that cities like *Paris* and *London* have as many inhabitants as several small countries combined. *Brussels* is another example of a complex governance situation with an accumulation of government functions varying from local to European level. As a result GDP per capita in *Brussels* is among the highest of European regions, but also the contrast with the negative performance in terms of long-term employment and the share of people at risk of poverty or social exclusion, is very high. The *Munich Metropolitan Area* with a population of 2.6 million is located in the NUTS2 region *Oberbayern*, which has a population of 4.3 million. *Bayern* is the NUTS1 level region which has 12.5 million inhabitants, and this is often taken as the "regional" level of innovation and innovation policy. At this administrative

---

[5] See: http://www.espon.eu/main/Menu_Projects/Menu_ESPON2006Projects/
Menu_StudiesScientificSupportProjects/urbanfunctions.html

[6] Baker, R. (2012), "Focusing on functionality; changing approaches to economic development in England". In: OECD, Redefining "Urban": A New Way to Measure Metropolitan Areas, OECD Publishing. doi: 10.1787/9789264174108-en.

level the sub-national RTDI policies are developed and funded. The importance of such governance issues for innovation policy is evidenced by the RIM regional innovation report *Bavaria*[7] which has identified '*intra-regional disparities*' as the most important innovation challenge. In a metropolitan area, characteristics of the complexity of the different scales and levels of governance raise an essential question: what is the most relevant level of governance for the various aspects of research and innovation, and related policies? The ESPON definition of "functional" regions, is based on the function as a labour market, as indicated by commuting flows. But what kind of flows, functions or markets would indicate the functional borders of regions concerning research and innovation and their related policies? In this respect, it is interesting to note that *the Aachen Region*[8], which is also located in *NRW*, co-operates concerning innovation within the functional cross-border region TTR-ELAt (which stands for Technological Top Region *Eindhoven-Leuven-Aachen* triangle). Functional in this case refers to cross-border regional cooperation between clusters of the participating regions, and cross-border investments in each other's R&D campuses. Functional in this case does not relate to the question for the appropriate level of governance to address societal challenges with innovation. Metropolitan areas have both certain advantages and disadvantages concerning governance, which can be related to agglomeration and serving as the core in functional regions. As a result metropolitan areas have a relatively large government sector (and public R&D sector), but a disadvantage is the complexity. New EU regional level data can perhaps tell us more on the quality of government. The indicator is based on the result of a large survey on: "quality", "impartiality" and "corruption" in public services, public education, health care, and law enforcement.[9] As mentioned before, several metropolitan areas have a special administrative status, e.g. *London* and *Prague*. However, their quality of government is lower than other regions in the same country (see Figure 3: London 0.6 / UK average 1.0), which point out that there are quite some challenges concerning governance and public services in these metropolitan areas.

Figure 3 - Quality of government in London compared to UK and other regions
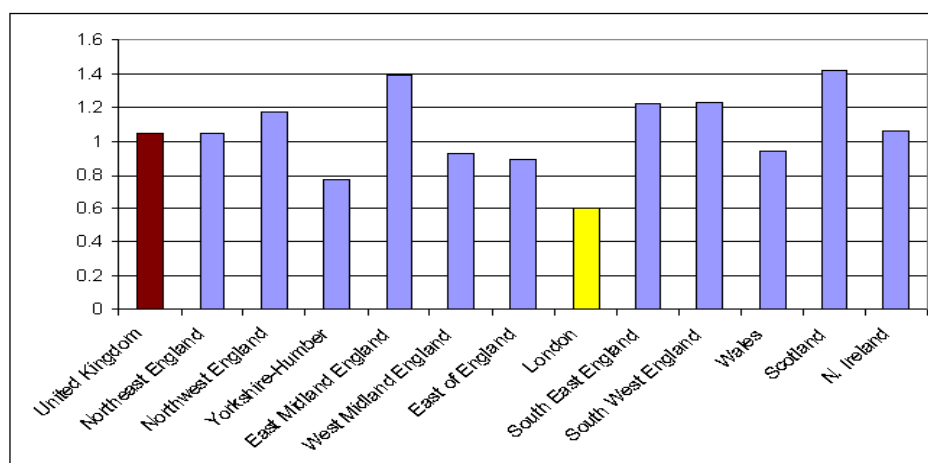
Data source: http://www.qog.pol.gu.se/digitalAssets/1362/1362473_eqi-and-correlates--qog-website-.xlsx

---

[7] Baier, E. (2012), RIM regional innovation report Bavaria.
http://www.rim-europa.eu/index.cfm?q=p.file&r=06975aebe810e80a602b770053b226ee

[8] Aachen Region is as of 1-1-2013 a separate regional administrative union of local municipalities.

[9] Charron, Nicholas, Victor Lapuente and Lewis Dykstra (2012). "Regional Governance Matters: A Study on Regional Variation in Quality of Government within the EU" (forthcoming in Regional Studies) http://www.qog.pol.gu.se/data/datadownloads/qogeuregionaldata/

Bucharest Metropolitan Area is also an example where the quality of governance and the definition of the functional region is an issue. The area is located in the *Bucharest-Ilfov region* which has no administrative or legal status. The region includes one municipality (*Bucharest*), 4 towns, 32 communes and 67 villages. Almost 90 per cent of the regional population lives in the *Bucharest* municipality. The region *Bucharest-Ilfov* as a whole is hardly a functional region, but the EU and national programmes for regional development policies are formulated and implemented at this level. Local governance performance is generally weak. Besides an increase in the research and innovation component in the 2014-2020 Regional Development Plan, a second major issue is the consolidation of the *Bucharest Metropolitan Area* based on an integrated polycentric approach and this will also involve a change in the definition of the borders of the region, including 62 additional localities.

Stuttgart Metropolitan Region has prioritized challenges concerning traffic and environment. In addressing this challenge the complex coordination between municipalities has been a major barrier, since a sustainable concept for the development of Stuttgart region required coordinating 179 isolated solutions adopted in 179 towns and municipalities. Two institutional changes have improved this situation. In 1994 an additional regional level of governance was established. The institution 'Verband Region Stuttgart' is a public authority for regional tasks of regional integration and international competitiveness. It is an answer to the demand for enhanced co-operation between local municipalities within the Stuttgart metropolitan area.[10] Also, the Stuttgart Metropolitan Region Platform is an additional governance structure. It is a voluntary, project-related co-operation between: Region Heilbronn-Franken, Region Neckar-Alb, Region Nordschwarzwald, Region Ostwürttemberg, and Region Stuttgart. Via coordinating committees and working teams, the platform has 36 representatives from municipalities and regions.

It is important to have such voluntary cooperation among local units, because the platform can discuss what the appropriate, functional level of governance is to address a specific societal challenge. In a sort of ex-ante policy evaluation the subsidiarity principle can be applied, resulting in a decision that it could be best to either tackle the concerning challenge at the local level, or by cooperation among the local administrations which share the same challenge, or it can result in a decision to involve an even higher regional level of territorial governance.

3.2 Innovation and innovation policy challenges

In the debate on characteristics of metropolitan areas and the policy options to promote development and growth, both the positive and negative images have their opponents. Glaeser (2005) writes about the 'Triumph of the City' showing that cities are sources of high productivity, wealth, social mobility, innovation, and even environmental sustainability. This is refreshing since for a long time 'anti-urbanism' dominated the discussion stressing the inequality, ethnic conflict, destruction of nature, etc.[11]. However, there are different views on the renewed dynamism in metropolitan areas, and these views emphasize different innovation and innovation policy options for metropolitan areas. Some[12] merely emphasize the importance of amenities for attracting more high-educated people with high income, while

---

[10] Jeannette Wopperer, Stuttgart Metropolitan Region, Verband Stuttgart.

[11] Storper, M. (2011),'Book review: Triumph of the City - Ed Glaeser' Journal of Economic Geography 11 (2011) pp. 1079–1082.

[12] E.g.: Glaeser, E. L. (2005b) Review of Richard Florida's the rise of the creative class. Regional Science and Urban Economics, 35: 593–596.

others[13] emphasize local dynamic relations and innovative interaction between firms and other actors in the innovation systems.

The problem with the differences in the geographical units hampers benchmarking between regions on innovation performance. Concerning the innovation performance of the selected metropolitan areas, we note that most of them are located in regions classified as leaders in the RIS 2012[14], e.g.: *Vienna, Berlin, Paris, Hamburg, Prague, Brussels, Stockholm, Lisbon, and Amsterdam. Metropolitan areas* located in regions classified as innovation followers include: *Madrid, London, Rome* and *Athens*. Examples of metropolitan areas located in the group of moderate innovating regions are *Naples* and *Bucharest*. Besides an overall high level of innovation performance, metropolitan areas also have in common: a high average GDP per capita, a high share of employment in knowledge intensive services (which includes for instance creative industries), and a high share of population with tertiary education, R&D expenditures at government research institutes, and the number of patents per million inhabitants (Figure 4).

Figure 4 - Average characteristics of the Regions (NUTS) of the 29 largest Metropolitan Areas in Europe, EU27=100
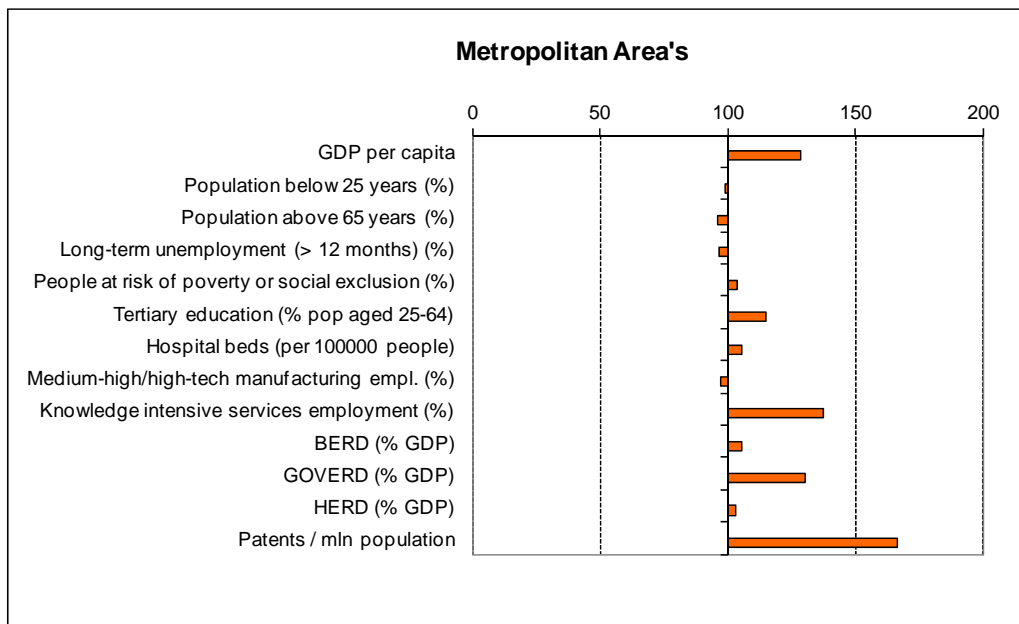
Most metropolitan areas are located in regions that have been classified in the 2011 RIM Annual report[15] as regions with a focus on services and public R&D, or in short: 'services & science' regions. Concerning R&D, the public sector (and especially the government research labs) is often more important than the business R&D sector[16]. However, among the individual

---

[13] E.g.: Michael Storper & Allen J. Scott (2009), "Rethinking human capital, creativity and urban growth". Journal of Economic Geography 9 (2009) pp. 147–167.

[14] RIS 2009, accessible: http://www.proinno-europe.eu/sites/default/files/page/10/03/RIS_2009-Regional_Innovation_Scoreboard.pdf

[15] RIM Annual Report 2011, accessible: http://www.rim-europa.eu/index.cfm?q=p.reportDetails&id=16006

[16] Wintjes R. & Hollanders H. (2011). Innovation pathways and policy challenges at the regional level: smart specialisation, UNU-MERIT Working Paper Series 2011-027, accessible: http://www.merit.unu.edu/publications/wppdf/2011/wp2011-027.pdf

metropolitan areas, as well as within metropolitan areas, the performance can vary considerably, e.g. the situation between *Greater Manchester North and South.*

In the *Bucharest-Ilfov region*, which includes *Bucharest City* (12.5 per cent of the territory, 86 per cent of population) and *Ilfov County*, the disparities within the region are large, and therefore the challenges differ. Some societal challenges are more visible in *Bucharest City* (traffic congestion, social exclusion and fragmentation), others in Ilfov county (high share of rural population, low level of basic services, sanitary/health, education and IT/Telecom infrastructure, high unemployment, low income), while others apply to the whole region (poor inter- and intra-regional transportation means, poor environment infrastructure, low RTDI investment and development of SMEs, low coordination between local administrations). For the *Bucharest-Ilfov Metropolitan Area* the 2014-2020 Regional Development Plan that will be implemented by local authorities and stakeholders has chosen for an integrated polycentric approach which will address the following challenges: low accessibility and mobility, brain drain, ageing population, high pollution, poor environment awareness, increasing public services costs, low energy efficiency, social exclusion and inequality, and the need for urban regeneration and better administrative capacity.

High local performance in one domain can create local challenges in other domains, e.g. due to the very high share of high-educated people in *Amsterdam* there is a lack of medium-educated people for providing care and health services to elderly. This called for innovations in the health and care sector, and for training of low-educated. Productivity enhancing solutions are for instance provided by graduate students who take part in a project organized by the Amsterdam Innovation Motor[17].

3.3. Societal challenges in metropolitan regions

Many societal challenges are global challenges but there are regional differences[18]. The growing urban population and increased spatial density creates specific societal challenges, or make global ones more manifest. From a survey asking to rate challenges hampering future regional development Wintjes and Hollanders (2010) show that challenges which have more often been rated important in metropolitan regions than in other regions include: *education and training, energy security and renewable energy sources, environment protection, ageing, water resources, climate change, information and media, and social polarization*[19]. We also recall the data provided in Figure 4: In some metropolitan regions long term unemployment and the share of population at risk of poverty or social exclusion is a major challenge with higher rates than average in the country or the EU. However, on average for the largest metropolitan areas we saw that these indicators were close to the EU average. The same holds for the share of elderly. Nonetheless, many societal challenges are locally specific, with differences and disparities within metropolitan areas (e.g. between *Greater Manchester North and South*) or between the metropolitan area and other parts of the region (e.g. in the case of *Munich*).The situation in metropolitan areas also creates specific opportunities for policy measures that could positively intervene and limit these challenges, e.g. measures to reduce carbon emissions. This simultaneity is also recognized in the new, place-based cohesion policy approach which calls for a different policy support for peripheral, low density regions as opposed to central, high density, agglomerated regions. Both types of regions have

---

[17] http://www.aimsterdam.nl/english

[18] http://ec.europa.eu/regional_policy/sources/docoffic/working/regions2020/pdf/regions2020_en.pdf

[19] Wintjes, R. and H. Hollanders (2010). "Regional impact of technological change in 2020; Synthesis Report". DG Regional Policy of European Commission, Brussels.
Available at: http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/2010_technological_change.pdf

different challenges and policy opportunities. These challenges may originate from negative returns to agglomeration, like pollution, but metropolitan areas also have positive returns to scale to address these challenges, for instance by improving public transport at relatively low costs per user, or large projects such as innovative procurement of new power-plants. Moreover, there are also positive agglomeration advantages concerning knowledge and innovation. In addressing societal problems with innovative solutions metropolitan regions are in this specific situation. Because of the localized specific need and the specific capacity to provide solutions, metropolitan regions are in a sort of 'lead-market' situation.

As an illustration of metropolitan areas, we refer to the policy document: "*Stockholm* 2025: the world's most innovation-driven economy; Innovation strategy for the Stockholm region"[20]. As the document states: *"The Stockholm region faces a number of challenges. At the same time, these challenges are the drivers of change and development – the solutions we come up with may be our main export success stories in the future. The most prominent challenges – globalization, climate change and an ageing population – are ones that we share with much of the world. Another challenge is accessibility – people's opportunities to settle and move around, both within and outside of the region"*.[21] This innovation strategy for *Stockholm* is initiated by a broad collaboration of actors.

For a city-region such as *Hamburg*, an illustration of Metropolitan Areas as Societal Sub-systems of Innovation, the borders of the administrative region and the functional metropolitan area are more or less the same. As a result the regional innovation strategy documents of Hamburg read more like a local strategy that defines a holistic approach by integrating the various functions this metropolis has in several Societal Innovation sub-systems. The Hamburg strategy "Growth with Vision" (2010) has the following four goals: (1) to further develop Hamburg into an international, dynamic, innovative and culturally diversified metropolitan city, (2) to promote above-average sustainable economic and demographic growth, and environmental quality through focusing on new economic strengths, (3) to support Hamburg's talents and Hamburg's attractiveness for talents, and (4) to advance Hamburg as a fair-minded city worth living in[22].

Role of the EU, national, regional, and local research and innovation policy in societal systems of innovation is of multi-dimensional governance, a concept that indicates the involved spatial and contextual levels of policy governance. The four ideal types of spatial levels are local, regional, national and supranational. The four ideal types of contextual levels are technological, social, socio-technical and sectoral levels. The field of innovation policy has gradually developed these multi-dimensional characteristics in the European Union (EU) since the mid-1980s. Functionally defined metropolitan areas often represent the local level in this setting. A major problem for both the vertical and horizontal coordination, and even orthogonal coordination is the large geographical diversity concerning innovation, and especially for social innovation, because of the context dependency, e.g. what works for one city, may not work for another, and what may seem to work at the national level, may appear to be counter-productive in some regions or cities.

In many metropolitan areas the influence of the higher-level policies are often large because of their weight and central function in the wider regional and national innovation system. For

---

[20] http://www.rim-europa.eu/index.cfm?q=p.policy&n=16331

[21] http://www.lansstyrelsen.se/stockholm/SiteCollectionDocuments/Sv/naringsliv-och-foreningar/naringslivsutveckling/InnovationskraftSthlm/Innovationsstrategin - engelsk version.pdf

[22] http://www.rim-europa.eu/index.cfm?q=p.policy&n=15923&r=DE6

instance, their strength in government research organizations is largely based on national research strategy and funding (or regional in the case of high autonomy of the concerning regions) but they are hardly the result of local research funding and strategy. The government research institutes and the universities often are engaged in society relevant research, and socio-economic impact is among the targets they get from policy makers. This makes government research institutes relevant actors in social innovation policies. Their functional area in this respect often extents the borders of the metropolitan area. The many patents they generate are for instance mostly used in applications elsewhere, although participation in local social innovation initiatives can be coherent with the missions of such (national or regional) institutes. Metropolitan regions are also major beneficiaries of the EU Framework Programme. The stylized societal challenges identified by the future EU research programme Horizon 2020[23] are:

- Health, demographic change and well-being;

- Food security, sustainable agriculture, marine and maritime research and the bio-economy;

- Secure, clean and efficient energy;

- Smart, green and integrated transport;

- Climate action, resource efficiency and raw materials;

- Inclusive, innovative and secure societies.

We conclude that metropolitan areas have a high position concerning research on societal challenges which is mainly performed at public funded research institutes and universities. As centres of research excellence, they are likely candidates to benefit largely of the budget of Horizon 2020. In terms of research on issues like climate change and food security they clearly benefit from research programmes at national and the EU level. However, there is increasing attention for demand-side innovation policies at the regional level[24]. For research policy the European level of governance seems most appropriate, and for innovation the regional level seems more relevant[25]. The Horizon 2020 subsidizes researchers from various Member States to cooperate in European research projects. The criterion for selection of proposals is 'excellence'. Cohesion, ESF and ERDF policy on the other hand provides subsidies for 'place-based' regional policy projects, and especially to poor and peripheral regions. Research excellence benefits to a large extent from concentration. Excellence-based policy of DG Research and Innovation may seem contradicting with the 'place-based' innovation strategies as supported by cohesion policy. However, local demand-side policies can complement the national and EU funded supply-side policy and they can be integrated in 'place-based' strategies. Examples come for instance from so-called 'science-cities'.

3.4 Metropolitan policies to address societal challenges

Based on the RIM Regional Innovation Reports and the RIM repository the specific innovation policy challenges that where identified in the RIM Annual reports of 2011 and

---

[23] EC DG Research & Innovation Horizon 2020, accessible:
http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020

[24] Wintjes, René (2012), "Demand-side innovation policies at regional level", Regional Innovation Monitor, Thematic Paper 3. Available at: http://www.rim-europa.eu

[25] Soete, L. (2008). 'Current Theories on Growth and Development: How to Promote Regional Innovation through Cohesion Policy.' Report for DG Regional policy.

2012 for the group of 'science & services' regions involved first of all to increase the economic benefit for the region of the strength in public funded research. In order to do so, regions which (are or) include metropolitan areas should not stick merely to 'supply-side' policy, strengthening science as a priority sector, complemented by generic metropolitan policies to attract (foot-loose) talent and foreign investments. In order to benefit locally (in economic, social and environmental terms) from foot-loose, 'excellence based' research policies, it should be complemented by 'place-based' demand-side innovation policies, since it would increase the embeddedness of the innovation dynamics and agglomeration advantages. Competing regions or cities would have difficulty to copy or buy similar localized advantages.

Concerning policies to address societal challenges in metropolitan areas we can make a distinction between regional level strategies (which often concerns an integrated development plan or programme which consists of a package of individual initiatives for the region or metropolitan area) and project-level initiatives, which refer to individual projects, measures, initiatives, schemes, and policy instruments. In this section, we will first give some examples of such integrated metropolitan strategies which were identified among the selected metropolitan areas. Turning to the level of individual projects and initiatives we discuss the concept of social innovation and social entrepreneurship and discuss some policy practices in metropolitan areas which promote this kind of innovation and entrepreneurship. To what extent do these new practices call for changes in the theoretical concept of innovation systems (Soete et al. 2009; Iizuka 2013) due to the changing nature and nurture of the boundary status and prospects of innovation in the societal sphere?

3.4.1 Integrated, interacting regional and metropolitan strategies

As an illustration of integrated development and innovation strategies we mention the case of **Birmingham Science City (BSC)**. Their vision is: "to develop and use science and technology to improve the prosperity and quality of life of the city, the West Midlands and the UK". Its main activities are: investment in research infrastructure and capacity; demonstration activities; and engagement, communications and awareness. The prioritized themes concern: Innovative Healthcare, Digital & Wireless technologies, Low carbon, and Security. An example is the project in which Birmingham and Coventry Universities are working with the city councils to trial hydrogen vehicles, improve hydrogen infrastructure and connect vehicles to digital technologies to map their position and enhance their use. In the future BSC will focus more on quality of life challenges; put greater focus on major public sector investment and create innovation platforms for further funding of applications and regional businesses. Future demonstration projects will include demonstration of new technology applied to the new University Hospital Birmingham; demonstration of i-health technology; competition around low carbon building technologies; and digital technologies for improved transport.

On multi-level governance an example from *Stockholm* concerns the involvement of various levels in relation to vocational education and training. In Stockholm, there are many different enterprises, agencies, organizations for social partners and education providers. Good cooperation between national, regional and local stakeholders and representatives is important to match demand and supply and coordinate the initiatives and cooperation among institutes in various sectors[26].

---

[26] http://studyvisits.cedefop.europa.eu/index.asp?cid=2&artid=8029&scid=74&artlang=EN&per_id=2555

Popular thematic smart specializations among metropolitan regions are in linking ICT or 'green' to existing strong sectors or clusters. A strong cluster in **Berlin** is for instance the gaming industry. By promoting 'serious gaming', Berlin could not only strengthen its gaming industry, but also benefit from applications which address local challenges concerning education, inequality, improvement of public services, etc. Another example from Berlin is innovation in vocational training for 'green jobs' which supports thematic specialization in energy efficiency and renewable energy: The solar sector in Berlin created 4000 new jobs and Berlin aims for high-energy standards in renovation of buildings. However, green jobs require workers with new (key) competences. New curricular contents and methods have to be implemented in initial and adult education[27].

In the case of **Stuttgart** the automotive industry is a strong and innovative sector. Linking this sectoral specialization to the local level challenges concerning transport and environmental issues sounds like a smart strategy. Stuttgart indeed wants to become a living lab for the future of urban mobility:

- World's largest electric fleet: car2go came to the Stuttgart region in 2012 with 500 electric vehicles;

- Energie Baden-Württemberg AG is building the necessary charging infrastructure and provide green electricity in cooperation with the federal state of Baden-Württemberg and the regional capital Stuttgart;

- Buses and trains, car2go and other mobility services will be linked to form a multimodal network;

- Stuttgart made a bid to be a shop window project for the National Platform for Electromobility;

- The Business Innovation unit of Daimler AG will work with partners including the Stuttgart integrated transport system (VVS) and Stuttgarter Straßenbahnen AG (SSB AG) to offer a multimodal network of transport providers and a jointly operated electronic information and payment system.

In section 2 we have already discussed some differences between strategies designed at the level of large administrative regions and those that are designed for a functional metropolitan area. The latter are often more local, horizontal and integrated strategies where research and technological innovation is integrated in a broader, more holistic conception of metropolitan development, which not only aim for impact on economic competitiveness but also include strategies to address local societal challenges (e.g. the 'Growth with Vision' strategy of **Hamburg)**. At the regional level the development plans actually always address certain societal challenges, and RTDI is often merely one of the policy domains. This type of programme or strategy refers to, or is similar to the Structural Funds operational programmes, where RTDI is one of the policy domains. For metropolitan areas such development strategies often also include remedies to address governance challenges, which shows that governance in metropolitan areas can indeed serve as a barrier or driver for the development of innovation strategies and implementation of policy measures. For several metropolitan areas improving governance for instance involves developing *polycentric* approaches (e.g. in **Stockholm**, and **Bucharest).**

---

[27] http://studyvisits.cedefop.europa.eu/index.asp?cid=2&artid=8029&scid=74&artlang=EN&per_id=2555

For the selected largest metropolitan areas the policy documents which specifically involve regional research and innovation policy, mostly do not explicitly mention social innovation among their main areas of focus. They do refer to societal challenges, but more in terms of global challenges, research excellence, and technological innovations. However, in several of such innovation policy strategies there is a clear reference to elements of social innovation, e.g. in the case of **Stockholm** and **Catalonia *(including Barcelona metropolitan area).***

The 2010-2013 **Catalan** Research and Innovation Plan (PRI)[28] for instance is based on two strategic approaches (in which elements of social innovation are integrated with the more traditional concept of research and innovation):

- *Systematic:* promoting an ecosystem made up of knowledge generation, innovative production activity, public sector, and an active society and citizens who co-create and co-innovate in local and global knowledge and innovation communities. This system must have sufficient resources and appropriate governance to drive projects and accommodate the interests of all for the common good.

- *Demand oriented:* focusing the generation of new knowledge, products, services and processes on real demands and needs arising from challenges and directing the socioeconomic value of knowledge and innovation at Catalonia's different spheres and regions.

Barcelona is one of the four provinces of the autonomous community of **Catalonia**. The Ajuntament de Barcelona (part of the Barcelona City Council) has initiated the 22@Barcelona project, which is an innovation project that integrates various concepts of innovation as it combines the objective of "urban renewal, economic renewal and social renewal". In 2000, 22@District began as a government initiative to transform the historic cotton district of Sant Martí, which was in decay and ripe for redevelopment, into a centre of knowledge intensive activities. Through the Digital District program, 22@Barcelona stimulates and supports innovative projects that foster both the use of new ICT technologies and the collaboration of citizens and professionals with social, educational and cultural organizations in the district. The 22@Living Labs, operated by both public and private actors, are oriented to the development of new mobile products and services, and are part of the Catalan Network of Living Labs. This innovative regeneration project has created new employment, housing and live-work spaces through five knowledge-intensive clusters: ICT, Media, Bio-Medical, Energy, and Design. Barcelona's international community and many of the high-educated citizens lacked a certain level of engagement with the city, as they merely used it as a stepping-stone. One of the ideas behind the project was to pro-actively engage those individuals and firms and integrate them more into Barcelona's society and professional realm.

The next section discusses social innovation policy models and concepts and provides individual examples of projects which are piloted or already have shown to be good practice.

3.4.2 Promoting social innovation and social entrepreneurship

Social innovations can be described as innovations that are social both in their ends and in their means. It involves new ideas (products, services and models) that simultaneously meet social needs (more effectively than alternatives) and create new social relationships or

---

[28] http://www.rim-europa.eu/index.cfm?q=p.policy&n=13377

collaborations[29]. Another broad concept is that of social entrepreneurship: The community's social, societal and environmental interests are being encouraged to be served by social entrepreneurship. Other than mere profit maximization, the targets are to contribute to social cohesion, sustainability, employment and reduction of inequalities through socially innovative goods or services, organization or production methods. An EU communication describes two kinds of social enterprises: those businesses providing social services to vulnerable persons, and businesses with a method of production of goods or services with a social objective[30]. Social entrepreneurs or social enterprises[31] typically also include bodies with a specific legal status, such as associations, foundations, and cooperatives. It is estimated that the share of population involved in social entrepreneurship is 4.1 per cent in Belgium, 7.5 per cent in Finland, 3.1 per cent in France, 3.3 per cent in Italy, and 5.7 per cent in the United Kingdom. Approximately one in four businesses founded in Europe would be a social enterprise.

Liverpool's top social enterprises were honoured in September 2012 at the first 'Merseyside Social Enterprise Awards'. It was organized by the Social Enterprise Network (SEN), who acknowledged not-for-profit organizations that are making a real economic, social or environmental difference in their local communities. The winners included Bulky Bob's, which collects, recycles furniture and white goods on behalf of councils. The Mayor's Award for Social Innovation was won by Liverpool's world-leading female enterprise agency, The Women's Organisation. Enviropool, from Hunts Cross Primary School, won the School Enterprise Challenge. More than 70 entries were received. The very best of Merseyside's social enterprise talent were celebrated across 11 categories. SEN is an organization created by social entrepreneurs, for social entrepreneurs. Based in Merseyside for 12 years, it provides a network for not-for-profit businesses, community and voluntary sector organizations.

Innovation Manchester is an action-focused network "of people who know that what's good for Manchester is also good for them". Business leaders, entrepreneurs, researchers and public sector decision-takers are cooperating in this network. As a part of the Innovation Manchester initiative, the Manchester knowledge Capital programme has two aims: Developing a feedstock of viable ideas that city partners could develop and support; Making a long term change in how the city works as an innovative place - helping people across sectors to innovate better and faster. To this end, there are several projects designed to give companies a greater competitive advantage, improve skills, and keep talented people in the city. The Manchester Masters project for instance: graduates from Manchester's universities can win a place on a year-long programme where they each experience different roles with a variety of local creative businesses.

BonVenture I and II (which started in Berlin) is a partner for social entrepreneurs who solve pressing social or ecological problems and wish to increase their social impact. BonVenture supports those organizations with advice, financing and networking. Their network of supporters allows for an effective collaboration between the social and economic sector in order to leverage innovative ideas. BonVenture is a social venture capital fund that was established by committed individuals willing to take responsibility for the community. The

---

[29] Open Book of Social Innovation, Murray, Calulier-Grice and Mulgan, March 2010; EC DG Enterprise and Industry, Social Innovation, accessible: http://ec.europa.eu/enterprise/policies/innovation/policy/social-innovation/index_en.htm

[30] EC The EU Single Market, Social Business, accessible: http://ec.europa.eu/internal_market/social_business/index_en.htm

[31] EC (2011) Social Business Initiative; Creating a favourable climate for social enterprises, key stakeholders in the social economy and innovation", COM(2011) 682.

investors dedicate their material and intellectual resources, in order to leverage efficient social or ecological solutions that cannot be provided by the public sector. Another example of a social enterprise supported by BonVenture II GmbH & Co. KG is *Bettermarks*. Founded in 2008, this Berlin-based company aims to improve children´s skills in mathematics, regardless of social or economic background. Bettermarks has developed and runs interactive online learning system for school mathematics that makes it easy for pupils of all ages and from all types of school to learn at home, just as if they were in the classroom. Bettermarks is used both by pupils for private learning and by teachers in school mathematics courses. Using the free basic version for schools, teachers can produce and mark tests, homework and individual exercises that the pupils carry out online. The Bettermarks system offers a chance for all pupils to improve their skills. Also available is an affordable subscription version ("Learning Centre") which helps pupils and parents fill in the gaps in their knowledge themselves, without having to resort to the expense of private tuition.

Enable Berlin is an open-design platform where creative people from various backgrounds meet to: solve challenges together; research, develop and apply collaborative methodologies; share skills, knowledge and insights; and enable locals to take action. Enable Berlin organizes creative sessions, during which a group of designers, artists, theorists, entrepreneurs, public sector, etc., collectively reflect on a specific problem. Through those events they come up with creative solutions to social and commercial challenges.

Amsterdam has various organizations which promote social innovation. The mission of Knowledgeland[32] is "to make our society smarter. We define smart as the ability to learn and to continue to innovate. Learning occurs primarily in interaction with others. So a smart society is a society where people work together". A society in which maximum use is made of the inherent knowledge, talents, experiences, organizations and technology present at every level and in every field: a knowledge society. The challenges of today's society demand new ways of innovation. Tackling them requires knowledge of the people who are directly affected. This demands a socially innovative approach. The Knowledgeland Social Innovation Safari[33] is a one-week program in which 30 participants (selected volunteers, mostly young professionals) from diverse backgrounds work together on complex issues for public and social organizations in Amsterdam. "The best solutions to complex issues are solved by teams as diverse as possible. For one week the perfect social innovation think tank is created. Imagine the thinking power of designers, consultants, social workers, entrepreneurs: all together". This programme is a learning-by-doing program for social innovators, "while solving problems they learn about social design and co-creation". Together with all stakeholders the best ideas that come up during the week are prototyped. In 2012 the six complex challenges in the field of education, diversity, democracy, culture, elderly care, and sustainability were articulated by for instance the City of Amsterdam, district East; Two high schools for children with special needs; Salvation Army, Goodwillcentra Amsterdam; and City Theatre.

The Social Entrepreneurship Academy in Munich[34] pools the competencies and resources of the four Munich-based universities in the field of social entrepreneurship. As a co-investor, the BMW Foundation has supported the establishment of the academy. The main aim of the Academy is to make the concept of social entrepreneurship more widely known and to

---

[32] http://www.knowledgeland.org

[33] http://www.socialsafari.org

[34] http://www.seakademie.de/

increase the popularity and social acceptance of social entrepreneurship. The SE Academy offers a training program for students and professionals and provides specific support to social business start-ups. They also organize the Idea Garage, a social entrepreneurship weekend in Munich. The Idea Garage is a platform for start-up ideas from the field of Social & Sustainable Entrepreneurship. People can learn in what way social start-ups differ from conventional ones. Social entrepreneurs can put their idea to the test in a competition and find co-founders or investors, and get inspired from others.

The UniCredit Foundation, Project Ahead and Euclid Network decided to test social innovation as a tool to advance change in Naples – "a city riddled with problems"[35]. The project was divided into two phases: the competition phase and the implementation phase. During the competition, people submitted their ideas and the best ones were awarded between €7 500 - €10 000. Those winners are now implementing their ideas, and setting up new social enterprises throughout Naples and beyond.

Many of the above mentioned social innovation initiatives have an impact on the public sector. Public sector innovation promoted by innovative public procurement can also be seen as a kind of social innovation and a tool to address societal challenges. Public sector is encouraged to develop and maintain trust and satisfaction in government and governmental public services through their innovative capacity in creating and enforcing laws and rules, ensuring social security, creating favourable institutional framework conditions, providing quality services and responding to the needs of citizens and businesses[36]. Since the public sector is a significant purchaser, improved public procurement practices are expected to foster commercialization of innovative products and services, "public purchasers as launching customers". However, we did not encounter many concrete examples in metropolitan areas. It was mentioned in the case of a few metropolitan areas in the UK and in Stockholm, but at the level of metropolitan areas concrete experiences are certainly not widespread. The Stockholm region reports in the innovation strategy that it must continue to expand its use of procurement as a strategic tool for innovation. It should provide a foundation for structural transformation in the business community while contributing to renewal, quality in the broad sense and efficiency in the public sector.Birmingham Science City was early to recognize the potential to use public sector procurement as a way to stimulate innovation and R&D, in order to simultaneously improve public services and create new market opportunities leading to growth for innovative business. Policy makers in both the UK and Europe are eager to use the power of huge public sector budgets to drive innovation in this way, but there are significant challenges in putting the principle into practice. Thus BSC has been working for a number of years to develop demonstrator projects with Birmingham City Council – Europe's largest local authority; the Council spends over £1bn externally each year commissioning and procuring goods and services[37].

3.4.3. Smart City Initiatives

Broadly speaking, smart cities can be described as user-driven, open innovation ecosystems, in which participatory processes, enabled through for instance social media and crowd sourcing platforms, include the user community in fostering collective urban intelligence and

[35] http://www.socialinnovationeurope.eu/magazine/local-development-and-communities/articles-reports/competing-naples

[36] EC DG Enterprise and Industry, Public Sector Innovation, accessible: http://ec.europa.eu/enterprise/policies/innovation/policy/public-sector-innovation/index_en.htm

[37] http://birminghamsciencecity.wordpress.com/2012/08/07/public-procurement-driving-innovation/

innovation. Smart city innovations can be described as innovative approaches to holistic management of cities' physical, socio-economic, cultural and political and technological assets across all urban domains, typically supported by ICT. A typical example would be the utilization of interconnected ICT-instrumentation to support intelligent decision-making, for instance using smart air quality sensors to inform real-time traffic management.

Various definitions of smart cities place different emphasis on different dimensions of what "smart" can mean in an urban context. A narrow conception considers smart city as based on usage of ICT for better liveability: in particular "smart" computing technologies, notably cloud computing, Internet-of-Things, open and linked data and the semantic web[38]. This type of conceptualization of "smart" city is, however, not purely technology-focused, but also acknowledges the combination of ICT with organizational issues. Toppeta for instance defines a smart city as "combining ICT and Web 2.0 technology with *other organizational, design and planning efforts to dematerialize and speed up bureaucratic processes* and help to identify new, innovative solutions to city management complexity, in order to improve sustainability and livability" (emphasis added)[39]. It implies thus not only technological innovations, but public-sector innovation in a broader sense, building on advances in information technology.[40] As Washburn and colleagues observe, this contribution of ICT to livability is not limited to a particular aspect of urban governance, but covers "all critical infrastructure components and services of a city", ranging from city administration to education, healthcare, public safety, real estate, transportation, and utilities.[41]

A type of policy categorized under Smart Cities are *Smart-grid projects*: Smart grid projects concentrate on efficiency, reliability, economics and sustainability of the production and distribution of electricity through electric grids with the help of information and communications technologies, developed to collect, analyse and respond to dynamic, "big data" and information.

A local-level smart city policy example is the *MEREGIO Smart Grid* from Stuttgart**:** ABB is a partner in an award-winning smart grid project to cut energy consumption and minimize CO_2 emissions by integrating an entire power grid system – generation, distribution and consumption - into a single, interactive real-time network. The objective of the project is to create an optimized and sustainable power network that reduces CO_2 emissions to as close to zero as is technically feasible and humanly possible – a so-called Minimum Emissions Region (MEREGIO)[42].

A multi-level smart city policy example is the Smart Cities project (http://www.smartcities.info), which aims "to create an innovation network between governments and academic partners leading to excellence in the domain of the development

---

[38] See an overview of technology trends in Komninos, N., Schaffers, H., Pallot, M. (2011). Developing a Policy Roadmap for Smart Cities and the Future Internet. e-Challenges e-2011 Conference Proceedings.

[39] Toppeta, D. (2010). The Smart City Vision: How Innovation and ICT Can Build Smart, "Livable", Sustainable Cities. The Innovation Knowledge Foundation. Available from http://www.thinkinnovation.org/file/research/23/en/Toppeta_Report_005_2010.pdf

[40] Nam, T., Pardo, T. (2011). Smart City as Urban Innovation. Focusing on Policy, Management, and Context. ICEGOV 2011 Conference Proceedings.

[41] Washburn, D., Sindhu, U., Balaouras, S., Dines, R. A., Hayes, N. M., & Nelson, L. E. (2010). Helping CIOs Understand "Smart City" Initiatives: Defining the Smart City, Its Drivers, and the Role of the CIO. Cambridge, MA: Forrester Research, Inc. Available from http://public.dhe.ibm.com/partnerworld/pub/smb/smarterplanet/forr_help_cios_und_smart_city_initiatives.pdf.

[42] MEREGIO, http://www.meregio.de/en/

and take-up of e-services, setting a new baseline for e-service delivery in the whole North Sea region".

Next to the "narrow" smart cities conception, there also is a broader conception of smart cities that is linked to the concept of "intelligent cities". Rather than emphasizing of the combination of ICT innovation and public-sector innovation, this conception focuses more on "smart" performance and intelligent networks based on interconnectedness of human and physical infrastructure as driving force of (participatory) urban innovation systems, and is thus not necessarily ICT-enabled. A smart city, according to this conceptualization, can for instance be defined as: a "city well performing in a forward-looking way in economy, people, governance, mobility, environment, and living, built on the smart combination of endowments and activities of self-decisive, independent and aware citizens".[43]

A multi-level example that fits this type of smart city policy is the European Platform for Intelligent Cities – EPIC (http://www.epic-cities.eu/content/smart-cities) – is a European Commission-funded project (CICT PSP) that aims to wed state-of-the-art cloud computing technologies with fully researched and tested e-Government service applications to create the first truly scalable and flexible pan-European platform for innovative, user-driven public service delivery.

3.4.4. Living Labs

The number of living labs is increasing very fast, but not always as a new, separate policy instrument, but for instance as a new element in existing cluster policy[44], or centres of excellence, or technology transfer facilities. Living labs can be described as user-centred, open innovation systems, which facilitate collaborative innovation processes of researchers, companies, users, and public sector that are locally bound, taking place in an embedded experimental setting. Often, but not necessarily, living labs are situated in a smart city context, which makes it an especially relevant tool for social innovation in metropolitan areas: "A Living Lab is a user-driven open innovation ecosystem based on a business – citizens – government partnership which enables users to take an active part in the research, development and innovation process"[45]

Niitamo et al. (2006) describes living labs as Public Private Partnerships *"in which firms, public authorities and citizens, work together to create, prototype, validate and test new services, businesses, markets and technologies in real-life contexts"*[46]. Real-life contexts both stimulate and challenge research and development as public authorities and citizens not only participate, but also contribute to the innovation process. Living Labs are therefore

---

[43] Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanović, N., & Meijers, E. (2007). Smart Cities: Ranking of European Medium-Sized Cities. Vienna, Austria: Centre of Regional Science (SRF), Vienna University of Technology. Available from http://www.smartcities.eu/download/smart_cities_final_report.pdf.

[44] E.g. the restaurant of the future is a living lab located at the University campus that was set up as a cluster-policy project by Food Valley, a cluster organisation in Gelderland. See p. 23 of the RIM Regional Report http://www.rim-europa.eu/index.cfm?q=p.file&r=39cc3eee94cc8564dfe3eda0a58438e5

[45] European Commission Information Society and Media, Unit F4 New Infrastructure Paradigms and Experimental Facilities. Living Labs for user-driven open innovation. An overview of the Living Labs methodology, activities and achievements:, Accessible: http://ec.europa.eu/information_society/activities/livinglabs/docs/brochure_jan09_en.pdf)

[46] Niitamo, V.-P.; Kulkki, S.; Eriksson, M.; Hribernik, K. A.: State-of-the-art and good practice in the field of living labs, Proceedings of the 12th International Conference on Concurrent Enterprising: Innovative Products and Services through Collaborative Networks, Milan, Italy, 2006, 349-357.

environments for experimentation in which technology is given shape and (end) users are considered "co-producers" of the concerning innovations. [47]

The fact that metropolitan areas are strong in terms of research taking place in government research labs makes the concept of living labs even more relevant, since these organizations are often asked to do research that address societal needs.

A local-level policy example is given by the range of living labs developed by the Waag society in Amsterdam, including an Open Design Lab, Creative Learning Lab, and the Wetlab. The latter focuses on life sciences and the design and ethics of life. Industry, artists, scientists and designers, are involved, but also the political forces and the public. Via a hands-on approach the public itself enters in contact and interacts with the technology. The Wetlab also offers a platform for debate on the usefulness and desirability of Life Sciences in society.

There are also multi-level policies aimed at Living Labs, such as networks in Europe where cities exchange practices and learn from each other concerning Living-Labs. One example of such a networks is the FIREBALL project(http://www.fireball4smartcities.eu/?page_id=2) This project promotes and facilitates learning among actors and cities who are interested in the domain of Future Internet research of innovation. The projects revolve around research and experimentation (including test-beds and experimental facilities), User driven open innovation (such as in Living Labs), and City innovation environments (representing the demand side). Fireball showcases are accessible, including cases from metropolitan areas such as Amsterdam, Barcelona, Lisbon, and Helsinki. Another example of cross-European Living Labs networks is the ENOLL European Network of Living Labs (http://www.openlivinglabs.eu).

3.4.5 Collective Awareness Platforms and Open data

Collective Awareness Platforms and Open data should rather be seen as classes of tools that facilitate the above trends such as smart cities or living labs. For Collective Awareness Platforms (CAPs), the EC is pushing the research agenda and has a dedicated website where CAPs are broadly described as ICT-based platforms that support the creation of "distributed situational awareness", i.e. bottom-up, up-to-date and relevant knowledge ("situational awareness") that is generated by a collective/community, rather than selected actors, through open access ("distributed") and shared through ICT networks ("platforms"). Fundamental elements are user-generated knowledge, distributed (rather than central) control of internet, and the society/community (rather than individuals/businesses) as key agents. ICT play a central role by leveraging network effects to create (social) innovations, by combining social media and data from internet sources.

A local-level CAPs example is the London Datastore (http://data.london.gov.uk). Next to being aimed at opening up data held by the Greater London Authority (GLA) for open use, this platform is aimed at providing a community for developers that use this data to create IT tools and "apps" (applications) for public use.

An example at international level is Urban Eco Map (http://urbanecomap.org), which is a global platform aimed at creating people's awareness to take eco-conscious decisions at local level by providing them with suggestions for concrete actions to take in order to reduce their carbon footprint. On the website, people can for instance look up emission levels in their

---

[47] Ballon, P., Pierson, J. and S. Delaere. Open Innovation Platforms for Broadband Services: Benchmarking European Practices. Proceedings of 16th European Regional Conference, Porto, Portugal, September 4-6, 2005.

neighbourhood, explore their own "priority portfolio" and receive recommendations for concrete steps to reduce carbon emissions that take into account their preferences.

Many more examples are listed by the European Commission on its dedicated website for CAPs[48].

"Open data" is the application of the "openness" principle to the realm of data. Open data can be defined as all data (from public and private sources) that can be readily and easily consulted and re-used by anyone with access to a computer[49] (see also www.opendefinition.org).

Examples of initiatives to promote open data applications include for instance open data catalogues by cities (e.g. Vienna[50]), national governments (e.g. the Netherlands[51]) or at European level[52]. Open data provides free and vast material for developers to create innovative app that can be used by citizens for instance on their smartphones. An example would be an app that provides a master directory of transport information for commuters and motorists to plan their journey.

A multi-level policy example for practices of open data and applications in a smart city context in metropolitan areas (such as Rome, Paris, Barcelona, Amsterdam and Berlin) is provided by the Open Cities network (http://www.opencities.net). Open Cities is a EU-funded project that "aims to validate how to approach Open & User Driven Innovation methodologies to the Public Sector in a scenario of Future Internet Services for Smart Cities, by leveraging existing tools, trials and platforms in Crowdsourcing, Open Data, Fiber to the Home and Open Sensor Networks". It has a specific focus area on Urban Living Labs that attempts to implement Living Labs methodologies to Smart Cities. It tries to bring together the mutual learning needs of industry (how to better fit their products with users and real-life environments) and of city governments and citizens (how to foster innovation and create innovative urban environments) in experimental encounters. For instance, the website features "challenges" where citizens are asked to launch ideas such as for example new crowd sourcing initiatives.

3.4.6 Smart specialization strategies in metropolitan areas

In a global perspective, addressing societal challenges has become a kind of smart specialization strategy of Europe as it is at the core of the Europe 2020 strategy and Horizon 2020. Social innovation is a broad concept that is used here as innovations which address societal challenges, and with social innovation policies and initiatives we mean all deliberate actions and interventions to promote social innovation. There are several differences between the concept of social innovation and the conventional concept of innovation (and innovation policy), since the objective of social innovation policy goes beyond targeted impact on economic competitiveness, beyond technological innovation, beyond innovation in companies and markets, and beyond triple helix actors, since also citizens and volunteers often have a prominent role. What is new in smart specialization strategies (a pre-condition to get the EU Structural Funds) is that it is a governance system by which the EU level asks the regional level to articulate differentiation strategies based on dynamic comparative advantages in the

---

[48] http://ec.europa.eu/information_society/activities/collectiveawareness/links/index_en.htm

[49] Schellong & Stepanets (2011). Unchartered Waters: the state of open data in Europe, CSC.

[50] http://www.wien.gv.at/english/politics-administration/open-data.html

[51] https://data.overheid.nl/

[52] http://open-data.europa.eu/open-data/

innovation potential of "spaces" (functional regions).[53] While in the past decades regions were asked by the EU level to converge by adopting 'best practice', in other words: develop imitation strategies. The diversified service economies that large metropolitan areas have, makes it difficult to choose to specialize in only a few niches, or sectors. Also the fact that on average public research is the main type of R&D makes that the knowledge base of metropolitan areas is often quite diversified. In addition, also the non-exporting service sector and the public sector are in general more diversified than industrial sectors. Innovation policy of metropolitan areas is therefore often more generic and less focused on specific sectors or technology fields. Typically the metropolitan areas are more engaged in generic policies, e.g. to enhance amenities which can help in attracting high educated people, as suggested by Glaeser (2011)[54]. In this respect metropolitan areas are often engaged in city-marketing and competing with each other in attracting the same (food-loose) human resources and investments. Storper and Scot (2009)[55] argue that this approach is neglecting the functioning of metropolitan areas as dynamic systems of production and innovation and they recommend policies which promote collective 'internalization of externalities' and 'localization of interdependencies'. This recommendation fits with the localized dynamics which is described in most social and sustainable innovation practices. Actors which are particularly strong in metropolitan areas include (national or regional) government research labs, public sector (providing national, regional or local services) and creative industries. Within the Smart Specialization Strategies at regional level social innovation policies in metropolitan areas can play an important role, since the interaction among these local actors can strengthen the chosen specialization trajectory at regional level; e.g. by embedding and exploiting the knowledge of the government research organizations and the creative industries into local experiments which involve public sector and citizens in addressing societal challenges with co-produced social innovation.

4. Discussions: Towards the Societal System of Innovation

In the sections above; we observed that metropolitan areas are the gateways in providing access to social and technological infrastructure, research, knowledge, and innovation excellence; thus, they have transformative capacities and capabilities to address societal challenges, and to turn local solutions into global opportunities. In this respect, metropolitan areas are also lead-markets for social innovations. They are key scientific and economic areas and driving forces of societal interaction and progress. A metropolitan area innovation policy addressing its specific societal challenges help metropolitan areas in providing favourable conditions for effective interaction and synergies between social participative dynamism and innovative economic efficiency. Multi-dimensional governance is important for metropolitan areas because these areas fulfil functions at several levels, and they host actors which function at various levels and domains. Local level is in general not the most appropriate level of governance for conventional research policies. Regional innovation strategies are mostly concerned with the more technological and research oriented supply-side innovation policies. At a lower level, in local strategies in metropolitan regions we find more examples of demand-side innovation policy initiatives, promoting localized applications addressing local societal challenges. The conventional policy solutions to the conventional innovation policy

---

[53] Patries Boekholt (2011) Case Studies Smart Specialisation: Vertical Case studies, 2nd Draft Structure of the Case Study Reports.

[54] Ed Glaeser (2011), "Triumph of the City".

[55] Storper, M. & A. J. Scott (2009), "Rethinking Human Capital, Creativity and Urban Growth". Economic Geography (9) 147 – 167.

challenges concerning the valorization of results from science and research are being complemented by social innovation policies, e.g. incubators and entrepreneurship policies in metropolitan areas including legal and social infrastructure support to start-ups based on social innovations developed by social entrepreneurs. Concerning innovation in the public sector we can conclude that the solutions not always come from more R&D or new technologies, but it also calls for social innovation initiatives. An additional reason why we did not find more policy projects and strategies for addressing societal challenges in the RIM regional reports is also that many initiatives do not rely on public funding and the initiative can be quite informal, and depend on crowd-funding and grant-making. Addressing societal challenges calls for development of new governance and systematization perspectives, such as 'next to merging' of local administrative units into additional levels of administration. It is important to also have voluntary cooperation among local units (as in the case of Stuttgart), because local municipalities can discuss what the appropriate, functional level of governance is to address a specific societal challenge. In a sort of ex-ante policy evaluation the subsidiarity principle can be applied, resulting in a decision that it could be best to either tackle the concerning challenge at the local level or by voluntary partnerships and cooperation (e.g. among the local administrations which share the same challenge) or it can result in a decision to involve an even higher regional level of territorial governance. Even when metropolitan areas have special autonomy (as is the case in London and Prague) the quality of government remains a challenge. Many knowledge intensive actors favour metropolitan areas due to positive returns to agglomeration. Through their involvement in social and sustainable innovation projects, actors internalize these advantages and increase their embeddedness in the region. One of the typical strengths of metropolitan areas in terms of innovation is the presence of government research organizations, which is largely based on national strategy and funding (or regional in the case of high autonomy of the concerning regions). The government research institutes and the universities are often engaged in society relevant research, which makes them relevant actors for addressing local societal challenges and relevant participants in local social innovation initiatives, living labs or smart city initiatives. The functional area of many actors located in metropolitan areas exceeds the borders of the metropolitan area, although involvement in local social innovation initiatives can be coherent with and complementary to the missions of such institutes at a higher level/larger functional region. In the same way, local social innovation policies can complement regional smart specialization strategies. Sustainable concentration of energy-smart infrastructures, networks of metropolitan area scientific institutes, highly specialized-but-connected service providers, public-private partnerships, multi-level policy making, innovative public sector and participatory metropolitan citizens are contributory factors in the success of innovation policy in metropolitan areas in efficiently and effectively addressing societal challenges.

Table 1 –Interactions between three systems of Innovation in Metropolitan Areas

The Societal System of Innovation	Regional SI	Local SI	Social SI	Action/Event	Case
Interactions and Organization of these Interactions between special-case systems	✓	✓	✓	Interaction or organization of interactions between Regional, Local, Social actors	**Metropolitan Area**

Up till now, the performance of metropolitan areas in innovation scoreboards is mostly based on their concentrated agglomeration in terms of generating patents, knowledge intensive and creative industries and high-educated. Increasing the benefits of the concerning assets for

welfare and well-being in these metropolitan areas call for social innovation policies which transform innovation systems into innovation societies by stimulating innovative behaviour and interaction among a broad range of actors, including citizens and actors from the public sector. Actors which are particularly strong in metropolitan areas include: government research labs, public sector, universities, social entrepreneurs and creative industries. Within the Smart Specialization Strategies at regional level and social innovation policies in metropolitan areas can play an important role, since the interaction among these local actors can strengthen the chosen specialization trajectory at regional level; e.g. by embedding and exploiting the knowledge of the government research organizations and the creative industries into local experiments which involve public sector, and citizens, and social entrepreneurs in addressing societal challenges with co-produced innovation connected to sectoral domains.
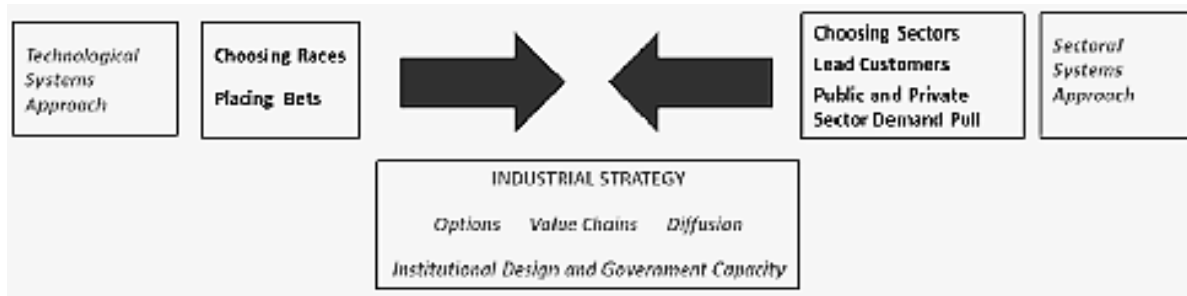
Figure 5– Interaction of Regional and Sectoral Systems in Smart Specialization
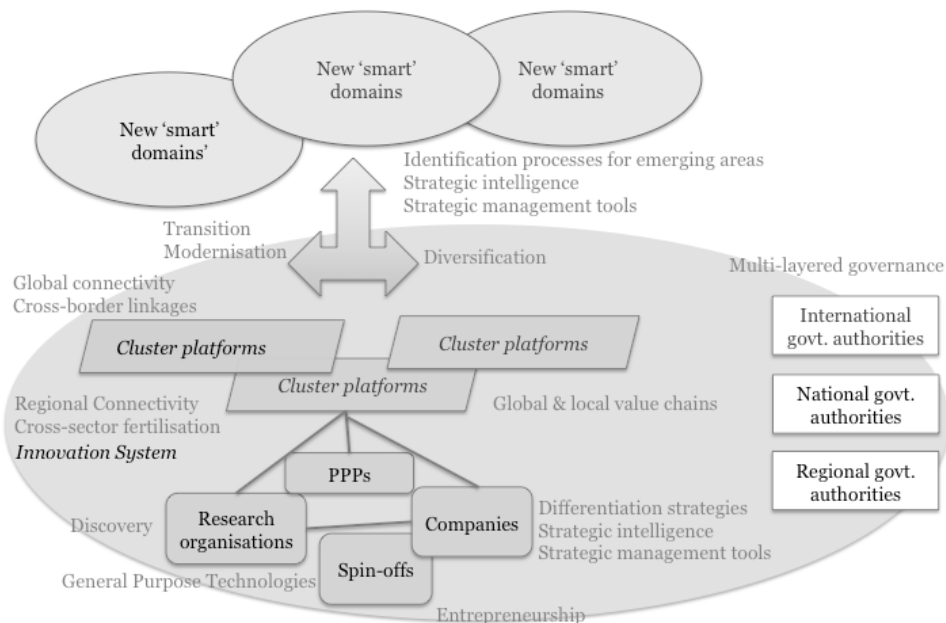
Source: Technopolis (Boekholt, 2011)

It is indeed dependent on exploration and exploitation of these interactional and organizational arenas of a potential societal system of innovation where new jobs, skills, and businesses most likely come from in a knowledge-oriented society. For instance, cross-border regional science, technology and innovation activities necessitate cross-border policies, and if regional discretion is not in place, organized interaction between these interactional systems and regional and national systems of innovation is required. OECD (2013) *Regions and Innovation "Collaboration across borders" Report* defines this interaction in terms of key recommendations on the governance of cross-border collaborations by giving politicians a reason to care about the issue, understanding that their time horizon and motivations are generally short term, and identifying for national (supra-national) governments where they can help cross-border efforts. Furthermore, a cross-border regional cooperation between scientific excellence partners in an emerging field of technology (say energy) of a technological system of innovation would necessitate equivalent financial back-up excellence from national systems of innovation, an industrial strategy, or from socio-technical systems of innovation to study demand articulation and commercialization prospects, to report to incumbent and emergent players of sectoral systems of innovation.

Figure 6 – Interaction of Sectoral and Technological Systems in Industrial Strategies

| Technological Systems Approach | Choosing Races / Placing Bets | | Choosing Sectors / Lead Customers / Public and Private Sector Demand Pull | Sectoral Systems Approach |

INDUSTRIAL STRATEGY

Options   Value Chains   Diffusion

Institutional Design and Government Capacity

Source: Crafts, Hughes, 2013 (forthcoming)

InnovationFab, a trademark of Key Management Consult BV is an organization in this interactional field between special-case systems. At socio-technical systems of innovation dimension, the company states that it *"starts by identifying the demand of the end-users [brand owners] and match these demands with a new setting of partners within the value chain in order to reach new product concepts and solutions. These solutions should add more functionality of the products on offer at a lower price point.* From sectoral systems points of view, the company *"aims to facilitate the commercialization of new technological applications at the cross-roads of photonics, electronics and information technology, in the vertical markets of lighting, solar energy, packaging for fast moving consumer goods and healthcare"*. InnovationFab collaborates within *"a grid of organizations bridging the cross-functional and inter-disciplinary areas of photonics, electronics and ICT"*. New solutions are offered *" through a network of 20.000+ experts, advanced pilot and pre-production line facilities, technical feasibilities and relevant market intelligence, public & private funding opportunities"* at regional, national system of innovation and EU FP levels.
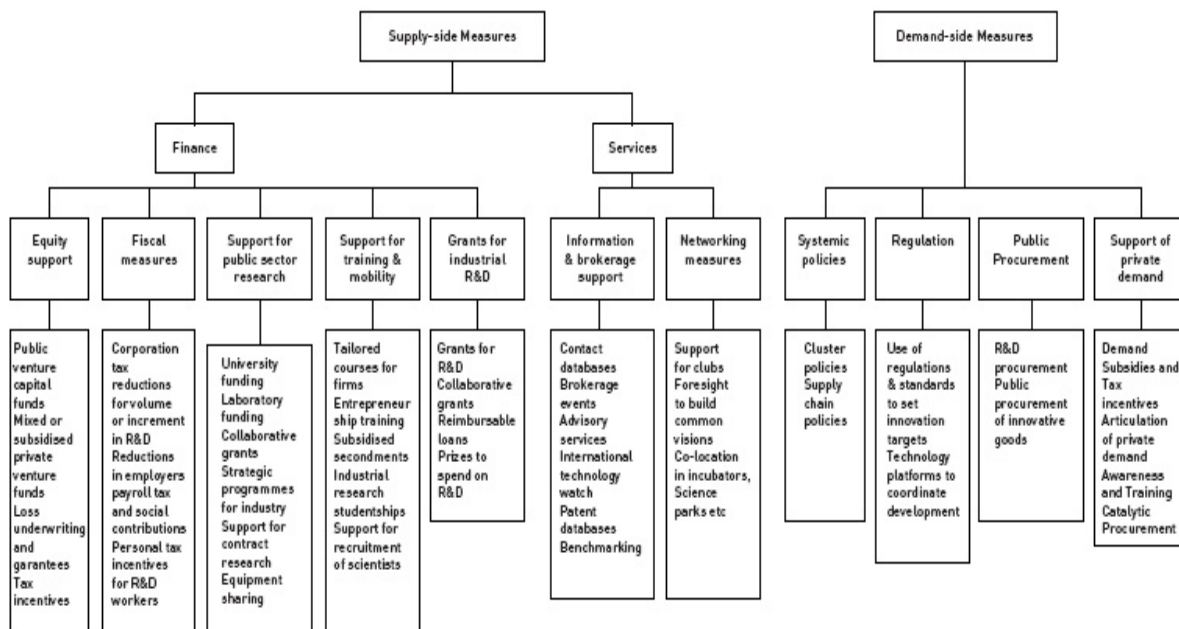
Figure 7– Interaction between Production and Adoption in Socio-Technical Systems
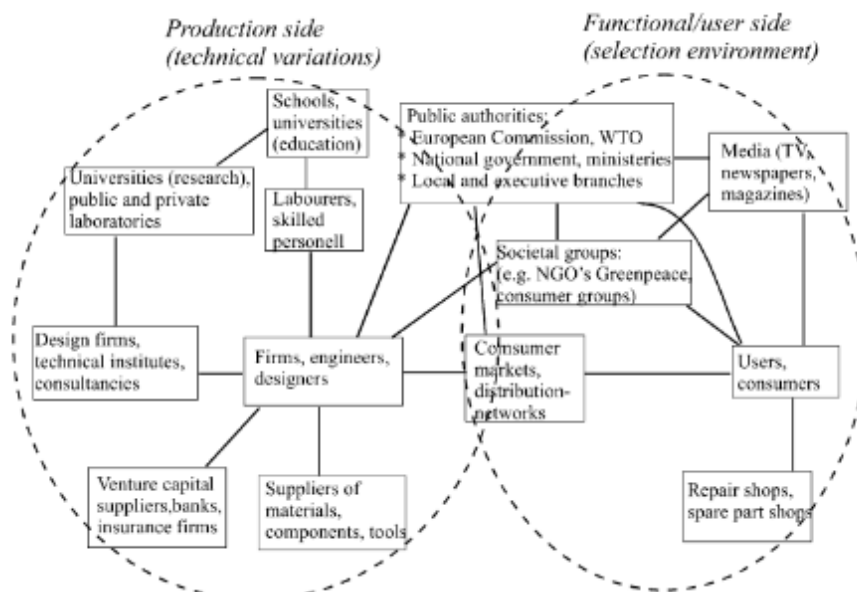
Source: Geels (2004)

Therefore, the societal system of innovation would require a policy (mix) design based on variables measuring interactions.

Figure 8– Interaction between Supply and Demand Side Measures in Policy Mixes

Supply-side Measures							Demand-side Measures			
Finance					**Services**					
Equity support	Fiscal measures	Support for public sector research	Support for training & mobility	Grants for industrial R&D	Information & brokerage support	Networking measures	Systemic policies	Regulation	Public Procurement	Support of private demand
Public venture capital funds Mixed or subsidised private venture funds Loss underwriting and garantees Tax incentives	Corporation tax reductions for volume or increment in R&D Reductions in employers payroll tax and social contributions Personal tax incentives for R&D workers	University funding Laboratory funding Collaborative grants Strategic programmes for industry Support for contract research Equipment sharing	Tailored courses for firms Entrepreneurship training Subsidised secondments Industrial research studentships Support for recruitment of scientists	Grants for R&D Collaborative grants Reimbursable loans Prizes to spend on R&D	Contact databases Brokerage events Advisory services International technology watch Patent databases Benchmarking	Support for clubs Foresight to build common visions Co-location in incubators, Science parks etc	Cluster policies Supply chain policies	Use of regulations & standards to set innovation targets Technology platforms to coordinate development	R&D procurement Public procurement of innovative goods	Demand Subsidies and Tax incentives Articulation of private demand Awareness and Training Catalytic Procurement

Source: Edler and Georghiou (2007, p. 953).

Standard approaches in production, dissemination (Supply-side measures), and use, adoption measures (Demand-Side) of science, technology and innovation are blind to progressive exploration and exploitation of the value intrinsic to evolving societal capabilities. Multi-dimensional complexity of grand challenges reminds us of the fact that bounded rationality of each actor, historically and spatio-organizationally, does only partially target relevant (political, administrative, economic, financial, technological, social, ecological...) uncertainty reduction strategies. The partial complexity could be partially decomposed, reflecting the actors' core activity field. It is indeed these natural and nurture-based partialities that have accumulated the structured problems into reached consensuses, or into unstructured problems of the on-going conflicts of current times such as climate change, global epidemics, and social exclusion (Hoppe, 2011). This situation has direct implications for science, technology and innovation, their cognate policy systematization and life-world for innovation.
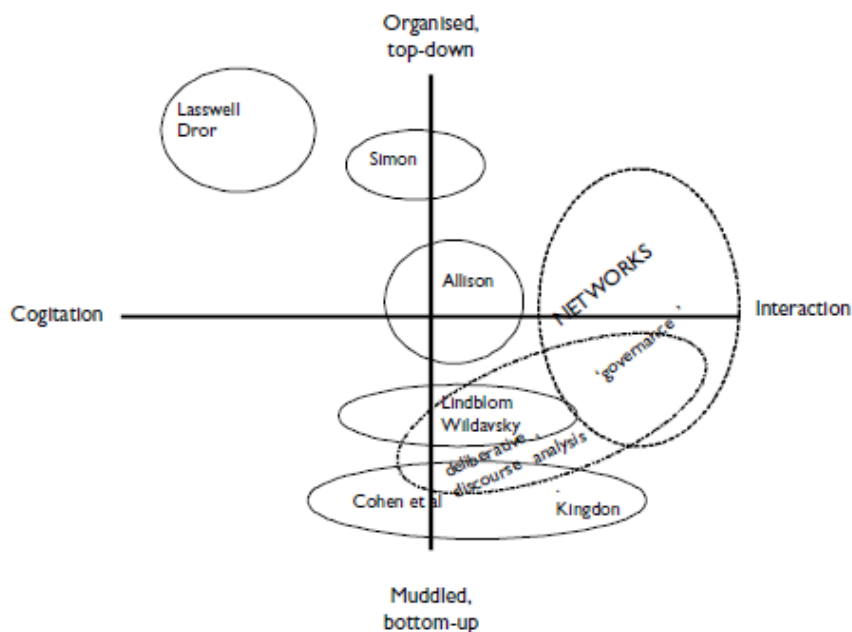
For measurement concerns, variables organized in multi-dimensional data structures other than scalar data types should be vectors and tensors. A scalar is a physical quantity that can be represented by a dimensional number at a particular point in space and time; say (number of researchers in Region R, 25.000). A vector is to keep track of two pieces of information (typically magnitude and direction) say in a three dimensional space (5 per cent annual rate of change in number of researchers in Region R, 10 per cent annual rate of change in number of publications in Region R, 15 per cent annual rate of change in received citations in Region R), this organized data structure is a vector (5, 10, 15). In order to incorporate new quantitative, hybrid and qualitative data structures and scales[56] to policy design, the learning interface

---

[56] This interactional system does not only necessitate new data structures but also new societal level (public, private) data, such as big data. In addition to big data, self-data revelations are also needed for a deepened response to this widened

between scientific and political/administrative actors of national innovations systems is defining for communicating, consulting with citizens in a socio-technical systems of innovation view to articulate different economic, social, political values, motivations, and perspectives for science in society, say being a researcher, in above given example, or regulating/adopting a new technology. It is the characteristics of the organization of interactions between special-case innovation systems which enable ground for further diversity creation. Selection redefines boundary issues of challenges through diversifying portfolios in technological, social innovations that will take place, be offered in markets and societies.

Hoppe (2011) states *that "governance-of-problems approach... aspires to rebalance, however tentatively, the cogitative and the interactive dimensions in network thinking"*. From political science perspective this interactional and organizational system between its special-case systems (state and market) is the networks where states and markets are of special cases, of lower level systems of the societal system. State readiness and market readiness are bounded to network readiness of interaction and organization of interactions in between. In a similar way, readiness of a regional system of innovation and a sectoral system of innovation is bounded to a network of interaction and organizational system of interactions among these systems of innovation to seize the size, embeddedness, connectivity and relatedness of the region and sector; segments of the market such as new to the firms, new to a market, new to a greater geographical region, new to the world, in terms of modernization, transition, diversification, radical change options. We in general see these approaches in smart specialization strategies defined between regional and sectoral systems of innovation.

**Figure 9– Interaction of policy networks for policy decisions in Governance**

Source: Hoppe, 2011, p.124

6. Concluding Remarks: The Societal System of Innovation

The societal system according to Luhmann (1982) is the most comprehensive social system. This comprehensiveness is due to its multiplicity and variety of interactional and organizational systems which makes the societal system itself a system of higher-order (Leleur, 2012). Lower-order systems such as national, regional, sectoral, technological and social systems are functional "nodes and links" systems while the societal system also includes potentially emergent and evolutionary "nodes and links" which are not present, such as absence of an interactional or lack of an organizational system between say technological and regional systems, or more fundamentally, lack of interactional and organizational systems between say the national system and ecology, the nature. In a societal system, perspectives, values, motivations and perceptions held by different individuals and groups (political, administrative, economic, financial, social, technological, environmental…) are all valid, and are taken as objectives as competing and cooperating interests and ideas in communication. These interactions provide ground for evolutionary functions, how functions evolve and change through time, and evolutionary institutionalization (evolving ways of institutionalizing the rules and play of the game).

Figure 10 – Towards the Societal System of Innovation
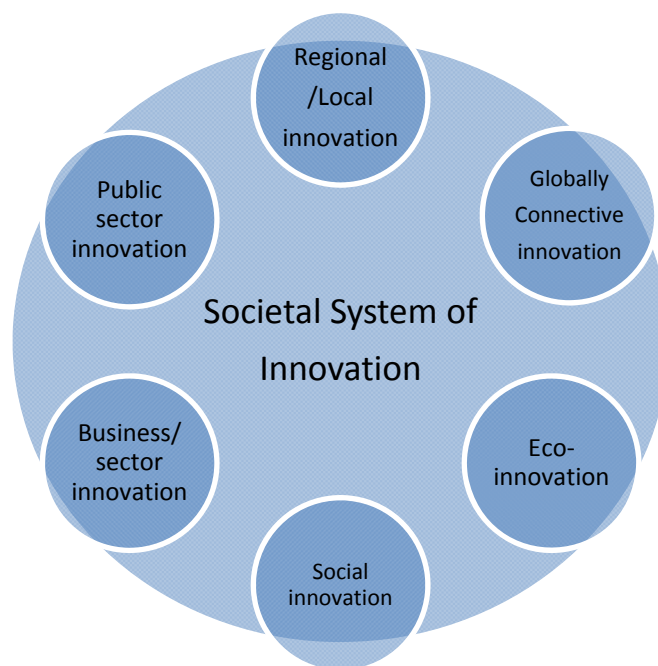
Outcome of a societal function SF (p), where S is a societal function of different profit making criteria, can range between minus infinity to plus infinity: Each actor or group pursue realization of their own rationale-dependent profit criteria. Bounded rationality of each actor (and their core activity domains; economic, political etc.) introduces only *partial* relevance for each actor in addressing an *overarching* complexity which is introduced by a grand societal challenge. Interactions and articulation become not only desirable but also necessary. Aggregated system's value, organizational, operational structures and processes require from actors a sound understanding of each other's objective/profit criteria and how they interact (Warfield, 1978). Kemp and Loorbach (2006) states that there is an increasing interest in how societal aspirations and shared problem definitions articulated.

As competing and cooperating interests and ideas in communication, Tihon and Ingham (2011) depicts the societal system as of 5 spheres: *autonomous individuals* (stylized carrier of socio-technical systems, end users, experts...), *social organizations* (stylized carrier of social systems of innovation...), *state administrations* (stylized carriers of national and regional systems), *profit-seeking enterprises* (stylized carriers of technological and sectoral systems), and finally *the political economic system between*. Considering these political economic systems, Redding (2003) introduces societal systems of capitalism based on three traditions of enquiry. The first one is the Weberian view of combinatory ideational and material foundations of individual (person, end-user, expert, investor...) and societal (organizations of citizens, politicians, businessmen, investors....) behaviour. The second tradition is of Granovetter (1985) who emphasized embeddedness of action in the context through space (geography) and time (history), such as economic actions embedded in a societal stock and flow. The third tradition of studies is business systems, such as technological or sectoral systems as special modes of coordination action in a societal stock and flow (Whitely 1992, 1999; Hall and Soskice 2001). Accordingly, Rotmans (2005) defines a societal pentagon: *government, companies, non-governmental organizations, knowledge institutes and intermediary mediators*. Our argument is that each of these organizations takes place simultaneously in different systems of innovation in a multiplex/multi-layered network.

The societal system of innovation is thus required to be a complex compound yet very simple. Such that, each of the special-case systems and interactions between these systems target different complexities and uncertainty reductions with respect to different economic, political, and social criteria, and each special-case aims to create its own preference portfolio through competing and cooperating with other communicated bounded-rationalities. Therefore, mixes of selection (say in technology or in policy) are not only of vertical (top-down/bottom-up national, regional systems of innovation or technological, social, socio-technical systems of innovation) but also of horizontal and orthogonal systems of selection and retention. Selected combinations are steered by internal forces of the societal system of innovation. Even if a follow-up struggle for life-world for innovation in focus[57] could be challenged by internally or externally introducible challenges of societal kind.

At its functionality vs. design phase, or scientific state or at its demonstration phase, or once a technology comes as an innovation to the markets and societies, it comes to the life-world that all actors experience together. However, perceptions, experiences, values, supply and demand attached towards these designs, functionalities, researches, demonstrations and innovations differ due to state, the ground, prospects, and the future of established affairs in the ways which each actor experiences the common life-world from different sets of scientific, technological and innovative preferences. There is a universal horizon towards which every actor looks at with different criteria of temporal range. Kraus (2013)[58] states that: *"a person's life-world is built depending on their particular life conditions... include the material and immaterial living circumstances... employment situation, availability of material resources, housing conditions, social environment... as well as the persons physical condition (female/male, healthy/sick, etc.)."* If we broaden and deepen the life conditions into professional conditions (for instance, a manager of a sectoral incumbent, a designer, an entrepreneur, an end-user or a policy maker in office) and into the personal situation of the

---

[57] today as the ground interpretation of innovation and tomorrow as the horizon interpretation of innovation

[58] Björn Kraus: Erkennen und Entscheiden. Grundlagen und Konsequenzen eines erkenntnistheoretischen Konstruktivismus für die Soziale Arbeit. Beltz Juventa, Weinheim/Basel 2013. P. 66.

same people after work (as end-user, or a mother) perceptions of research, technology development and innovations become differently due to what benefits and costs, impacts in what temporal frames this research, demonstration or innovation could bring into their own experience when they individually act and into the systems (social, economic, political/administrative) in which they socially act, and have a role and responsibility in.

According to Husserl, therefore, life-world is a collective inter-subjective pool of perceiving, reflexive, based on personal perceptions (Home-world) and inter-subjectivities (Perspectives) that are already embedded in and operating in systems of meanings (that are constituted in national, regional, local, sector-wise, technological, socio-technical, social systems of innovation). Each of these systems are called "home-world(s)" for themselves and limited by other systems. Grassroots are of an example. However, each system can only be appropriated or assimilated into the life-world through communicative action among environments of competences, practices, and attitudes such as S2S (system-to-system), G2G (grassroots-to-grassroots) and deepened contextuality S2G (systems-to-grassroots); and G2S (grassroots-to-systems).

"The 'life-world' is a grand theatre of objects variously arranged in space and time relative to perceiving subjects, is already-always there, and is the "ground" for all shared human experience" Husserl, Edmund. (1936/1970). The Crisis of the European Sciences, p. 142
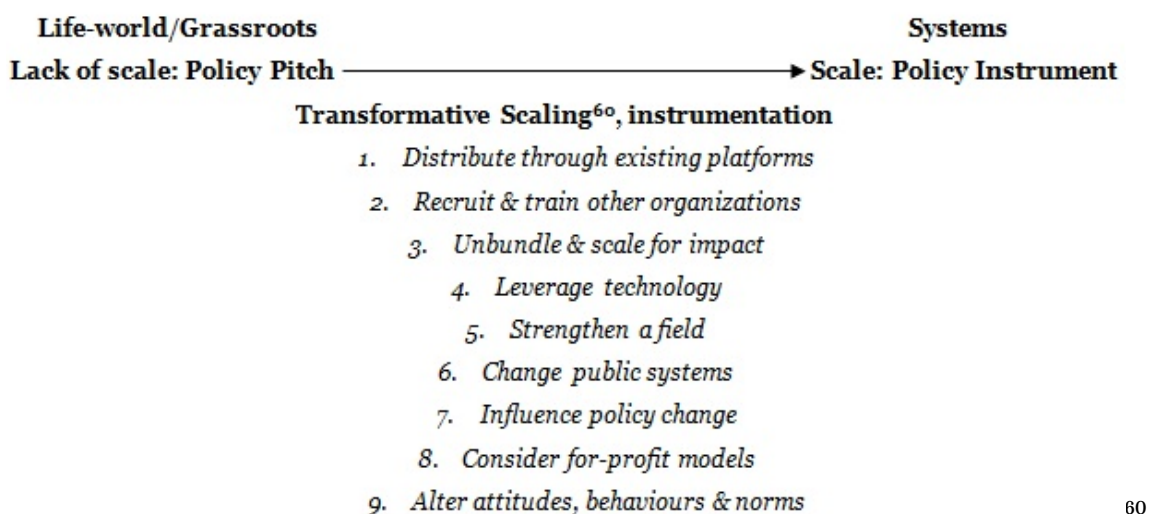
According to Habermas (1981) the features of this communicative act define the appropriation, assimilation or colonization aspects of this integration and in this sense, rationalization and colonization of the life-world by the instrumental rationality of bureaucracies and markets. Societal coordination is only then held by means and ends of shared perspectives, co-practices, value creation processes, and structures of communicative action between institutions and individuals, individual institutions and institutionalized groups of individuals. A widened and deepened system (and life-world) framework should concentrate in a broader sense on presence or lack of co-evolution of interactional and organization of these interactional "system and life-world" between its special-case systems of innovation: national, regional, sectoral, technological, social, socio-technical systems of innovation in production, dissemination and adoption, and people, grassroots. Having noted that, such a system of innovation should also be a structuration bridge between the determinability of mission-oriented view (systemic) and probabilities of diffusion-oriented view (out of the box) in order to bring about the overarching systematization and individualization for the system and life-world for innovation: Freedom, democratization, and Capitalism 2.0 as listed in Sustainable Innovation Conference in 2013 as key lessons[59].

In a view of the arguments above, *The Societal System of Innovation* in this paper calls for a widened and deepened framework over different systems of innovation (through interactions and organization of interactions between different special-case systems of innovation) to understand, explain and expect new societal practices, new contextuality in the field of research, technology development and innovation, and a deepened framework towards the perspectives, perceptions, and beliefs of actors which differentiate the context in which these new co-practices (from co-products to co-organizational forms in living labs and platforms, from co-processes to co-resources, such as big data) emerge and evolve with distinct and overarching societal characteristics. "The societal system of innovation" therefore

---

[59] http://cfsd.org.uk/events/sustainable-innovation-2014/sustainable-innovation-2013-key-lessons/

concentrates on these infrastructures of inter-systemic interactions and organization of these interactions between special-case systems of innovation. Interactions are seen as the complementary source of innovation. This interactional and organizational (of interactions) system targets reduction of uncertainty, increasing flexibility, and decomposition of complexity between these special-case systems, each of which consists of various actors ranging from knowledge personnel, regulatory agencies, industry, intermediaries, citizens communities/demand side: the societal pentagon, as Rotmans (2005) calls it. The societal system of innovation offers being critical over co-governance of production, distribution and use/adoption (widening) of different type of innovation (social, smart, sustainable, eco-innovation…) (deepening). Our framework calls for concentrating on the interactions among special-case innovation systems, organization of interactions among special-case innovation systems, and external mixes of the policy mixes which are internal to each of these special-case systems (supply-side, demand side).

With respect to social innovations, scale defines whether further systemic policy instruments would be needed or not. In case the scale is not of transformative level, we suggest designing policy pitches instead of policy instruments (where the pitched policies are induced ideas and initiatives, and organizing the pitching is the policy instrument). They are not financial incentive- or information-based tools for use of society, but they provide infrastructure and societal spaces for communities to interconnect on the challenges and solutions. It enables to communicate challenges, search for creative contributions, raise funds via crowd-funding, grant-making etc. Policy pitches are not subject to immediate efficiency concerns, but to (inter-) subjective valorization of communities engaged.

Life-world/Grassroots   **Systems**

Lack of scale: Policy Pitch ————————————➤ **Scale: Policy Instrument**

Transformative Scaling[60], instrumentation

1. *Distribute through existing platforms*
2. *Recruit & train other organizations*
3. *Unbundle & scale for impact*
4. *Leverage technology*
5. *Strengthen a field*
6. *Change public systems*
7. *Influence policy change*
8. *Consider for-profit models*
9. *Alter attitudes, behaviours & norms*   60

The status and prospects of the institutional and agent-based organization of these interactions among different SIs and the mix of their special-case policy mixes are evaluated for the cases of social innovation initiatives analysed in Section 4. Our framework presents an analytical tool to initiate or further facilitate the societal system of innovation to cope with the limits and lock-ins of standard approaches in design and delivery of STI, their associated policies, and governance with respect to life-world for innovation. As shown in the table below, the societal system of innovation holds interactional and operational value and motivations for

---

[60] Jeffrey Bradach and Abe Grindle, http://www.bridgespan.org/getdoc/15d77274-10b3-46bc-bdc6-3c7efaad3f7c/Transformative-Scale-Nine-Pathways.aspx#.U1_KDFdZSVN

each sector of societies around the world to design and deliver a coherent and communicative system of innovation in widened and deepened coupling contexts. The organization of interaction between different special-cases of innovation systems provides an analytical approach for multi-perspective engagement into multi-domain solutions and multi-level impacts.

Table 2– The Societal System of Innovation and Empirical Cases in this text

The Societal System of Innovation	Global International Level ← →	National SI ← →	Regional SI ← →	Local SI ← →	Sectoral SI ← →	Technological SI ← →	Socio-Technical SI ← →	Social SI ← →	Emergence	Selected from the text Cases
Interaction of different perspectives, values and motivations	✓ Communications, visions on social innovation	✓ Enhancing legal frame for specific legal status associations, foundations, cooperatives	✓ Greater Community level solutions	✓ Community Level solutions	✓ e.g. Environment, Education, Health Public sector local level solutions	✓ Low-medium sophistication in technologies	✓ Methods of production with a social objective	✓ Social Services to vulnerable	Social Innovation and Social entrepreneurship	Innovation Manchester, Birmingham Science City, Bon Venture, Digital Pioneers, Enable Berlin, Bettermarks, Social Entrepreneurship Munich…
Co-processes and co-structures (organisations) Co-processes and co-structures	✓ Open Innovation Eco-systems	✓ Open Innovation Eco-systems	✓ Collective Urban Intelligence	✓ Urban Intelligence	✓ Base: ICT Towards: Energy, Transportation, Public Sector	✓ Social Media Technologies/ Smart Computing Technologies	✓ User-driven / User community	✓ e.g. Smart Air quality sensors to inform real-time traffic management	Smart City Initiatives Smart Grids	North Sea Region Smart Cities MEREGIO Smart Grid …
	✓ Open Innovation Eco-systems	✓ Open Innovation Eco-systems	✓ New element in Cluster policy	✓ Locally bounded / embedded experiments	✓ e.g. Life Sciences	✓ e.g. Broadband Services	✓ User-centred / real-life contexts	✓ e.g. social innovation in metropolitan areas	Living Labs	The Waag Society in Amsterdam, Open Design Lab, Creative Learning Lab, the Wetlab …
New Tools in form of org. structures to explore and exploit societal level data	✓ Distributed Situational Awareness	✓ Distributed Situational Awareness	✓ Greater Collective Community/Awareness	✓ Community Awareness	✓ e.g. IT tools and apps towards eco-actions	✓ ICT Platforms	✓ User-generated information	✓ Open Access	Collective Awareness Platforms	Local level CAP: London Datastore Global level: Urban Eco Map …
New Resources in to explore and exploit societal level data	✓ For EU: Innovative use of Transparency /accountability enabled data	✓ National level Public and Private data	✓ Regional level Public and Private data	✓ Local/City Level Public and Private data	✓ Public and Private data e.g. IT tools and apps towards eco-actions, transport, food, health sectors	✓ ICT Platforms	✓ User-driven Mutual learning	✓ Non exclusionary access	Open data	Open Cities Network…

Table 3 – The Societal System of Innovation and its generalized framework towards instrument design

The Societal SI	National Sys. Inn. (NSI)	Regional Sys. Inn. (RSI)	Local Sys. Inn. (LSI)	Sectoral Sys. Inn. (SSI)	Technological Sys. Inn. (TSI)	Socio-Technical Sys. Inn. (STSI)	Social Sys. Inn. (SSI)
NSI	(*)	Meso-to-Macro level Policies *(regional discovery process, feedback to national level)*	Bottom-Up Policies *(city-level discovery** process, feedback to national level)*	Sectoral Modernization National level	Technological Modernization National level	Policy Regimes	Policy Take-up
RSI	Top-to-Meso Level Policies *(Regional, cluster-based sectoral discretion)*	(*)	Micro-to-Meso Level Policies *(city-level discovery process, feedback to regional level)*	Sectoral Diversification Regional level	Technological Specialisation Regional level	Landscape	Regulation and Financialization
LSI	Top-Down Policies *(National city-level priorities...)*	Meso-to-Micro Level Policies *(regional discovery process, feedback to city level)*	(*)	Sectoral Specialisation Urban City Level	Technological Diversification Urban City level	Landscape development	Hubs and Incubators
SSI	Top Sectoral Policies *(National sectoral priorities...)*	Regional Specialisation and Connectivity	Embeddedness	(*)	Technological Portfolios	Patchwork of regimes	Sectors of Challenges *(Energy, environment. Health, Education...)*
TSI	Top Priority Technology Policies *(National technological priorities...)*	Regional Relatedness and Scale	Excellence	Sectoral (Incremental, Substantial, Radical) Change	(*)	Technological Niches	User driven innovation
STSI	Top New Market Support Policies *(National market creation priorities...)*	Regional Transitions	Local Transitions	Sectoral Transformations	Co-Design	(*)	Demand Articulation
SSI	Grand Societal Challenges *(National social priorities...)*	Collective Awareness Platforms	Smart Cities, Living Labs	Sectoral Open data	Big data-enabled Applications	Socio-cultural Regimes	(*)

(*) Interaction with other systems of the same kind. Interactions with different type of systems at different spaces (such as Sectoral Systems in the NL and Technological Systems in Ghana), (**) discovery includes financial aspects.

.

References

Alain Tihon and Marc Ingham (2011) The societal system and responsible innovations: Freeing sustainable development from a deadlock», Journal of Innovation Economics 2/2011 (n°8), p. 11-31. URL : www.cairn.info/revue-journal-of-innovation-economics-2011-2-page-11.htm. DOI : 10.3917/jie.008.0011.

Baier, E. (2012), RIM regional innovation report Bavaria. Available: http://www.rim-europa.eu/index.cfm?q=p.file&r=06975aebe810e80a602b770053b226ee

Baker, R. (2012), "Focusing on functionality; changing approaches to economic development in England". In: OECD, Redefining "Urban": A New Way to Measure Metropolitan Areas, OECD Publishing. doi: 10.1787/9789264174108-en.

Ballon, P., Pierson, J. and S. Delaere. Open Innovation Platforms for Broadband Services: Benchmarking European Practices. Proceedings of 16th European Regional Conference, Porto, Portugal, September 4-6, 2005.

Boudrea, J. A. (2010) Metropolitan governance, in: R. Hutchinson (Ed.) Metropolitan Governance, London: Sage.

Brenner, N. (1999) Globalisation as reterritorialisation: The re-scaling of Urban governance in the European Union, Urban Studies, 36(3),Charron, Nicholas, Victor Lapuente and Lewis Dykstra (2012). "Regional Governance Matters: A Study on Regional Variation in Quality of Government within the EU" (forthcoming in Regional Studies). Data available: http://www.qog.pol.gu.se/data/datadownloads/qogeuregionaldata/

Cooke (2010), Regional innovation systems: Development opportunities from the 'green turn'. Technology Analysis and Strategic Management, 22, 831-844.

Coenen, L. & F.J. Diaz López (2009) "Comparing systems approaches to innovation and technological change for sustainable and competitive economies: an explorative study into conceptual commonalities, differences and complementarities". Paper no. 2009/12. CIRCLE, Lund University.

ESPON (2007), 'Study on Urban Functions' Accessible at: http://www.espon.eu/main/Menu_Projects/Menu_ESPON2006Projects/Menu_StudiesScientificSupportProjects/urbanfunctions.html

European Commission (2008), 'Regions 2020; An Assessment of Future Challenges for EU Regions'. Commission Staff Working Document. DG Regional Policy, Brussels. Available: http://ec.europa.eu/regional_policy/sources/docoffic/working/regions2020/pdf/regions2020_en.pdf

European Commission (2009), New Infrastructure Paradigms and Experimental Facilities. Living Labs for user-driven open innovation. An overview of the Living Labs methodology, activities and achievements. DG Information Society and Media, Unit F4. Accessible: http://ec.europa.eu/information_society/activities/livinglabs/docs/brochure_jan09_en.pdf

European Commission (2010), 'Social Innovation, Empowering people, driving change: Social innovation in the European Union'. DG Enterprise and Industry. Accessible: http://ec.europa.eu/bepa/pdf/publications_pdf/social_innovation.pdf

European Commission (2011a). Horizon 2020 – The Framework Programme for Research and Innovation. Brussels: COM(2011) 808 final.

European Commission (2011b) Social Business Initiative; Creating a favourable climate for social enterprises, key stakeholders in the social economy and innovation", COM(2011) 682. Available: http://ec.europa.eu/enterprise/policies/innovation/policy/social-innovation/index_en.htm

European Commission (2012a), 'Strengthening social innovation in Europe; Journey to effective assessment and metrics', A social innovation Europe publication. Available at: http://ec.europa.eu/enterprise/policies/innovation/files/social-innovation/strengthening-social-innovation_en.pdf

European Commission (2012b), 'Enhancing and focusing EU international cooperation in research and innovation: a strategic approach', COM(2012) 497. DG Research & Innovation. Accessible: http://ec.europa.eu/research/horizon2020/index_en.cfm?pg=h2020

Foray, D., D. Mowery, R. Nelson (2012) Public R&D and societal challenges: What lessons from mission R&D programmes? Research Policy, Vol. 41, 10, pp. 1697-1702

Glaeser, E. L. (2005) Review of Richard Florida's the rise of the creative class. Regional Science and Urban Economics, 35: 593–596.

Glaeser, Ed (2011), 'Triumph of the City; How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier, and Happier', The Penguin Press.

Gassler, Polt & Rammer 2008

Gault, F. (2012) 'User innovation and the market', Science and Public Policy, 39, 118–128.

Geels, F. (2004) From sectoral systems of innovation to socio-technical systems: Insights about dynamics and change from sociology and institutional theory. Research Policy, 33, 897-920.

Gomez, S., Diaz-Guilera, A., Gomez-Gardeñes, J., Perez-Vicente, C. J., Moreno, Y., & Arenas, A. (2013). Diffusion dynamics on multiplex networks. Physical review letters, 110(2), 028701.

Hippel, Von E. (2005) 'Horizontal innovation networks—by and for users', Industrial and Corporate Change, 16/2: 293–315.

Hollanders, Hugo, Stefano Tarantola, Alexander Loschky (2009), Regional Innovation Scoreboard 2009. Accessible:http://www.proinno-europe.eu/sites/default/files/page/10/03/RIS_2009-Regional_Innovation_Scoreboard.pdf

Husserl, Edmund. (1936/1970). The Crisis of the European Sciences, p. 142

Hutchinson, R. (2010) Metropolitan governance, in: R. Hutchinson (Ed.) Encyclopaedia of Urban Studies, London: Sage.

Iizuka, Michiko (2013) Innovation systems framework: still useful in the new global context? UNU-Merit Workingpaper, #2013-005

Kallerud, E., E. Amanatidou, P. Upham, M. Nieminen, A. Klitkou, D. Sutherland Olsen, M. Lima Toivanen, J. Oksanen and L. Scordato (2013) Dimensions of Research and Innovation Policies to Address Grand and Global Challenges. NIFU Working Paper 13/2013.

Kemp, R., Schot, J., & Hoogma, R. (1998). Regime shifts to sustainability through processes of niche formation: the approach of strategic niche management. Technology Analysis & Strategic Management, 10(2), 175-198.

Kemp, R. and Loorbach, D. (2006) 'Transition Management: a reflexive governance approach', in, Voss, J-P., Bauknecht, D. and Kemp, R. (eds). Reflexive Governance for Sustainable Development, Cheltenham: Edward Elgar..

Komninos, N., Schaffers, H., Pallot, M. (2011). Developing a Policy Roadmap for Smart Cities and the Future Internet. e-Challenges e-2011 Conference Proceedings.

Kraus

Krause, R. M. (2011), Policy Innovation, Intergovernmental Relations, and the Adoption of Climate Protection Initiatives by U.S. Cities. Journal of Urban Affairs, 33: 45–60

Leleur S. (2012) Complex Strategic Choices: Applying Systemic Planning for Strategic Decision Publication Date: February 7, 2012 | ISBN-10: 1447124901 | ISBN-13: 978-1447124900 | Edition: 2012

Luhmann N. (1982): The World Society as a Social System, International Journal of General Systems, 8:3, 131-138

Lundvall, B.-Å. (2010) National Systems of Innovation–Towards a Theory of Innovation and Interactive Learning, New York: Anthem Press.

Malerba, Franco (2002) Sectoral systems of innovation and production. Research Policy, 31, 247–264

Mayer, M. (1994) Post Fordist city politics, in: T. Le Gates & F. Stout (Eds) The City Reader (2002), pp. 229–239 London: Routledge

Mollenkopf, J. (1992) How to study Urban political power, in: T. Le Gates & F. Stout (Eds) The City Reader (2002), London: Routledge.

Mowery, D. C., R. Nelson & R. Martin (2010) "Technology policy and global warming: why new policy models are needed (or why putting old wine in new bottles won't work). Research Policy, 39 (8), 1011-1023

Mucha, P. J., Richardson, T., Macon, K., Porter, M. A., & Onnela, J. P. (2010). Community structure in time-dependent, multiscale, and multiplex networks. Science, 328(5980), 876-878.

Murray, R., Caulier-Grice, J. & Mulgan, G. (2010): The open book of social innovation. London: NESTA. London (Social Innovation Series: Ways to design, develop and grow social innovation).

Niitamo, V.-P.; Kulkki, S.; Eriksson, M.; Hribernik, K. A. (2006), State-of-the-art and good practice in the field of living labs, Proceedings of the 12th International Conference on Concurrent Enterprising: Innovative Products and Services through Collaborative Networks, Milan, Italy, 2006, 349-357.

OECD (2000) The Reform of Metropolitan Governance (Paris: OECD).

OECD (2001), Redefining "Urban": A New Way to Measure Metropolitan Areas, OECD Publishing.

Schellong & Stepanets (2011). Unchartered Waters: the state of open data in Europe, CSC.

Senate of the Free and Hanseatic City of Hamburg (2010), Model Hamburg: Growth with Vision (in German: Leitbild Hamburg: Wachsen mit Weitsicht). Available: http://www.rim-europa.eu/index.cfm?q=p.policy&n=15923&r=DE6

Soete, L., Verspagen, B. and ter Weel, B. (2009) 'System of innovation', UNU-MERIT

Workingpaper series no. 2009-062, Maastricht: UNU-MERIT.Soete, L. (2008). 'Current Theories on Growth and Development: How to Promote Regional Innovation through Cohesion Policy.' Report for DG Regional policy.

Redding G. (2003) The Thick Description and Comparison of Societal Systems of Capitalism

Rotmans J. (2005) Societal Innovation: between dream and reality lies complexity, inauguralLecture, Retrieved from http://repub.eur.nl/pub/7293

Stockholm 2025: The world most innovation-driven economy; Innovation strategy for the Stockholm Region. Available at: http://www.lansstyrelsen.se/stockholm/SiteCollectionDocuments/Sv/naringsliv-och-foreningar/naringslivsutveckling/InnovationskraftSthlm/Innovationsstrategin - engelsk version.pdf

Storper, Michael & Allen J. Scott (2009), "Rethinking human capital, creativity and urban growth". Journal of Economic Geography 9 (2009) pp. 147–167.

Storper, M. (2011),'Book review: Triumph of the City - Ed Glaeser' Journal of Economic Geography 11 (2011) pp. 1079–1082.

Turkeli S., Erdil E. (2013), A Foursquare Quality of Life Agenda: Governing European Neighbourhood Policy, Open Method of "Neighbourhoods" Coordination, Smart "Cross – Continental Regions" Specialisation, and an "Adaptive Synchronous" European Strategic Energy Technology Plan http://www.ub.edu/searchproject/wp-content/uploads/2013/09/WP05.23.pdf

Walendowski, J., R. Wintjes, H. Kroll (2012). Regional Innovation Monitor 2011 Annual Report, Governance, policies, and perspectives in European regions. Accessible: http://www.rim-europa.eu/index.cfm?q=p.reportDetails&id=16006

Walendowski, J., R. Wintjes, H. Kroll (2013). Regional Innovation Monitor 2012 Annual Report, 'Credible Actions Key to Regions' Future Innovation Performance'. Accessible: http://www.rim-europa.eu/index.cfm?q=p.reportDetails&id=16508

Wallis, A. D. (2010) New regionalism, in: R. Hutchinson (Ed.) Encyclopaedia of Urban Studies, (London: Sage).

Warfield JN (1978) SOCIETAL SYSTEMS Planning, Policy and Complexity, Journal of Cybernetics, 8:1, 113-115

Weber, K. M., H. Rohracher (2012) Legitimizing research, technology and innovation policies for transformative change. Combining insights from innovation systems and multi-level perspective in a comprehensive "failures" framework. Research Policy, 41, 1037-1047.

Wintjes, R. and H. Hollanders (2010). "Regional impact of technological change in 2020; Synthesis Report". DG Regional Policy of European Commission, Brussels. Available at: http://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/2010_technological_change.pdf

Wintjes R. & Hollanders H. (2011). Innovation pathways and policy challenges at the regional level: smart specialisation, UNU-MERIT Working Paper Series 2011-027, accessible: http://www.merit.unu.edu/publications/wppdf/2011/wp2011-027.pdf

Wintjes, René (2012), "Demand-side innovation policies at regional level", Regional Innovation Monitor, Thematic Paper 3. Available at: http://www.rim-europa.eu/

Wintjes, R. (ed.) (2013), 'Technological Top Region TTR-ELAt; Background report to the OECD Study: Cross-border Regional Innovation Policy'. Forthcoming.

Wopperer, Jeannette (2011), 'Stuttgart Metropolitan Region, Verband Stuttgart'. In: Efficient Metropolitan Governance Functioning Urban-Rural Relations, European Parliament Brussels.

Appendix A - Metropolitan areas

Selection Based on ESPON: "Study on Urban Functions", which defines cities according to the concept of a functional urban area (core urban area defined morphologically on the basis of population density, plus the surrounding labour pool defined on the basis of commuting.

Metropolitan areas in Europe, inhabitants			
Bucharest metropolitan area	2,064,000	Naples metropolitan area	2,905,000
Metropolitan Stockholm	2,171,000	Hamburg Metropolitan Region	2,983,000
Liverpool	2,241,000	Katowice metropolitan area	3,029,000
Stuttgart Metropolitan Region	2,289,000	Rhein-Süd (Cologne/Bonn Region)	3,070,000
West Yorkshire (Bradford & Leeds)	2,302,000	Rhein-Nord (Düsseldorf-Neuss)	3,073,000
Amsterdam metropolitan area	2,497,000	Rome metropolitan area	3,190,000
Budapest metropolitan area	2,523,000	West Midlands (Birmingham)	3,683,000
Greater Manchester	2,556,000	Athens	3,761,000
Vienna	2,584,000	Berlin	4,016,000
Lisbon Metropolitan Area	2,591,000	Barcelona metropolitan area	4,082,000
Brussels-Capital Region	2,639,000	Milan metropolitan area	4,136,000
Munich	2,665,000	Madrid metropolitan area	5,263,000
Frankfurt/Rhine-Main Region	2,764,000	Ruhr area (Essen – Bochum – Dortmund)	5,376,000
Warsaw metropolitan area	2,785,000	Paris metropolitan area	11,175,000
		Greater London	13,709,000

Appendix B – Technology Research Area Distribution in Governance related Publications, 2012

Research Areas	records	% of 4593
ENGINEERING	112	2.438
INFORMATION SCIENCE LIBRARY SCIENCE	86	1.872
COMPUTER SCIENCE	80	1.742
BIOMEDICAL SOCIAL SCIENCES	54	1.176
ENERGY FUELS	30	0.653
TRANSPORTATION	28	0.61
METEOROLOGY ATMOSPHERIC SCIENCES	22	0.479
TELECOMMUNICATIONS	16	0.348
FOOD SCIENCE TECHNOLOGY	14	0.305
CHEMISTRY	10	0.218
BIOTECHNOLOGY APPLIED MICROBIOLOGY	9	0.196
CELL BIOLOGY	9	0.196
CONSTRUCTION BUILDING TECHNOLOGY	9	0.196
PHARMACOLOGY PHARMACY	9	0.196
ARCHITECTURE	8	0.174
BIOCHEMISTRY MOLECULAR BIOLOGY	8	0.174
MEDICAL INFORMATICS	8	0.174
MATERIALS SCIENCE	5	0.109
METALLURGY METALLURGICAL ENGINEERING	5	0.109
REMOTE SENSING	5	0.109
FILM RADIO TELEVISION	2	0.044
MINING MINERAL PROCESSING	2	0.044
AUTOMATION CONTROL SYSTEMS	1	0.022
MECHANICS	1	0.022
MEDICAL LABORATORY TECHNOLOGY	1	0.022

Source: Web of Science, query: "Governance", 2012

The UNU-MERIT WORKING Paper Series

2014-01 *The medium-term effect of R&D on firm growth* by Marco Capasso, Tania Treibich and Bart Verspagen

2014-02 *Diverse and uneven pathways towards transition to low carbon development: The case of diffusion of solar PV technology in China*Michiko Iizuka

2014-03 *User innovators and their influence on innovation activities of firms in Finland* by JariKuusisto, MerviNiemi and Fred Gault

2014-04 *Migration, remittances and household welfare in Ethiopia* by Lisa Andersson

2014-05 *Path-breaking directions of nanotechnology-based chemotherapy and molecular cancer therapy* by Mario Coccia and Lili Wang

2014-06 *Poor trends - The pace of poverty reduction after the Millennium Development Agenda*Richard Bluhm, Denis de Crombrugghe, Adam Szirmai

2014-07 *Firms' adoption of international standards: Evidence from the Ethiopian floriculture sector* by MuluGebreeyesu

2014-08 *School choice, segregation, and forced school closure*by Cheng Boon Ong andKristof De Witte

2014-09 *Gender difference in support for democracy in Sub-Saharan Africa: Do social institutions matter?*by MatyKonte

2014-10 *Why are women less democratic than men? Evidence from Sub-Saharan African countries* by Cecilia García-Peñalosa and MatyKonte

2014-11 *Tipping points? Ethnic composition change in Dutch big city neighbourhoods* by Cheng Boon Ong

2014-12 *Technology life cycle and specialization patterns of latecomer countries. The case of the semiconductor industry* by Giorgio Triulzi

2014-13 *Patents as quality signals? The implications for financing constraints on R&D* by Dirk Czarnitzki, Bronwyn H. Hall and Hanna Hottenrott

2014-14 *Assessment of effectiveness of Chinese aid in competence building and financing development in Sudan* by SamiaSatti Osman Mohamed Nour

2014-15 *Education, training and skill development policies in Arab Gulf countries: Macro-micro overview* by SamiaSatti Osman Mohamed Nour

2014-16 *Structure of labour market and unemployment in Sudan* by SamiaSatti Osman Mohamed Nour

2014-17 *Overview of knowledge transfer in MENA countries - The case of Egypt* by SamiaSatti Osman Mohamed Nour

2014-18 *The impact of ICT in public and private universities in Sudan*by SamiaSatti Osman Mohamed Nour

2014-19 *End-user collaboration for process innovation in services: The role of internal resources* by Mona Ashok, Rajneesh Narula and Andrea Martinez-Noya

2014-20 *Public investment and regional politics: The case of Turkey* by Mehmet Guney Celbis, Denis de Crombrugghe and Joan Muysken

2014-21 *Infrastructure and the international export performance of Turkish regions* by Mehmet Guney Celbis, Peter Nijkamp and Jacques Poot

2014-22 *Discovering and explaining work-family strategies of parents in Luxembourg* by Nevena Zhelyazkova

2014-23 *Parental leave take up and return to work of mothers in Luxembourg: An application of the model of nested dichotomies* by Nevena Zhelyazkova