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Challenges, Opportunities and Entry Points

Discussion Paper

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Preface

Urbanization is a megatrend which will significantly shape the economic, political and social transformation of societies and their spatial impacts. It is estimated that up to 70% of the global population will be living in cities by 2050. Future urban growth will thereby almost exclusively take place in developing countries. Spatial and functional interrelations between cities, settlements and their surrounding areas are increasing and the metropolitan scale is gaining more and more relevance for integrated urban and city-regional planning and implementation.

The Sector Project "Sustainable Development of Metropolitan Regions", implemented by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), develops action-oriented advisory services on the role of metropolitan regions as drivers for sustainable development. Within this approach, the Sector Project operates in four focus areas to address the diverse social, economic and ecologic challenges in urban agglomerations.

The four focus areas refer to:

- Metropolitan governance structures and cooperation beyond administrative boundaries / urban-rural-linkages
- Integrated resource efficient development / Urban NEXUS
- Regional development and innovative business regions
- Inclusive labor markets and residential centers.

This study forms part of the publication series "Sustainable Development of Metropolitan Regions" that gives conceptual guidance and recommendations for hands-on approaches for development organizations as well as partner countries in the field of sustainable development of metropolitan regions.

Metropolitan regions are main drivers for national economic development. They act as production and transport hubs, domestic markets and knowledge centers. As such, they offer tremendous potential for economic development not only within their own territory, but also as part of the broader regional and national development agenda. A metropolitan region perspective enables local governments to promote cooperation and overcome competition between different ministries and sectors through coordinated policy making and planning, thus facilitating a business and innovation friendly environment. Fostering innovation systems is essential for regional development, because other strategies and concepts (e.g. Smart Cities, Green Economy, Urban Nexus Approach) build on innovation to promote a smarter, greener or more inclusive development within urban areas. The study illustrates the specific challenges of developing countries in promoting innovation systems and provides a set of tools to identify local innovation potential.

We encourage a critical and intensive discussion about the publication through policy makers and practitioners as well as academia. The publication series shall serve as a reference point for the ongoing international discussion on transforming urbanization and therefore contribute to the Habitat III debate.

Carmen Vogt
Head of Programme
"Sustainable Development of Metropolitan Regions"

Innovation Systems in Metropolitan Regions of Developing Countries

Challenges, Opportunities and Entry Points

Discussion Paper

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Executive Summary

This report investigates how an innovation systems approach can support metropolitan regions to foster a regional dynamic that is reflexive and that lays a foundation for future growth and development. Three important concepts are discussed. The first is the phenomenon of the emergence of metropolitan regions and how it differs between developed and developing countries. The second is how innovation emerges in a society and how it is fueled by an intensification of the use of knowledge – as knowledge becomes more formal and rapidly spreads globally, the importance of hard-to-capture tacit local knowledge increases. The third concept is innovation systems approaches that go beyond innovation at the micro level and that consider how a network of public and private organisations create, use and disseminate knowledge that leads to innovation.

The reasons for urbanisation and the emergence of metropolitan regions differ between OECD and developing countries. In many developing countries, the inward migration into cities is driven by social and not necessarily economic reasons. Many metropolitan regions in developing countries are under pressure, with large disparities between urban and rural areas. Infrastructure development often lags and is unevenly integrated, while maintenance and upgrading are done on an ad hoc or emergency basis. Institutional and industry development are typically not high-priority areas. They do not enable industry to evolve, nor do they enable a society to leverage its full human capacity. Metropolitan regions in developing countries require new governance formats and coordination structures to manage the process of more sustainable growth, and to ensure trust building, social cohesion and sustainable development. The future prosperity and sustainability of metropolitan regions are dependent on the well-being of key industries and economic activities.

While innovation is mostly observed at the firm level, innovation systems describe a more dynamic system. Here the emphasis is mainly on the dynamics, process and transformation of knowledge and learning into desired outputs within an adaptive and complex economic system. Thus the innovation system approach spells out quite explicitly the importance of the 'systemic' patterns of interactions between the various components of inventions, research, technical change, learning and innovation, and the network of institutions in the public and private sector whose activities and interactions initiate, import and diffuse new technologies. In developing countries the institutional and industrial prerequisites are different, as are their interrelations and the ways to encourage dynamism.

A functioning regional innovation system is characterised by a high level of technological capabilities of public and private organisations in the system that co-evolve as industries and institutions adapt, change or emerge. Furthermore, there is a large scale and scope of interactions among sub-systems, combined with a breadth and depth of relations with the outside world. The system is not inwardly focused and is connected with global markets, technological systems, networks and knowledge sources. The absorptive capacity of local stakeholders determines the speed and direction of change, and acquiring knowledge by interaction is often more efficient. Metropolitan regions in this respect have certain advantages because knowledge flows more easily in places where there is a certain scale to the density of knowledge and where policies, institutions and industry structures can better co-evolve as a result of proximity, diversity and dynamism.

A regional or metropolitan innovation perspective makes sense for a developing country because it allows innovation and knowledge intensification around emerging industries that are hard to spot at a national level, and that are almost impossible to manage in a systemic way from beyond the region. There is a strong rationale for trying to plan and manage the process of urbanisation more constructively: it will help cities to become more stable, healthy and resilient. However, a regional innovation system is much harder to improve in a developing country than it is in an industrialised country because of the contexts and the competing demands on limited resources. Innovation systems in many OECD countries have a long development and experience track record, which in general developing countries do not have. Framework conditions such as the institutional frameworks in developing countries are often under-developed and fragmented. The dominance of top-down rather than bottom-up approaches in promoting innovation also leads to weak integration of learning and feedback, and makes for demanding learning environments. Very often there is also a huge performance gap between successful enterprises with international networks and

smaller domestically focused enterprises. Furthermore, domestic stakeholders may become too focused on learning and exchange with a strong local or inward focus, thus allowing them to become disconnected from important global technology shifts and learning.

Launching an effort to improve an innovation system in a developing country may appear to be a daunting task, but it need not be. In developing countries it is important to focus more on technology diffusion than on novel innovations, and more on interactive learning than on R&D-based approaches. The identification of truly motivated actors is of high importance, as is the promotion of reflexive policies that also entail space for exploration and a learning-by-doing approach. It is proposed that the improvement process should start with trying to determine who in the region is creating useful knowledge, who is using knowledge creatively, and who is disseminating knowledge. Instead of starting with universities, scientists and researchers, the process should assess the interplay between institutions and industries and its effect on innovative behaviour within regions. In addition, identifying organisations or individuals that have insight into unique challenges or problems in the region may provide opportunities for collaboration and the development of creative local solutions that build trust, confidence and stronger local networks. It is not about the presence of organisations, but about the dynamism between different actors and elements in the innovation system.

We propose that the process of improving the innovation system be structured along six lines of enquiry as follows:

- The company-level innovation capability and the incentives of firms to innovate, compete, collaborate and improve, in other words the **firm-level factors affecting the performance of firms and their networks of customers and suppliers.** These include attempts within firms to become more competitive and also attempts between firms to cooperate on issues such as skills development, R&D, etc.
- The **macroeconomic, regulatory, political and other framework conditions** that shape the incentives of enterprises and institutions to develop technological capability and to be innovative.
- Investigation of the **technological institutions that disseminate knowledge**.
- The responsiveness and contribution of **training and education organisations** in building the capacity of industry, employees and society at large.
- Investigation not only of the **interaction and dynamics** between individual elements in the system, but of the whole system.
- Exploring poorly articulated needs or unmet demands that are not visibly pursued by the innovation system.

These lines of enquiry may each separately require a small sub-investigation, but often insight into the six perspectives is gained through every interaction with different stakeholders in the system.

The German Development Cooperation (GDC) has great potential to become a driver of the promotion of such a metropolitan innovation system approach. The German Development Cooperation experience covers a wide range of topics and contexts that bring together different perspectives of the same system, for instance private sector development, education and TVET (technical and vocational education and training) reform, good governance and policy reform. On the one hand the GDC can leverage the German laboratory experience of innovation system promotion, and on the other hand it has a competitive advantage due to its long experience in related competence fields such as value chain and cluster promotion, local economic development and regional innovation programmes. Not only is the GDC also equipped with a wide range of relevant instruments for such an approach, but it has been following the systemic competitiveness approach since the mid-1990s as a dominant framework for intervention design (although sometimes this was implicit in the background). This provides the organisation with the opportunity to promote metropolitan regions in developing countries in a distinct and at the same time novel way.

Such a role would require the GDC to act to a greater extent as a change agent in the donor community and as a driver of a systemic and flexible approach rather than an isolated and linear approach. It can do this by positioning itself as a partner who contributes towards the understanding of the larger picture, and one who at the same time promotes concrete small and medium-sized change initiatives. The focus would have to be

on two aspects. First the GDC would have to strengthen the awareness of interventions related to the components of the system by dealing with the organisations in the system and their competence. Second, the GDC would have to strengthen the dynamics of the system through the creation of intelligence flows in the system and also create awareness of isolated approaches.

The report concludes with proposed entry points for interventions.

1. Introduction

Regions and countries worldwide are experiencing a growth in urbanisation which has never before been experienced. This trend is expected to intensify even further in the coming decades – globally there will be a significant regional shift in the structure and hierarchies of cities. Most of the population growth in urban areas will be concentrated in the cities and towns of the less developed countries, accompanied by an increasing gap between rural and urban areas (see Table 1). Managing this rapid growth of mega cities and metropolitan areas will become key. Especially metropolitan regions in less developed countries are struggling to manage the challenges of this accelerated growth. New systems of governance, social and environmental development and innovation promotion need to be in place to ensure balanced economic development in the longer run (Roberts, 2014: 89).

Table 1: Urban population size and distribution by major geographic area, 1950-2030

Region	1950	1975	2000	2030
Total Population (millions)				
World	2,519	4,068	6,071	8,130
More Developed Regions[a]	813	1,047	1,194	1,242
Less Developed Regions[b]	280	3,021	4,877	6,888
Rural Population (millions of inhabitants)				
World	1,786	2,552	3,214	3,185
More Developed Regions	386	344	311	228
Less Developed Regions	1,400	2,208	2,902	2,958
Urban Population (millions of inhabitants)				
World	733	1,516	2,857	4,945
More Developed Regions	427	703	882	1,015
Less Developed Regions	306	813	1,974	3,930
Percentage of Population Living in Urban Areas				
World	29.1	37.3	47.1	60.8
More Developed Regions	52.5	67.2	73.9	81.7
Less Developed Regions	17.9	26.9	40.5	57.1
Distribution of the World's Urban Population				
(World)	100	100	100	100
More Developed Regions	58.3	46.4	30.9	20.5
Less Developed Regions	41.7	53.6	69.1	79.5

Source: Cohen (2006: 68).

Lall (2002) states that "historically, all societies that have developed meaningfully have done so by moving from traditional low-productivity activities like agriculture or simple services to manufacturing and high-value services. Manufacturing has generally been the engine of the transformation process. The reasons are well known: manufacturing allows greater scope for the continuous application of new technology, yields greater economies of scale, scope and learning, has more spillover effects, and is a major source of innovation and skill formation. It is also a powerful modernising agent, changing work and entrepreneurial attitudes, creating new institutions and ownership forms and raising the productivity of traditional activities. The information age is itself the outcome of technical progress in manufacturing. For poor societies, there seem to be few development alternatives to industrialisation, at least for some time to come."

To strengthen competitiveness, alleviate poverty and implement an environmentally sound development strategy, every developing country should make use of a relatively broad spectrum of technological options, ranging from simple to high technologies. Sufficiently developed technological capability of the society is key and must be built. Technological capability includes, for instance, knowledge of the technologies available, the ability to evaluate and select such technologies, to utilise, adapt, improve, and finally, to further develop them (Hillebrand, Messner & Meyer-Stamer, 1994). We propose that the broad definition of technology (see Textbox 1) be used.

Box 1: Study Methodology

A broad definition of technology which is adequate to these problems comprises four components:

- Technical hardware, i.e. a specific configuration of machinery and equipment designed to produce a good or provide a service.
- Know-how, i.e. scientific and technical knowledge, formal qualifications and experience-based knowledge.
- Organisation, i.e. the managerial methods used to link technical hardware and know-how.
- The product, i.e. the physical good or the service emerging from the production process.

Source: Hillebrand et al. (1994)

The field of study that investigates how this accumulation of technological capability and knowledge takes place is called innovation systems. It is a multidisciplinary field that has strong roots in evolutionary economics, political science and science management. A regional innovation system looks especially at the knowledge and technological capabilities in a certain territory as well as opportunities to improve it.

The objective of this report is to provide a better understanding of the importance of an adjusted innovation system approach for metropolitan regions in less developed countries. It starts with the premise that innovation and technological capability are key to the development, future competitiveness and quality of life of metropolitan regions. These regions have to increase and use their endogenous development potentials and follow a more interconnected city approach to be able to promote a sustainable development process in the longer run. As economies and production are growing increasingly more global, so too is the functioning of innovation systems in regional spaces becoming increasingly important. Thus innovation and innovation systems are important for societal development in every region in the world. Although context is significant, there are essential differences not only between less and more developed countries, but even within regions of countries and agglomeration areas such as metropolitan regions.

The overarching hypothesis of this report is that the reality of regional innovation systems in developing countries as well as the elements that shape and guide the efficiency and effectiveness of these systems is very different from the reality in more developed OECD countries – and the elements also have to be defined in the context in which they are applied. This report outlines the challenges that developing countries face in promoting innovation systems in their metropolitan regions. At the same time it provides entry points for identifying and promoting regional innovation systems based in metropolitan regions to better face the challenges of urbanisation.

To this end, this report is structured into five chapters. In line with its focus on innovation system promotion in metropolitan regions, Chapter 2 defines the basic principles which have universal relevance despite many different configurations in different countries. Key aspects of metropolitan regions are clarified and regional innovation systems are described.

Chapter 3 considers how the development context differs and thus affects a regional innovation approach when applied to a less developed region. The priorities of promoting regional innovation in a developing country are different to those in a more developed environment, and local stakeholders must somehow deal with priorities that also seem contradictory. The characteristics of less developed regions and their demands on regional innovation systems, and the tensions between different priorities are rarely mentioned in the general literature on innovation systems and regional economic development.

After the stage has been set for a developing region and its challenges in Chapter 3, Chapter 4 provides a framework and instruments to identify entry points for the promotion of regional innovation systems in metropolitan regions in developing countries. The final chapter, Chapter 5, discusses recommendations and considerations for the GIZ.

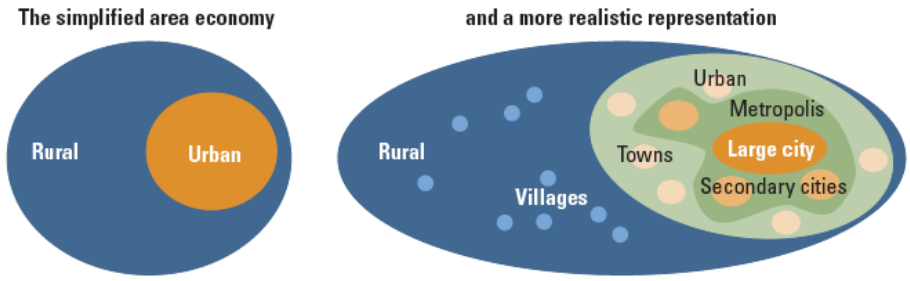
2. Introducing metropolitan regions and innovation systems

This chapter lays the theoretical foundation for the report. We start by unpacking the concept of metropolitan regions. Thereafter the concept of innovation systems, especially that of regional innovation systems, is discussed in some depth. This chapter sets the scene for the following chapters, which discuss the implications of a regional innovation systems approach applied to metropolitan regions.

2.1 Metropolitan regions in less and more developed countries

A metropolitan area is often defined as a sub-national geographic space consisting of a densely populated urban core and its less-populated surrounding territories. In general, it is felt that these different territories have certain linkages with each other. Metropolitan regions are also often defined as systems of cities that involve a certain hierarchy in their functions and the number of inhabitants. They can be based on a certain regional identity that shares industry, infrastructure and market connections. Figure 1 shows the different territories that can often be found in metropolitan areas (The World Bank, 2009). In general it involves a leading primary city, secondary cities surrounding it, and urban towns which are often more closely related to rural areas and, to a certain extent, play an intermediary role between the rural and urban areas.[1] Villages often see urban towns as main reference points for their products. This is quite a diversified picture of a metropolitan region. Many, especially smaller, developing countries are rather structured in such a way that a primary city, often the capital of the country, is surrounded by smaller secondary cities that are growing steadily and are merging with the capital. In many developing countries the change of an urban to a rural area can also be very sudden (see for instance the diagram on the left of Figure 1). Cities such as Cairo and Windhoek, and many others, show a strong divide between a larger city and a rural area regarding production techniques, development dynamics and the potential to develop technological capabilities in a systemic and sustainable way.

Figure 1: Representation of a regional economy



Source: The World Bank (2009)

Viewing a region from a metropolitan perspective makes sense if there is sufficient governance capacity and the social or economic interest to develop the space and to overcome an isolated city approach. Especially in OECD countries, metropolitan regions have become important planning units to overcome fragmented city planning, to promote structural change processes as well as to ensure the integration of backward rural areas, their settlement development and their linkages to main markets. Strengthening interrelations and creating synergies between the different territories is thus one of the key reasons why metropolitan regions have become reference points for the design of development and innovation strategies.

[1] Primary cities are often defined as leading cities in their country or region, and are disproportionately larger than any others in the urban hierarchy. They are surrounded by secondary cities which are defined by Roberts (2014) as "secondary hubs, spokes and centres in a complex network of production-distribution supply chain and waste-management recovery systems connecting different spatial levels of human settlement at both a national, but increasingly global, system of cities."

Viewing a region from a metropolitan perspective makes sense if there is sufficient governance capacity and the social or economic interest to develop the space and to overcome an isolated city approach. Especially in OECD countries, metropolitan regions have become important planning units to overcome fragmented city planning, to promote structural change processes as well as to ensure the integration of backward rural areas, their settlement development and their linkages to main markets. Strengthening interrelations and creating synergies between the different territories is thus one of the key reasons why metropolitan regions have become reference points for the design of development and innovation strategies.

The boundaries as well as the size of metropolitan regions differ greatly between OECD countries and less developed countries. Many metropolitan regions were also redefined during the last two decades. This conceptual adjustment goes back to a change in their self-understanding. While metropolitan regions were first defined based on the number of inhabitants and often also on dominant sectors (e.g. the Ruhr area as main former region of steel and mining), structural economic change also broke old identity boundaries. Metropolitan regions started to define or redefine themselves according to new emerging economic linkages, but especially also according to living spaces with stronger intercommunal cooperation and network efforts as well as more aligned planning activities. This trend was encouraged in the European Union through the way regional development funding was made available to metropolitan regions as a means to overcome isolated territorial development efforts and to encourage intercommunal coordination and development linkages.

In developing countries the use of the term “metropolitan region” or “area” emerged as a result of the discussion especially on the growth of capital cities and the social effects brought about by the migration of inhabitants from rural to city areas. At the same time secondary cities gained increasing consideration in the process of urbanisation growth because it is expected that they will experience tremendous growth in the upcoming decades and will become strong urban agglomerations and metropolitan regions or systems of cities. They will also require new governance formats and coordination structures in the near future to enable them to manage the process of more sustainable growth. The negative consequences can already be seen in many urban agglomerations, such as the lack of coordinated infrastructure, crime, unplanned settlements, lower-skilled immigration, fragmentation of support activities, political non-alignment of development strategies, etc. Thus if innovation promotion is considered to provide a solution for economic development in metropolitan areas, it has to be borne in mind that many secondary cities face a greater challenge in developing technological capabilities than primary cities. Furthermore, there is an even greater discrepancy between the technological capability of knowledge creation and innovation between urban areas and the surrounding areas.

Metropolitan regions have not yet become integrated planning units in most developing countries. Nonetheless, it has become obvious during the past few years that urbanisation growth requires more complex and comprehensive regional intervention approaches if the economic development requirements are to be matched in the longer run. Thus the performance of a metropolitan area and secondary cities, and their linkage to the more rural surroundings, is to a large extent defined by the “*level, quality and global orientation of the connectivity of its supply chains and logistic systems that support the development of the local regional economy…*” (Roberts, 2014).

From an economic perspective (in the OECD and developing countries), the objective of metropolitan regions is to promote sectors, chains and clusters as growth poles to generate an economic surplus and support a sustainable urbanisation process. Finally, it should provide economic scale and diversity. This diversity creates ideal conditions for Schumpeterian innovation in the sense of allowing individuals, enterprises and organisations to innovate through a process of combination and recombination of different ideas, technologies and knowledge bases. However, metropolitan regions are still aggregate systems that are dependent on the well-being of key industries and economic activities, and many economic activities that are not that easy to identify or track.

2.2 The interdependencies of institutional settings and industry life cycles – understanding regional dynamics

To gain a deeper understanding of the economic dynamics of metropolitan regions, it is necessary to consider endogenous growth potentials. Endogenous potential originates and is produced internally in the territory (e.g. the metropolitan region). It requires intensive communication and coordination between the relevant stakeholders as well as continuous learning to stay dynamic and to be able to combine new knowledge. It thus requires strong bonding and exchange relations between the relevant stakeholders, and must also form relationships with outsiders. When it comes to the promotion of a regional innovation system, it is necessary to analyse pre-established linkages and relations between the main representatives of the system. This also includes different sectors, clusters, networks and value chains in the region. How they are presently configured and interrelated is also influenced by certain dynamics, such as continuously changing industry life cycles, important changes in the past, and the existing institutional and organisational settings that influence and react to these dynamics. The life cycle of the local industries has an impact on the institutional setting of the region, but also vice versa.

It was earlier shown in Figure 1 that a metropolitan region integrates different territorial realities. Apart from their economic interrelations, each of these territories also includes different industries as well as institutional configurations and innovation dynamics. In general, primary cities are seen as the most dynamic territories which are also able to develop the highest level of knowledge creation and innovation due to the presence of knowledge institutions, competitive businesses and a more intensive learning environment. This is evident in the tendency for multinational corporations to base large parts of their operations in primary cities in developing countries, even if their domestic competitors are located elsewhere. In many less and more developed regions the primary cities on average make the highest contribution to GDP per capita. However, they cannot be seen in an isolated way, but have to be considered as part of the system of cities. This includes the secondary cities. Their innovation orientation is often lagging behind that of the primary cities. They often also have less important knowledge institutions with local decision-making power and responsibility. A similar pattern can be seen in urban towns that show different industry and institutional structures when compared to smaller towns and villages. There are also differences in the quality of the infrastructure between more urban and less urban regions.

Figure 2: Four kinds of territorial dynamics and life cycle interrelations

Source: Meyer-Stamer (2007)

Over time it can been observed that in cities and regions these industry structures and institutional settings need to change due to changes in dominant industries. This is where the life cycles of industries interact with the dominant mind set and the economics and geography.

Figure 2 illustrates that in a metropolitan region, but also within each of its territories, declining and emerging, and marginalised and very dynamic areas, can simultaneously be found, which are depicted by the four quadrants.[2] Primary and secondary cities are in general more innovative and more dynamic than rural towns and villages due to the fact that they can provide a better institutional and physical infrastructure (Y-axis). However, when the details are examined, it can be seen that they also face very different dynamics – some are quite progressive, others are quite digressive. Thus to understand regional dynamics and innovation trends, it is necessary to analyse not only the institutional and physical infrastructure that is present in the different territories but also the industry life cycles dynamics (X-axis). This is necessary because the innovative relations and interplay between industry life cycle trends and institutional and physical infrastructure will play a decisive role in the economic development (see Textbox 2).

Box 2: Example of the interrelation between institutional settings and industry life cycle for regional dynamics

Regional institutions that provide key infrastructure as well as human capacity emerge over time to support dominant sectors. For instance, a metropolitan area with a strong automotive industry might develop specific educational institutions offering a wide range of vocational and tertiary educational programmes. Specialised rail infrastructure and a range of supporting institutions might develop over time. The challenge comes when this industry goes into a long-term decline which is not typical of expected industry life cycles fluctuations. When a primary or secondary city depends on several key industries that are facing decline or major structural changes, this can have a huge effect on a metropolitan region. The decline of a leading sector could lead to a collapse in the property market and cause disinvestment. The shift from a few large employers too many smaller dispersed employers can affect traffic flows and infrastructure shortages. This means that even having first-class infrastructure and a wide range of technical skills is not enough to secure the resilience of a regional community. Many rural areas around urban areas have a similar challenge. While the infrastructure was perhaps appropriate for a previous era, change in key economic activities can render such infrastructure ineffective. Examples are climate change, which affects crop types, or mining activities, which become unaffordable due to changes in global commodity prices.

In the early phases of an industry's life cycle, companies often rely on a more sophisticated environment, density of networks, proximity to demanding users, access to diverse knowledge and component inputs. Enterprises in emerging and growing industries depend more on local factors, particularly those that must be created through collaborative action or by government, rather than on companies in mature and declining industries. Thus a coordination challenge must be overcome. At the same time, companies in emerging and growing industries tend to be less organised, making them difficult partners for local economic development (LED) initiatives (Meyer-Stamer, 2005).

Table 2 illustrates in practical terms what industries in different phases of the life cycle demand from locations.

In the later industry life cycle phases, industries move to locations where production requirements, particularly real estate and labour, are cheaper. Once the industry settles into a more consolidated supply network and standards, it becomes possible to move production further away from design centres to lower-cost locations. This explains why many high-tech industry production operations have moved from countries such as the US or from countries in Europe. Even though the products may be high-tech, the production methods have become standard. Meyer-Stamer asserts that "While much can and should be done to support the emergence of new industries, little can be done with respect to mature and declining ones" (Meyer-Stamer, 2005). The challenge for developing countries is that the more mature industries are also more price and scale sensitive. Conditions must be created in developing countries to allow more of the early-stage industry development to take place. There are many isolated examples of multinational companies emerging from developing countries, but these are still few and far between.

[2] For more information see the paper by Roberts (2014), which describes present and future challenges of secondary cities, especially in developing countries.

Table 2: The demand of industry life cycle on locations

Start-up phase	Growth phase	Maturity phase	Decline phase
• Highly skilled workers • Knowledge infrastructure • Proximity to customers • Networks of suppliers • Diverse intermediary inputs such as specialists, customised inputs, and knowledge.	• Proximity to market (upstream and downstream) • Specialised workers • Highly-skilled workers • Real estate	• Cheap workers • Low location cost • Proximity to market	• Cheap workers • Low location cost • Little regulatory cost

Source: Adapted from Pieper (1994)

In summary, metropolitan regions entail very different territories, regional industry dynamics and institutional settings that can contribute to a greater or lesser extent to the development, adjustment and increase of technological capabilities and innovation in the location overall. From a regional innovation system perspective, it is important to consider these different realities and not to run the risk of depending on and promoting mainly the traditionally oriented and declining industries and actors. At the same time it is important to take into consideration that industries require support from different local actors to enable them to innovate at different phases of their life cycle. This requires high flexibility and proactive behaviour by all the relevant actors.

2.3 Innovation systems – the theory in a nutshell

Most research into innovation systems draws on evolutionary and complexity theories, where economic growth and technological change are seen as endogenous to the system[3]. Soete, Verspagen and Ter Weel (2010) state that *"the central idea in modern innovation systems theory is the notion that what appears as innovation at the aggregate level is in fact the result of an interactive process that involves many actors at the micro level, and that next to market forces many of these interactions are governed by nonmarket institutions"*. They go on to state that coordination problems arise because the efficiency of this process observed at the macro level depends on the behaviour of individual actors and the institutions that govern their interaction. Institutions in this sense describe both societal norms as well as formal and informal organisations.

Freeman (Freeman, 1987: 1) defines an innovation system as "the network of institutions in the public and private sectors whose activities and interactions initiate, import and diffuse new technologies." Lundvall (1992: 10) argued that the "structure of production" and the "institutional set-up" are the two most important dimensions that jointly define an innovation system. The innovation systems approach spells out quite explicitly the importance of the "systemic" patterns of interactions between the various components of inventions, research, technical change, learning and innovation (Soete *et al.*, 2010). From an innovation systems perspective, the emphasis is less on the internal technology management activities of individual firms at the micro level, and more on the dynamics, process and transformation of knowledge and learning within a complex economic system.

Although most of the research and literature on innovation systems have related origins, there are small yet important differences between the various schools of thought. The differences explained by Cunningham (2012: 32) can be summarised as follows:

- National innovation systems – bring to the forefront the central role of the state as coordinating agent of public resources, often with the emphasis on research and development and innovation commercialisa-

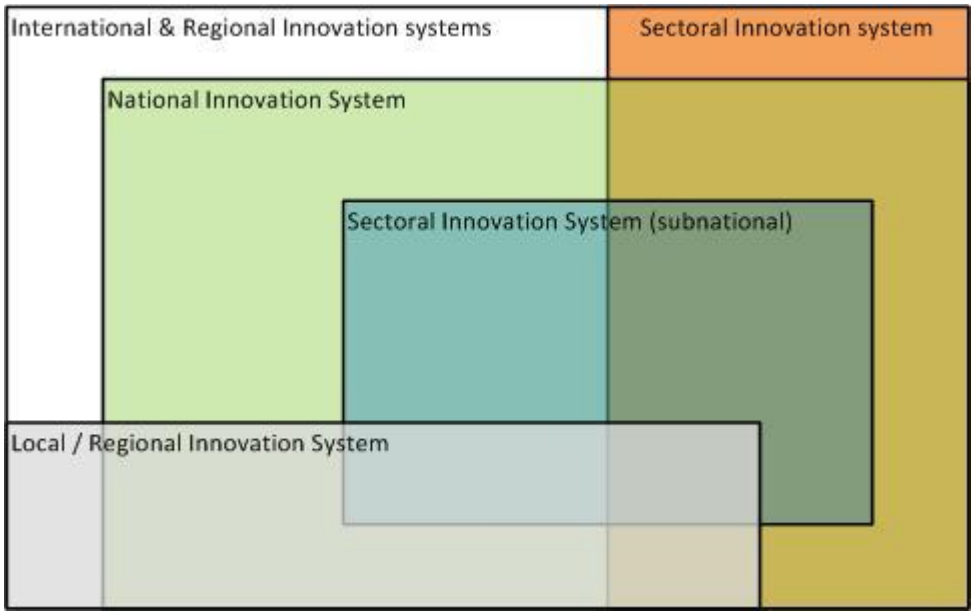
[3] Lall (1992) explains that in the highly simplified models used in trade theory, technology is taken to be freely available to all countries and, within countries, to all firms. Adopting technology is separated from mastering technology.

tion. Their particular attractiveness to policy makers lies in the explicit recognition of the need for complementary policies – this draws attention to weaknesses in the system while highlighting the national setting of most of the institutions in the system.

- Sectoral innovation systems – According to Malerba (2005), the emphasis of sectoral innovation systems is on a group of firms that develop and manufacture products for a specific sector and that generate and utilise the technologies of that sector. The boundary of the system is drawn around a technological paradigm that is formed by a knowledge base, specific technologies and inputs, the different actors and networks that are systemically interacting, and the institutions supporting a specific industry.
- Local and regional innovation systems – the focus is on the configuration of regional networks, organisations and institutions, which are in turn mainly focused on a specific geographic space and the specific knowledge spill-overs that occur around certain firms, industries or institutions unique to that space.

Within a particular region in a country, all three of these innovation systems perspectives could be relevant; yet industries, individuals and whole regions might not even be aware of their existence (see Figure 3). Firms within a metropolitan region may not even be aware that their behaviour, networks and innovative activities are shaped by national innovation systems (e.g. the availability of certain technological capability within a country created by comparative advantage), sectoral innovation systems (particular knowledge domains relevant for the industry network or value chain the firm is a part of) and a local innovation system perspective (e.g. the firm is surrounded by several suppliers, some customers and perhaps some important service providers, which makes it possible for the firm to operate in a particular place).

Figure 3: Different innovation system perspectives overlayed



Source: Cunningham (2010)

When approaching the economy of a metropolitan region, a combination of a sectoral innovation and regional innovation approach is recommended. For instance, it is possible to look at a sectoral innovation system (e.g. food production) within a metropolitan region, although the co-location of a number of different organisations does not necessarily automatically result in an innovation system. A focus on food production will extend beyond food producers alone, and should include equipment, logistics, farming, retail and a whole range of other actors. A specific emphasis in local or regional innovation systems is rather to look at unique regional patterns of interaction that may lead to increased knowledge sharing, joint research opportunities, and the responsiveness of technological and educational institutions to the needs of industries.

Soete *et al.* (Soete *et al.*, 2010) conclude with a summary of the main insights brought about by the innovation systems literature:

- the importance of a broader set of innovation inputs than just research and development (R&D),
- the importance of institutions and organisations that emerge from a specific economic and social context,
- the role of interactive learning,
- leads to a dynamic perspective rather than a static allocative one,
- the role of interaction between agents, and
- the importance of social capital.

Further to these points, Soete *et al.* (Soete *et al.*, 2010) state that the innovation systems literature brings a multidisciplinary perspective to the development of regions and industries.

From a metropolitan or place-based perspective, the regional innovation systems approach is the most promising as it takes into consideration aspects of the national innovation system, several sectoral innovation systems but also the unique characteristics and history of a particular region. The following section will examine the main characteristics of a regional innovation system.

2.4 The regional innovation systems perspective

In the innovation systems literature there is a body of knowledge that deals with a regional or sub-national perspective. The study of regional innovation systems concentrates on the importance of systemic characteristics of the innovation system within a particular region, **thus the dynamic interaction between different individuals, organisations and institutions and knowledge flows in a region**. The dynamics of the region go far beyond just the creativity of individual firms or industries, as it also depends on factors such as the innovativeness of the public sector, specific physical infrastructure that supports industry, the networks between different kinds of industries and stakeholders, the mobility of people and ideas and the social diversity that enables creative exchange of ideas, concepts and stimuli. A regional innovation perspective goes beyond traditional Local Economic Development as it must include factors such as culture, informal knowledge networks, framework conditions created at the national and international level as well as longer-term development trends in the region.

A functioning regional innovation system is characterised by a high level of technological capabilities of organisations (public and private) in the system, a large scale and scope of interactions among sub-systems, as well as a breadth and depth of outward flows and relations with the outside world. A regional innovation system is not inwardly focused, it is connected with global markets, technological systems, networks and knowledge sources. Typically, innovation systems policy attempts to support the creation, acquisition and retention of technological capabilities and the diffusion of relevant knowledge among the actors in the system. But the kind of interventions, institutions and actors depends on the regional context and also the history of the region.

2.4.1 Innovation is iterative and not linear

Distinct from the theories of innovation and technology management, innovation systems scholars see innovation as **iterative and interactive, and thus not linear**. This being said, many researchers and governments still measure the performance of their innovation systems in terms of PhDs, patents and R&D spend. This is too narrow a view of innovation systems. Innovation is seen as a result of using knowledge in new or different ways, it is not seen as a process driven by research, followed by design, followed by market promotion. In fact, research and development is seen as just one (rather expensive) way of generating knowledge for innovation. For instance, imitating or learning from a competitor and adapting an internal process in a firm is also seen as an innovation.

2.4.2 The absorptive capacity of local stakeholders determines the speed and direction of change

The absorptive capacity of firms and individuals is an important factor in the ability of formal enterprises and supporting institutions to be able to acquire, assess, integrate and use new knowledge for innovation.

Two important antecedents to absorptive capacity is on-the-job experience as well as the education levels of both entrepreneurs and various kinds of managers, but also of employees and communities in general. Of

course, the regional context is very important and regions with a specialised industrial structure not only struggle to foster new industries, but they often struggle to absorb new knowledge that challenges tradition or habits.

Cunningham (2012) contends that a large part of **the knowledge that a firm needs is available internally**, namely the knowledge of the engineers, managers, technicians and other employees. At the very least this is the starting point, the base from where more knowledge can be explored or acquired. Their knowledge is partially acquired externally based on previous formal training, and partially acquired through a cumulative process of learning-by-doing based on past experience. This internal knowledge, which is available at any given time, is the main resource of a firm when it comes to innovation.

Furthermore, organisations that innovate more frequently are better able to absorb new knowledge and learning compared to organisations that only purposefully innovate occasionally or infrequently. But not all firms are able to tap into this internal knowledge asset, mainly because many firms are managed in a way that does not allow reflection on their own patterns of behaviour or the trends affecting their performance. When the day-to-day emphasis is on survival or routines, a tendency to under-invest in purposeful innovation activities may occur. This behaviour not only undermines the development of the internal knowledge base, but will also lead to an underdevelopment of external networks that could lead to exchange or transactions with other knowledge sources.

Finding ways to cultivate the absorptive capacity of actors in the system is important, especially for innovative firms (Nonaka, 1994; Cohen & Levinthal, 1990). From a different perspective, it is obvious that a firm relies on external knowledge in two ways, indirect and direct:

- The indirect way includes the school education, vocational training and higher education of its employees as well as further training. This creates the knowledge base of a firm which is not aimed at resolving an immediate problem but rather at providing the knowledge that helps a solution to be found (it allows for better informed tinkering and higher-level deductive reasoning).
- The direct way includes exchange of information and experience with other firms and contracting consultants, and cooperation with a contract research institute.

These different kinds of knowledge acquisition have a strong influence on the competitive and innovative behaviour of firms.

2.4.3 Acquiring knowledge by interaction is often more efficient

As a rule, **acquiring knowledge by interaction is more efficient** as the innovator can learn from the deductions and experiments of others. Knowledge is cumulative and is possessed by different actors throughout the system. Thus, while some knowledge is exogenous, most knowledge is in the minds of the agents within the system. **Firms are both users of knowledge and sources of knowledge.** Often the most important sources of knowledge are other manufacturing firms, customers, suppliers of inputs and equipment, and other competitors. Also important are service firms which offer specialised services such as consultancy, software or access to databases. Other external sources include business and professional associations, technology institutions, research centres, universities, government agencies and meso-level organisations.

However, learning from others is only possible if the costs of interaction with other peers and organisations are low enough or if the density of networks makes this possible. Malerba (2005: 387) states that *"knowledge is highly idiosyncratic at the firm level, does not diffuse automatically and freely among firms, and has to be absorbed by firms through their differential abilities accumulated over time."* This accumulation often emerges through an iterative cycle combining deduction, experimentation, application, reflection, learning and adaptation between people working on the same problems or opportunities. **Knowledge hardly ever flows from clever academics to practical businesspeople.**

2.4.4 Knowledge flows more easily in places where there is a certain scale to the density of knowledge

Urban concentrations or regions where certain sectors are more prominent enable these knowledge flows to take place at a lower cost. Search costs are reduced through other complementary factors in denser areas, for instance through theatres, churches, schools and other social infrastructures. At the same time there is a

higher return on knowledge investment, which partially explains why people are willing to pay such high living costs to live and work in a city.

Over time the knowledge intensity of industries increases, leading to more specialisation and concentration of resources. In regions where there is a concentration of production and competition, the scale of knowledge specialisation activities may increase over time. This spatial intensity of knowledge spill-overs is often created by outsourcing, or the establishment of specialised institutions and through the increased availability of knowledge-intensive business professionals and services that spread knowledge between actors.

2.4.5 Knowledge density could lead to industry concentration

Several studies have also shown that greater access to knowledge can also lead to a densification of industry, a trend that is clearly visible around or near scientific research centres, universities or specific customers. Better resourced organisations can connect to regional or global knowledge systems, thus in effect overcoming local-scale issues. Various kinds of specialists known as knowledge-intensive business service providers emerge in knowledge-dense areas or industries, and act as carriers of knowledge between firms. Lundvall (1992) goes as far as to describe knowledge as the most fundamental resource in the modern economy, with learning being the most important process.

2.4.6 Market-supporting institutions matter

The configuration of unique local market and non-market institutions are important. For instance, organisations that help to make knowledge, technology and information available so that local enterprises can upgrade, make better technological investment choices, or improve their productivity are important to overcome technology-related market failures created by high coordination costs, asymmetrical information or adverse selection. Yet these knowledge-intensive services and facilities often are themselves plagued by market failures. Furthermore, failure to provide public goods such as good basic education, relevant quality infrastructure and also more advanced public goods such as scientific and technological infrastructure will lead to underinvestment and high costs in the private sector (thus resulting in market failures). Technological organisations could be publicly funded or privately funded, but must be visible and accessible. They could be responding to a public policy to assist modernisation, or they could be a private enterprise that is keen to equip its suppliers or customers with relevant knowledge. A technological organisation could be a university with an excellent engineering department, or a hardware store keen to help customers use their tools or materials in the best way.

2.4.7 Policies, institutions and industry structures co-evolve

An important co-evolution takes place between industry-supporting institutions and industry structures. For instance, as institutions adapt more to the needs of specific industries (thus they become more specific), they also accelerate and support the industry to become more specialised. In turn, the industries shape the offerings of the institutions. Thus industries and their supporting institutions are co-dependent on each other, and they could also easily lock each other into very specific development paths. Of course, the same could be said about industry development and regional policy that co-evolve. Policies respond to or accelerate the development of certain industry structures, which in turn accelerate or shape the development of specific policies that benefit the regions. This can be both a good thing and a bad thing when change is needed.

2.4.8 Local learning and tacit knowledge is important

Despite the huge quantity of information captured on the Internet and developed in other spaces worldwide, local knowledge still matters and in many cases matters more than before. In the age of instant information, it is possible for regions to develop a specific competitive advantage that is hard to capture. For instance, in a region with a concentration of heavy engineering firms, tacit knowledge gained by individuals and firms as part of a difficult engineering product could be hard to record precisely, meaning that the tacit knowledge gives the firms in the region a competitive advantage that is hard to copy. It is hard to copy because it is hard to document. Another reason why this local learning is so hard to copy is that local actors share a common or related identity, they share similar cost factors and they share other socio-cultural values.

Malmberg and Maskel (2001) identify three kinds of local learning:

- Horizontal (learning and monitoring of competitors making similar or related outputs)
- Vertical (knowledge complementarities, the outputs of one firm go into another as in a value chain)
- Social (spatial proximity increases the likelihood of fruitful unanticipated encounters among key players outside the workplace or creative stimulation through social engagement).

Within an innovation system, all these different kinds of learning should take place, not only between firms, but also between different public institutions, all within a particular spatial context.

2.4.9 Trust, social networks and social embeddedness

As global markets move further away from the Fordist socioeconomic model, manufacturing and services are becoming increasingly modular and dependent on the socioeconomic systems they are embedded in. This means that even large firms often depend more on external firms for intermediary or specialised inputs, and the sociocultural environment matters more. This has four implications for regional innovation systems:

Firstly, it means that regional relations and collaboration between firms and with supporting institutions matter more than before. This is especially relevant for newer industries and markets at the early phases of industry and product life cycles where there are still high learning costs and high coordination costs between co-dependent inputs and investments.

Secondly, trust is more important than before. This is both within firms as development cycles shorten and problems must be dealt with in real time and also between firms as well as between the public sector and industry. Markets depend on trust, which is often supported by institutional measures such as a functioning and accessible legal system, or an internationally recognised quality standard that makes it easier to transact with other parties. It means that in developing countries more effort must be put into strengthening institutions that makes it easier for businesses to find each other, transact, contract and enforce agreements.

Thirdly, within firms, culture matters more, especially with regard to cooperation, learning from failure, learning from others, and constantly working on improving productivity. As products become more complex and technologies become more interdependent, management becomes more functionally specialised and multidisciplinary, resulting in difficulties with regard to communication and problem solving

Lastly, as firms collaborate more with other firms and public-funded organisations, cooperating in networks is more important. Networks are sensitive to reciprocity, exchange and social behaviour, which promotes cooperation and sharing of scarce resources and information. For instance, clusters typically emerge where there are high levels of networking based on trust and reciprocity. These industrial networks seek to collaborate on certain issues while still depending on firms being competitive.

2.4.10 Linkages between local and global matters

Links between local actors and external actors (customers, suppliers or other) are seen as important as they connect the locality with external sources of knowledge from suppliers, markets or even supporting institutions external to the location or the country. For instance, one influential local manufacturer with a local supplier network that exports products into a global market can connect a local economy with a global market, thus creating a knowledge pipeline between international development and the local economy. This same manufacturer might require much specialised technical expertise nearby, giving the region access to very scarce expertise. However, when all technological inputs are procured from outside the region, it may also undermine local development and learning.

2.4.11 There are different modes of innovation

Innovation is often associated too narrowly with research and development activities that are carried out in the high-tech world (Kline & Rosenburg, 1986). Innovation includes not only technologically new products and processes, but also improvements in areas such as logistics, distribution, management and marketing (see Box 3). Even in so-called low-tech industries, there may be a lot of innovation going on, and the economic effects may be very large (Von Tunzelmann & Acha 2005). Moreover, the term innovation may also be used for changes that are new to the local context, even if the contribution to the global knowledge frontier is negligible. In this broader perspective, innovation – the attempt to try out new or improved products,

processes, or combinations of doing things – is an aspect of most, if not all, economic activities. Thus innovation could include imitating what works elsewhere, or integrating an idea from another context into the local environment. Often innovation (new to the context) is confused with invention (new to the world).

There are also different modes of innovation that are important to recognise. In some industries, the Science, Technology and Innovation (STI) mode is the norm. For this mode of innovation patents are an important way of protecting investment, thus intellectual property rights are an important aspect. Inventions, new-to-the-world discoveries, are often the result of the STI mode. In other industries, such as food production, the main form of innovation is through the Doing, Using and Interacting (DUI) mode, where producers learn (often with their key customers) how to improve product quality, labelling and food standards. This is more iterative than the STI mode (see Section 0). In the DUI mode, informal networks between different kinds of enterprises and institutions are important, and the process of improvement is incremental based on learning and adjustment of what works. Tacit knowledge is exchanged via personal networks with lower levels of formality, while the STI approach is often more formal, contract based and focused on explicitly documented knowledge.

Box 3: Three kinds of innovative activity

The most easily identifiable form of innovation is innovation aimed at developing new or improved products and services. In technical products this product development process may require deep knowledge of how to harness natural phenomena or use certain technology, while in other sectors like the food sector developing a new product may require a good understanding of consumer tastes and different ingredients. Not all new products require a complicated design and development process.

Process innovation is slightly more difficult and involves making improvements to existing products and services or designing completely new products and services, often in an incremental or ongoing way. Process innovation could be aimed at improving efficiency and reducing waste or costs, or it could be the introduction of new equipment and technologies into an existing process. While many smaller companies lack this process improvement ability in-house, even high-tech manufacturers depend on specialists external to the organisation. In places where these experts or specialists are not available, process improvement costs are much higher and improvements are more difficult to implement. In many industries, product innovation is made possible by new process innovations, so manufacturers who integrate new equipment into their production facilities may be able to offer new products and services simply by upgrading their systems. An interesting phenomenon is that enterprises that are good at continuous process improvement are often able to introduce many more product innovations, as they typically have internal systems for product development, product distribution and knowledge accumulation.

The third kind of innovation is focused on business model innovation and organisational design. This kind of innovation is all about internal organisation, functional specification, combining different kinds of internal expertise, knowledge and technology domains and being able to adapt the management of a company division based on differences in specific contexts. We include innovation in marketing strategies, innovation in supply chain integration, and innovate approaches to co-opting or working with customers as well as improved management models under this heading. Enterprises that are able to manage innovatively tend to be better at process innovation, resulting in more options and the ability to improve products or services.

In summary, this chapter provided insight into basic aspects of the economic development of metropolitan regions as well as the role of innovation systems in this respect. On the one hand, it emphasised the importance of considering metropolitan regions as agglomerations of inhabitants, industries and territories. On the other hand, it stressed the importance of taking a regional system perspective to promote more holistic as opposed to isolated and only business-focused innovation promotion approaches.

In the following chapter the specific challenges of promoting regional innovation systems in developing countries are considered in more detail.

3. Regional innovation systems in developing countries

In the previous chapter the universal principles of metropolitan regions, innovation systems and especially regional innovation systems were discussed. In this chapter we will continue exploring these concepts, but within the context of a developing country.

In developing countries, a regional innovation systems approach is important as it allows innovation and knowledge intensification around emerging industries that are hard to spot at a national level, and almost impossible to manage in a systemic way from beyond the region. This is not very different from the need of a local authority to be able to respond to local infrastructure challenges. With regard to the trend of urbanisation and the rapid growth of cities in developing countries, Turok and Parnell (2009) state that there is a strong rationale for trying to plan and manage the process of urbanisation more constructively, on the grounds that this will help cities to become more stable, healthy and resilient. There are also additional possibilities relevant to the whole nation arising from the growing concentration of activity in well-connected locations, including improved prospects for sustained economic growth, greater scope to deal with particular environmental challenges and more cost-effective delivery of public services.

At the same time the approaches to promoting regional innovation systems or improving the governance of metropolitan regions are very different in the less developed world compared to when the same concept is applied for instance to Europe. There are also important differences across less developed regions and across countries. Economic development in more developed countries is made possible by relatively stable market, organisational and policy systems that often do not exist in given in developing countries. At the same time social, sectoral and business prerequisites are often very different.

The chapter is structured as follows. The first part emphasises the different contexts and challenges that must be considered when making use of the innovation systems approach in developing countries. The second part focuses on the priorities of an innovation systems approach that have to be addressed in developing countries.

3.1 The different context of developing regional innovation systems in developing countries

Improving a regional innovation system in a developing country is much harder than developing such a system in an industrialised country. This has to do with the origins of the concept as well as with the reality of developing economies.

The concept of regional innovation systems was developed *ex post* based on case studies of innovation systems in the US, Europe and Asia (mainly Japan). Many of the institutions needed to support the emergence of a regional innovation system in developing countries simply do not exist, or they are weak or overloaded. Thus to promote regional innovation systems in developing countries an *ex ante* approach is called for, meaning that the key institutions and mechanisms that are needed must be identified and developed. A checklist approach of ticking off institutions and mechanisms is not appropriate, as the innovation system in a location typically evolve out of the unique economic configuration and dynamism of interaction between agents involved in disseminating and creating knowledge. Furthermore, as explained in Chapter 2, it is not about the existence of a capability or an element, but rather about the dynamics of interaction between different elements of the system. By implication, a region without a university can still be innovative if firms and public actors work together in a dynamic way. At the same time, having a local university does not guarantee a dynamic innovation system.

An innovation systems approach applied to a less-developed region will face certain contextual realities that a typical regional innovation systems approach in a more developed region may not have to contend with. This list is not exhaustive, but it will highlight issues that must be taken into consideration.

3.1.1 Weaknesses in the generic external environment conditions

In developing countries, **the social market system is weak, incomplete or non-existent**. Whereas in many OECD countries the system of labour rights, property rights and social security systems provide a foundation for a structured approach to innovation promotion. These generic framework conditions do not exist in many developing countries. For instance, the cost of failure of an enterprise in a developing country is high for both the state and the individual involved. Also in developing countries access to basic social institutions such as education, healthcare, social welfare and a functioning and just legal system is often highly unequal.

Coordination of innovation and related policies is poor. Regional innovation systems depend on a wide range of policies and programmes to work at a national level, and at the same time they require a degree of decentralisation of power and responsibility to the local level. In developing countries many decisions relating to regions, such as agricultural policy, infrastructure funding decisions, education priorities, research funding and even small business support are all decided at a national level. Regional innovation systems depend on the ability of sub-national stakeholders to set priorities with regard to innovation policy, sector priorities, industrial policy and infrastructure development.

There is a **dominance of top-down vs. bottom-up policies**: place-based approaches such as the promotion of regional innovation systems in certain regions also require a coordinated strategic orientation at the policy as well as institutional level. The reality in developing economies is often rather different: economic development promotion is rather defined by a centralised approach and not a synergetic approach in which top-down and bottom-up perspectives and knowledge creation enrich each other. A fragmentation of responsibilities in a larger number of ministries at the national level and line ministries in the more decentralised territories makes coordination in general even more difficult. Accordingly at the local and regional administrative level, strategic and economic competence is rather weak in many cases. At the same time, local development is made much easier as certain national policies are in place, such as competition policy, consumer protection and environmental standards.

A **larger divide between rural and urban environments exists.** What is often different in many metropolitan areas in developing countries are the large innovation capability and social infrastructure gaps between metropolitan cities and the rather rural disconnected surroundings. This divide is often directly visible when leaving the city boundaries. At the same time it demonstrates the lack of connectivity and knowledge exchange between various social strata.

There is a lack of **urban, innovation and network management competences:** Future urbanisation trends in developing countries will focus on secondary cities and middle-sized towns (see Cohen 2006; Roberts 2014). Most of these cities lack innovation and urban management skills as well as the ability to promote the flow of knowledge between people and different knowledge poles. This requires moderation and facilitation competences, and at the same time the ability to combine more specific market, industry and knowledge aspects.

Urbanisation growth in metropolitan regions is often based on social factors and less on economic factors. Urbanisation trends in EU countries often demonstrate strong migration to larger cities for economic reasons. In many developing countries migration is rooted in a lack of economic opportunities in rural areas or in social aspects. Migration in developing countries involves not only the lack of working opportunities in the countryside, but also the wish to have access to basic infrastructure (e.g. water and electricity), learning opportunities, and the feeling of being part of modernity. Turok and Parnell (2009) claim that "*most of Africa's urban growth is likely to be accommodated in dense, unplanned settlements where most people will lack formal jobs and housing and will not pay taxes*". Using UN Habitat data, they show that compared with previous urban transitions on other continents, Africa's urbanisation is being driven to a larger extent by poverty, conflict and demographic change, and is being led to a lesser extent by industrialisation and employment growth. While many governments are overwhelmed by these problems, others are trying varying strategies to cope with the demographic and geographic shifts that are taking place. For instance, some governments are increasing investments in rural areas, hoping to slow down urbanisation, for instance by addressing transport infrastructure development that will enable the movement of people between distant (formal or

informal) residential areas and working areas. Another strategy is the creation of low-cost or mixed-income housing.

The focus on poverty reduction often leads to isolated rather than coordinated intervention approaches. There are many opportunities to promote innovation in the informal sector, and to encourage new product development in survival businesses to ensure a minimum wage or income. From an innovation system perspective, it is necessary to distinguish the relevant target groups more precisely. The informal economy can be promoted through technology diffusion activities provided by actors in the innovation system or intermediaries (e.g. NGOs whose specific focus is on capacity building or entrepreneurship development). Nonetheless, the innovation system approach would first focus on strong knowledge creators as well as knowledge users, e.g. businesses with growth potential and less of a survival orientation. This does not mean that there are no social and technological innovations that can be transferred and made use of for poverty reduction. However, reality shows that economic and social development criteria, e.g. in poverty reduction strategies, often get confused with their objectives and inherited rationalities. A regional innovation system would first target those businesses with growth potentials and growth orientation. These can be micro businesses, SMEs or large businesses.

In developing countries disagreement can often be observed within politics and society about who benefits from specifically targeted policies (e.g. the promotion of the innovation system) and initiatives of the public sector –the middle class or the poorer parts of society. Awareness has to been created in this respect.

3.1.2 Institutional and network conditions are different

There is a low level of relevant knowledge organisations and lack of diverse knowledge abilities. In OECD countries business development co-evolved with the development of knowledge institutions. In many developing countries there are fewer publicly funded intermediary knowledge organisations such as technology centres, research and educational institutions as well as quality infrastructure, and these are mainly located in main cities and offer generic services to local businesses. Overall this often leads to a lack of diverse inputs that could be pooled for the creation of relevant knowledge spill-overs.

There is often a **disorganised private sector with narrow interests.** A poorly organised, too general private sector or one driven by narrow self-interests makes a regional innovation approach very difficult, if not impossible. A poorly organised private sector raises coordination costs, both for enterprises and for the public sector. Private sector network organisations such as voluntary industry associations and business associations are often underfunded and unable to contribute to the development and increasing competitiveness of the private sector. A further complication lies in the structure and main mandate of private sector associations and networks. In many developing countries the main function of the private sector representative bodies is advocacy. These network organisations are often more concerned with the narrow sectoral interests of their existing members – they are not resourced nor are they able to contribute constructively to development. In many developing countries, import tariffs that protect local industry are actually the result of advocacy by well-connected business groups. Where business associations do exist, they often represent the interests of mainly larger enterprises, and are generic in nature. Professional industry bodies do not play a very important role in the development of careers, professional standards and knowledge.

There are **fragmented support mechanisms in the form of formal institutions and many network failures.** Fragmented structures often lead to a lack of real constructive networks between the supporting organisations in developed countries and rather to strong competition between these organisations.

3.1.3 Market and business conditions

There is an **absence of innovation-based vs. price-based competition.** Localised learning and the development of technological capabilities depend on competitors being near, and the ideas and stimuli from proximate customers and suppliers. They are recognised sources of innovation. In developing countries the number of competitors is often fewer, and some kinds of input suppliers and customers are not available in many locations (if they are available at all). Thus not only is the public sector fragmented, but also the private sector.

There are many of persistent market failures[4]. Although economists describe perfectly competitive markets, in the real world markets do not always perform perfectly or optimally. This is particularly true in developing countries where many market institutions are emergent on non-existent. When markets do not perform in an optimal way economists refer to the situation as a "market failure". A market failure can be described as "*The inability of a system of private markets to provide certain goods either at all or at the most desirable or 'optimal' level*". Samuelson and Nordhaus (1969) define a market failure as *"An imperfection in a price system that prevents an efficient allocation of resources"*. In developing countries market failures increase the costs of coordination and make investment more expensive. Public institutions at the meso level that are meant to overcome persistent market failures often do not exist, or they are not focused on addressing market failures at all (Esser, Hillebrand, Messner & Meyer-Stamer, 1995). Technologically related services and investments are particularly prone to market failures. Beyond technical and product inputs, firms in developing countries also often under-invest in building human capital, which is also a market failure.

In developing countries, market failures are often visible in the form of the growth of monopolistic firms and other non-competitive organisations. Different markets are interdependent, so a failure in one market could affect the viability of many others.

Market failures also have a particular regional effect, as a region might simply lack sufficient scale to make a particular market viable, or lack scale to make a particular market-sustaining institution sustainable.

Lastly, markets are social phenomena that are tightly embedded in the social context. For markets to function, social institutions such as trust but also formal institutions such as means to enforce contracts, property rights, etc. are needed.

3.1.4 Knowledge accumulation is an interplay of endogenous and external learning processes

Developing countries often depend on knowledge (and capital and equipment) from outside the region and the country, making the technological catch-up of indigenous organisations more expensive and difficult. Attempts to protect the local industry from imports often simply result in new production technology and intermediary inputs costing more, further isolating the economy from the international improvement in productivity and efficiency. Importing equipment is often affected by fluctuating currencies and high transport costs, increasingly resulting in developing countries falling further behind the technology curve.

A country that is cut off from international technology and knowledge streams will soon fall behind. At the same time, demand in local or nearby markets is an important driver of innovation. If this demand is not well articulated or known, local manufacturers might not respond to it. In poorer regions, consumers prioritise cheaper goods as they try to maximise their money. The result is that producers are under pressure to cut costs and find it hard to move up the value ladder to higher-income goods. Producers in other regions that are further down the efficiency curve may be able to undercut local enterprises, further reducing scale in the local market.

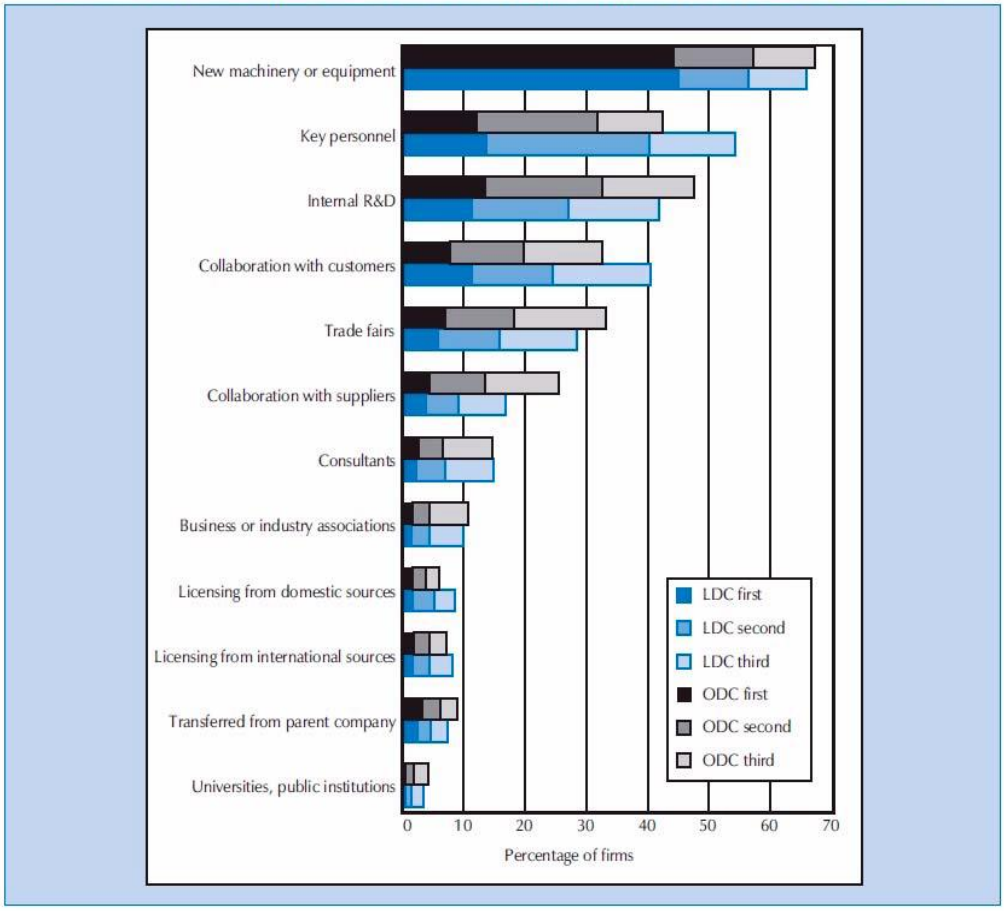
Lastly, procurement from the public sector is an important impetus in regional development. However, corruption, centralised procurement and a preference for foreign goods may undermine efforts to develop local industries.

Figure 4 is taken from UNCTAD's 2007 Least Developed Countries Report (UNCTAD, 2007) and illustrates the importance of new equipment suppliers, followed by new employees and internal R&D as sources of knowledge.

The graph highlights the fact that both in least developed countries (LDCs) and in other developing countries the most important conduits for technology transfer are the acquisition of new machinery and equipment, the recruitment of specialised staff, internal R&D, interaction with customers and suppliers, and trade fairs. The assumption that knowledge of how to use new technology flows from universities and public institutions would be wrong.

[4] See Cunningham Cunningham (2011) for a more detailed discussion on market failures and how they affect economic development.

Figure 4: Important sources of knowledge in Least Developed Countries



Source: (UNCTAD 2007: 12)

Innovation policy in developing countries must be aimed at solving or mitigating particular development problems or issues that constrain the economy, for instance food scarcity, tropical diseases, land erosion, crime, low productivity and lack of investment.

Perhaps it is also necessary to express a caution: over-dependence on external acquisition in the form of equipment might also undermine efforts to develop technological capability (perhaps from a lower base). So somehow a balance must be found, even if this is subjective and hard to do.

Lastly, developing countries are often faced with the outward migration of knowledge workers, managers and other professionals, the so-called brain drain. Building technological capability and knowledge in a society is important to enable innovation. But developing countries often face the reality that specialists and knowledge workers migrate from rural areas to cities, and from secondary cities to primary cities or to more developed countries where they have higher earning and development potential. This phenomenon is called a brain drain and it has a devastating effect on many developing countries which are able to train but not retain their knowledge workers.

3.2 Priorities of regional innovation systems in developing countries

Not only is the reality of promoting innovation systems in developing countries different, but so are the priorities. While we believe that the principles of promoting innovation are universal, we are the first to acknowledge that in a developing context there are certain priorities that are more important in a less developed country than in a more developed country. This section highlights some of these priorities. The following chapter proposes instruments and practical ways of addressing some of these priorities.

In a development context, there are multiple priorities that often seem to contradict each other.

3.2.1 Who takes the lead in promoting the regional innovation system?

In the industrial world, there is a rich network of public and private stakeholders that can work together. Models such as the triple helix model of innovation (Etzkowitz & Leydesdorff, 1995) describe an approach where government, academia and industry work together to explore new technological possibilities. These models are often based on a context where a rich history of development cooperation between different stakeholders exists, and where structural funds (such as the EU funds) made this development possible at sub-national level in member states.

Furthermore, in many developed countries professional managers and knowledge workers can often move between the different spheres of business, academia and government, and the gap between objectives and roles are not that wide. In developing countries, the gap between academia, the private sector and the public sector is quite wide. Managers and individuals do not move so easily between these different spheres, and the goal alignment between different stakeholders could be very low to start with. In this context, the ability of the public sector to take a leading role in the coordination attempts to improve an innovation system could be questioned by academia and industry, while innovation systems scholars often over-emphasise the legitimacy and the credibility of the state to take the lead. The same can be said of the private sector and academia: they often lack credibility or the means to coordinate the improvement of the innovation system. In a developing country, the role of NGOs and civil organisations could thus be more important.

Ultimately a broker or a champion is needed, and this person or organisation must have credibility with the other actors. Perhaps a constellation of public, private and academic champions is needed, but this depends on the specific context and the legacy of past development efforts.

3.2.2 Determining which kinds of institutions are needed to foster innovation

In a developing country, it can be assumed that while some institutions and organisations may be in place, the fragmentation of effort between actors and the cost of learning by doing may be high. For instance, in the developed world, many innovations result from intensive interaction between sophisticated or demanding users and producers in response to specific problems. Entrepreneurs learn from the attempts of their competitors, and they gain insight from the comments and feedback of their customers.

The more competitors there are, the more experiments are made, and the density leads to quick adaptation of formulae that work. Thus there is a richness of knowledge and exchange that is hard to follow far away from the competitive markets, and it is hard to copy in places with fewer competitors and less demanding buyers. With fewer competitors, developing country producers are also less likely to invest continuously in a wide range of innovative activities, with the ultimate victims being consumers and buyers who have fewer choices. What works in an industrial country or another developing country cannot simply be copied as the institutional and social contexts differ fundamentally.

As stated before, it is not so much the presence of every kind of actor or element in the system that matters, but more the dynamism of the interaction between the different elements. This means that the priority should not be to figure out which actors or institutions are needed, but rather what kind of interaction is necessary and how certain kinds of interactions (or lack thereof) can be stimulated or formalised if they exist informally.

Thus in a developing context, it is necessary to understand what the needs in the context are, and then we have to determine if this function would fit an existing actor, or whether a new kind of institution must be created. The principle here is “form follows function”: where possible, the function that is missing must first be ident

3.2.3 Technology diffusion vs. new-to-the-world innovationified, and then the appropriate institutional form.

Innovation is often misperceived as being about creating new-to-the-world products (inventions). Innovation is about combination, about learning, adapting and integrating knowledge and technology from elsewhere into a specific context. In more developed countries, the Science, Technology and Innovation (STI) mode (see Section 2.4.8) is often seen as a panacea for innovation. It is quite exclusive and for instance only enterprises with deep technological capacity can engage with scientists in a public research entity to solve a specific problem through scientific enquiry. Many industries, such as pharmaceutical, health and physics industries, depend on large investments in formal scientific research, and both academia and industries have deep knowledge and high absorptive capacity.

Altenburg (Altenburg, 2009) contends that in less developed countries, new-to-the-world innovations that result in patents is not the main priority. Altenburg explains that more attention should be given to technology diffusion, adoption and adaptation, like the Doing, Using and Interacting mode introduced in Chapter 2. According to Viotti, most innovation taking place in developing countries concerns the absorption of technology and competence-building rather than resulting in the introduction of new-to-the-world innovations (Viotti, 2002). This means that copying what works elsewhere and integrating it into a local context is a very important form of innovation. This innovation should not only be focused on the needs of more capable firms, but also on addressing pressing needs and upliftment in the region.

This is not to say that the STI mode of research has no place, as modes of innovation are also prevalent in certain industries. For instance, in a developing country it may be justified and indeed very necessary to conduct scientific research on certain issues that affect the local community. However, in many developing countries research budgets and infrastructure are often limited, and academics or scientists may be more oriented towards international journals and research funding. Formal knowledge institutions such as universities are often not the ideal promoters of the Doing, Using and Interacting mode of innovation as they are mainly occupied with teaching and to a lesser degree research. In a developing context, indirect knowledge intermediaries such as social clubs, maintenance technicians, telecommunication technicians and other service providers could be more important and unrecognised carriers of knowledge in communities. The media could also be an important source of ongoing learning, and so could the diaspora. From a skills development perspective, private or community-based training providers, online courses from other regions and human mobility are often more important sources of new knowledge than the formal education system.

The focus of innovation in a less developed country must be more inclusive and aimed at making innovation and experimentation with new technology as affordable as possible. Finding new ways to reduce research costs, improve processes or imitate successful innovations from elsewhere are more important. This may involve strengthening social networks, conducting more technology demonstrations and even funding

tours to international technology fairs to expose entrepreneurs and innovators to cutting-edge technology in order to reduce the technology gap between developing countries and the rest of the world.

3.3 The importance of locational policy that addresses the context and the tension between different priorities

The idea of developing the economy of a sub-national region is not new. For many, the development of the local economy is seen as an antidote to globalisation. In a local economic development (LED) context local stakeholders in an emerging region could come together and purposefully work together to prioritise the development of certain kinds of networks, infrastructure or dynamics. In this regard, LED and innovation system promotion is in general a clear network governance task. However, if joint strategies are to be developed and progressive alignment reached without wrong compromises, there are certain prerequisites for network governance, such as clear roles, responsibilities and competences of the different stakeholders involved as well as social capital. Regional innovation systems are often weak in developing countries when it comes to providing these prerequisites. The ability of local stakeholders to set locational policy is in itself a function that depends on permission from other levels of government. Somehow the local policy must also fit, acknowledge or draw on policies and strategies developed at other levels of government. Locational policy in an environment where hardly any resource allocation or local priorities can be set is a very challenging task.

There are different locational policy formats that are all designed to promote coordinated governance structures but use different strategies. Meyer-Stamer (Meyer-Stamer, 2005) summarised three different kinds of locational policy that can be used to shape the dynamics of the local economy.

3.3.1 Generic locational policy

One straightforward option is a generic locational policy, whose goal is to create favourable business conditions overall, without targeting specific companies or sectors (i.e. the functional equivalent of operational effectiveness within companies). Generic locational policies can also include certain support programmes, e.g. for clusters or business networks in general but not related to specific industries or clusters. Many developing countries are dominated by uncoordinated sectoral policies via different line ministries present at the regional administrative level. A generic approach would provide horizontal support mechanisms in which certain industry networks or clusters could then apply. On the one hand it reduces the risk that governments with a lack of management competences will promote market distortions with selective policies, and on the other hand it promotes network-driven approaches.

In practical terms, a generic locational policy may include:

- A systematic effort to assess the consistency, necessity, effectiveness and efficiency of local rules and regulations on which their streamlining is based
- An effort to make local and national rules and regulations more transparent and easier to handle and raise public agencies' awareness of private companies' needs and demands
- The creation of first-stop or one-stop agencies
- The provision of efficient real estate information systems and locational marketing efforts
- In more advanced stages, the generic approach may also include horizontal promotion programmes not focused on a specific industry.

The generic locational policy approach is clearly steered by the public sector, often also with a strong role of the national level. These items are not easily implemented, particularly with regard to making public agencies more private sector-friendly, which requires a long-term effort. In the context of generic locational policy, two types of stakeholder must be distinguished: 1) chambers, business associations and other collective actors, and 2) supporting institutions (e.g. training or technology extension). The first stakeholder group can contribute to locational quality simply by doing a good job (i.e. being agile, in close contact with member firms, and constantly adapting to new challenges). In the case of a chamber, this means providing effi-

cient, good-quality, and constantly updated services to its member firms and pursuing effective lobbying. The second stakeholder group, supporting institutions, must compete on markets. These are preferably real markets where customers pay (e.g. training courses or firm-commissioned research and development projects). Often, however, these are distorted markets where a third party, usually the government, pays a substantial portion of the price of the service (e.g. as part of employability or technology and innovation programmes).

3.3.2 Strategic locational policy

Strategic locational policy is a major focus of discussions on clusters and local innovation systems. This policy concept does not leave upgrading to the invisible hand of the market, but attempts to define specifically where to upgrade (i.e. agree on a direction and goal). Formulation of a strategic locational policy is the outcome of a decision-making process that involves and defines the tasks and responsibilities of government, firms and other local stakeholders. Reaching an agreement, however, involves enormous effort grappling with difficult governance issues.

The experience of local economic development projects in developing countries demonstrates that in practical terms a so-called "strategic locational policy approach" is often dominated rather by the public sector, in which businesses and other stakeholders are invited to workshops, but ultimately the power of decision remains in the hands of the local or regional government. Based on administrative logic, the result of such processes is often development plans with a less dynamic implementation orientation towards innovation flow promotion and business promotion. Infrastructure development (such as setting up of technology institutions, incubators, etc.) takes the form of following a planning approach rather than an exploratory and network-driven approach. This also applies to official innovation system initiatives, which are in general very much driven by the government or the public sector and less so than by a knowledge exchange-oriented network manner with the industry and the knowledge carriers (technology intermediaries).

3.3.3 Reflexive locational policy

Reflexive locational policy lies conceptually between generic and strategic locational policy. It is the policy approach nearest to a network governance perspective like those that exist in many developed countries. It involves the organisation of a collective reflection effort of tendencies and structural change in the industries, clusters and value chains relevant to the location. Unlike strategic locational policy, it does not involve negotiating a joint strategy and action plan with a clear definition of responsibilities for various actors. Rather, it provides a basis for decentralised strategy formulation within companies and government agencies.

The effort is based purposely on gathering intelligence that would not otherwise surface through decentralised actors and an organised reflection exercise based on seminars, workshops and presentations involving government actors, business representatives and researchers.

Regarding practical activities based on the reflection exercise, government focuses on generic locational activities; however, it can achieve greater effectiveness and efficiency since its action is based on better information. Companies pursue individual strategies, but their internal strategy formulation process is likewise based on improved information. In general, this coordination process also implies an alignment on concrete requirements to improve the competitiveness of the location or industry and refers to common responsibilities. Instead of designing a development strategy overall, the reflexive policy approach rather takes a more exploratory and learning-oriented view.

Our recommendation is that locations with a reflexive policy approach provide the best environment to introduce an innovation systems approach as the stakeholders in the public and private sectors are already motivated and have a track record of working together. Alternatively, a track record of Local Economic Development involving public and private networks (even on a small scale) will also make an innovation systems approach easier. However, in many developing countries these relations and experiences do not yet exist.

3.4 Chapter conclusion

We can deduce the following principles for a regional innovation systems approach in developing countries:

First, the promotion of a regional innovation system should not be too selective with regard to industries, but should rather be selective as to which kinds of actors to work with. The most important actors are those who play a role in disseminating knowledge and technology to the private sector, and those who are interested in improving the performance of enterprises in the region. Altenburg (2009) advises that attention should be given to broader market-enabling factors rather than take a too-specific sectoral or economic activity approach.

Second, the focus should not be only on R&D and STI modes of innovation, but also on interactive learning and DUI modes of innovation. Therefore enterprises, but also hobby clubs, enthusiasts and civil organisations involved in adult education are important actors.

Third, promoting a regional innovation system in a developing country is about determining ex ante what the adjacent possibility is. Therefore if a university currently has an engineering department, is it possible to expand to a nearby discipline without taking too large risks? If a company is maintaining equipment, is it possible for them to start adapting equipment or adding additional services? Therefore the focus should be on stimulating exploration of what is possible by mobilising networks of actors in a process of continuous discovery, and not on alignment of actors towards a common and normative goal.

Fourth, the interaction between a wide range of actors from all walks of life is important. It must thus be inclusive and not exclusive. Knowledge and its use must be made more accessible, and not to only assist those that have overcome high entry barriers and coordination costs. Activities should include the building of trust, the exchange of ideas, the revelation of opportunities and improved information flows between different communities. This requires one to be creative about how existing events, festivals and social events can be used to increase the interaction between different agents as a means of reducing the costs involved in finding potential collaborators. Problems solved and opportunities exploited creatively must be communicated widely and effectively, as should the successful use, adaptation and exploitation of knowledge.

Fifth, interaction between the public and private sector must be facilitated. Public officials often find it threatening to engage with businesses, and therefore a process of helping the public sector to understand the challenges and points of view of the private sector must be set in motion. At the same time, business is often accustomed to advocating for favourable change by the public sector, and is not in the habit of being a constructive development partner.

Sixth, the promotion of innovation systems should follow a reflexive locational policy approach that is oriented towards identifying synergy potentials and concrete entry points and at the same time addressing the responsibilities of the different private and public sector representatives involved.

Last, a long-term approach to fostering curiosity and stimulating interest in science, technology, biology, mathematics and business must be aimed at both children and adults.

4. Entry points to promote innovation systems in metropolitan regions in developing countries

An innovation systems perspective provides insight into how many different elements in a society work together to ensure the growth and well-being of the system. Of particular importance is how the different elements in the system interact to ensure that technological capability is built. This interaction in turn depends on broader social institutions that govern markets, build trust and allow information to flow. It can be a very daunting task to figure out where to start.

Chapter 3 outlined the challenges for innovation systems in developing and emerging countries. This chapter gives some pointers on where to start with the process of improving an innovation system in a metropolitan region. We do not attempt to provide a checklist or a recipe, but try to give some guidance.

The chapter is organised as follows. In the first section we describe a starting point of an investigation to find entry points into the metropolitan innovation system. In our experience, mapping every actor and institution, conducting SWOT exercises and collecting data on different industries and sub-sectors will in most cases lead to ad hoc interventions or paralysis, or both. We propose that the investigation should start with trying to determine who in the region is creating useful knowledge, who is using knowledge creatively, and who is disseminating knowledge. This is not yet a diagnosis, but is a high-level question that may lead us to people with insight into how firms use knowledge and how formal institutions and other firms play a role.

The second section looks at the regional dynamics and the interaction between industries, institutions and geography. When industries are in decline, the economic environment and the innovative behaviour of everyone involved in these industries are typically affected. When new industries emerge, formal institutions may find it difficult to figure out how to respond or support these industries, or what to anticipate.

The third section discusses the kind of issues that must be understood as part of a more detailed investigation or improvement process. We introduce six lines of enquiry that practitioners, institutions in the region and development partners must pursue.

The final section of the chapter will describe intervention criteria and the process logic of improving innovation systems.

4.1 Identify the creative use of knowledge and innovation

An important starting point that is part of the ongoing process of improving an innovation system is to understand which enterprises, organisations and even individuals are using knowledge in an innovative way, or which stakeholders are actively accumulating knowledge from local or external sources. It is important to connect with these actors and to network the generators and users of knowledge. Ways to improve the absorptive capacity and knowledge networking of local stakeholders were discussed in Section 0. Identifying the disseminators of knowledge is an ongoing process. Knowledge flows do not always follow formal channels (such as from universities to businesses). Important knowledge often flows through standards and specifications from buyers, equipment suppliers and even unintentionally from service providers such as couriers, computer technicians, etc. A more structured way of identifying these sources of knowledge will be discussed in Section 2.4.2.

A second kind of knowledge flow that we want to try and identify are organisations or individuals that are drawing on knowledge from outside the region. This could include exporters (they know what markets outside the region demand), multinationals (they know something about process combinations and market performance criteria) or academia (they are connected to international knowledge communities).

A third kind of knowledge relates to individuals or organisations that know something about unique problems in the region. These could be buyers, supply chain development officials, public officials, engineers or even politicians. This will be discussed in more detail in Section 4.3.3.

There are three ways in which new knowledge that enables innovation can be generated within a firm. It is not very difficult to enquire in a local economy which organisations have systems in place to enable (or discourage) this kind of learning.

The first is knowledge generated through **experimentation**. Enterprises that enable their staff to formally experiment with new knowledge or with new solutions often grow faster and more continuously. This is along the lines of the DUI mode innovation, but it could also be present in organisations involved in STI modes of innovation (discussed in Section 0).

A second way of gaining knowledge is through **reading, deduction and research**. These individuals or organisations have a structured way of gathering new information and reflecting on what they know or do not know. This does not always have to be formal or R&D-like. Even small enterprises or individuals can attempt this. It is valuable to determine which enterprises (or other organisations) in a location have set aside resources, even if limited, to purposefully discover new knowledge.

A third way is to try and find enquiring-minded individuals or organisations that **have realised that they do not have all the answers in-house**. Where do they turn to find new information or to solve their problems? Who helped them when they were stuck? Do the organisations that help them offer formal support to industry, or are the sources of the solutions exclusive or expensive to reach?

Again, these are the kinds of questions that we ask in our everyday work in promoting innovation systems. To conduct a specific investigation into these local knowledge flows is the topic of Section 4.3.

4.2 Assess the interplay between institutions and industries and its effect on innovative behaviour within regions

The regional innovation system needs to contribute to the development of unique competitive advantage of the metropolitan region. To follow a progressive and unique development path it is necessary to understand the different dynamics of the industries, the related supportive institutional environment as well as the overall orientation of the stakeholders in the region. This section provides insights into how to understand the regional dynamics as well as the competitive advantages of the metropolitan region.

Section 2.2 elaborated on the importance of the interplay between industry life cycles and the proactive role of the local knowledge and support institutions to provide applied technological expertise, innovation consultancy and certain resource inputs targeted at managing change requirements. Figure 2 shows an analysis framework that can be used to understand the dynamic between industries and institutions in a geographic space. It can be used as a workshop tool for reflection with certain actors who are well informed about the different sector and industry dynamics in the different territories of the metropolitan region. It can also be used more intensively in the comprehensive analysis along the six lines of enquiry (see Section 4.3) and interviews with the relevant stakeholders.

In both cases the objective would be to get an idea of the dynamics of the main industries, locations or suburbs that are in decline, in a growth phase, or that have emerging dynamics. A set of questions would be along the following lines:

- Which are the main industries that are in decline, dynamically emerging or in a marginalised position?
- Are they located in specific locations in the region?
- Are different locations in the region especially affected by the growth or decline of particular industries?
- What are the sources of knowledge creation which the different industries are searching for?

- What is the setting of traditional and new knowledge providers (private or public) in the different locations? What kind of knowledge do they provide? How much demand is there for this knowledge by businesses?
- How does the presence or absence of human and physical infrastructure affect the options to promote the region or certain industries?

Apart from the identification of the dynamics and interrelations between the industries and the different locations, one other key factor is to identify the drivers of change who want to develop the competitive advantages of the region. The term "competitive advantage" derives from the publications of Michael Porter who first used the concept to describe the competitiveness of regions (Porter, 2003; Porter, 1998c; Porter, 1998a). Competitive advantage emphasises the role of deliberate efforts that are created by the local stakeholders to develop the location or region.

As distinct from static advantages (e.g. geographic location, given resources, closeness to markets), competitive advantages emerge from the interaction and contribution of the local stakeholders themselves. Mesopartner distinguishes between three kinds of advantages:

- Regional/local **advantages that are inherited.** These are similar to the static advantages mentioned, but also include the competitive advantages of the past that have been developed by forerunners (e.g. natural resources, good climate and also tourist attractions developed in the past – pagodas, churches, industry structures with long heritages, etc.)
- Regional/local **advantages that are generic.** Many metropolitan regions have reached the development of certain industry structures, related workforce and technological and institutional competences. Nonetheless their efforts, compared to other metropolitan regions, do not differ in their innovation and knowledge intensity. They have thus developed generically compared to other regions.
- Regional/local **advantages that are unique.** Unique regions demonstrate a more innovative and progressive approach to developing their industries and promoting knowledge spill-overs that finally lead to the increasing competitiveness of the location.

During interviews and workshops with key stakeholders in the metropolitan region, reflection on these different kinds of existing advantages provides a better understanding of the overall orientation and direction of the main actors in the innovation system as well as the development requirements to become more unique.

Finally the promotion of a regional innovation system makes sense when it aims to make the region more unique and different from other regions.

4.3 Investigating and improving metropolitan innovation systems

This section describes what kind of issues should be investigated to find opportunities for improvement. We present this as lines of enquiry, which means that organisations involved in improving the innovation system can pursue an investigation of a thematic topic that connects many related issues. These lines of enquiry should not be seen as being static or as a prediction of what is needed, but should rather be interpreted as providing different perspectives (research angles) on the interaction between different actors within a system.

These lines of enquiry are presented in six themes. The first four of these are based on the Four Pillars of Innovation Systems model developed by Meyer-Stamer and Hildebrand (1994). The four lines of enquiry are:

1. The company-level innovation capability and the incentives of firms to innovate, compete, collaborate and improve, in other words the **firm-level factors affecting the performance of firms and their networks of customers and suppliers.** These include attempts within firms to become more

competitive and also attempts between firms to cooperate on issues such as skills development, R&D, etc.

2. The **macroeconomic, regulatory, political and other framework conditions** that shape the incentives of enterprises and institutions to develop technological capability.

3. An investigation of the **technological institutions that disseminate knowledge**. These include both formal institutions such as a standards authority or a research centre) and informal intermediary organisations (such as a small consulting firm) that play a role in disseminating knowledge between different actors in the innovation system. This enquiry identifies the direct support provided by technology-oriented governmental institutions, intermediary organisations, and certain types of service enterprises. It includes indirect sources such as equipment manufacturers, management consultants and technical experts.

4. The responsiveness and contribution of **training and education organisations** in building the capacity of industry, employees and society at large. This includes formal education providers and private skills development providers, and includes both supply push and responding to unmet needs. In advanced innovation systems these institutions often shift from responding to industry needs to anticipating industry needs based on their ability to identify local patterns and trends and external technological developments.

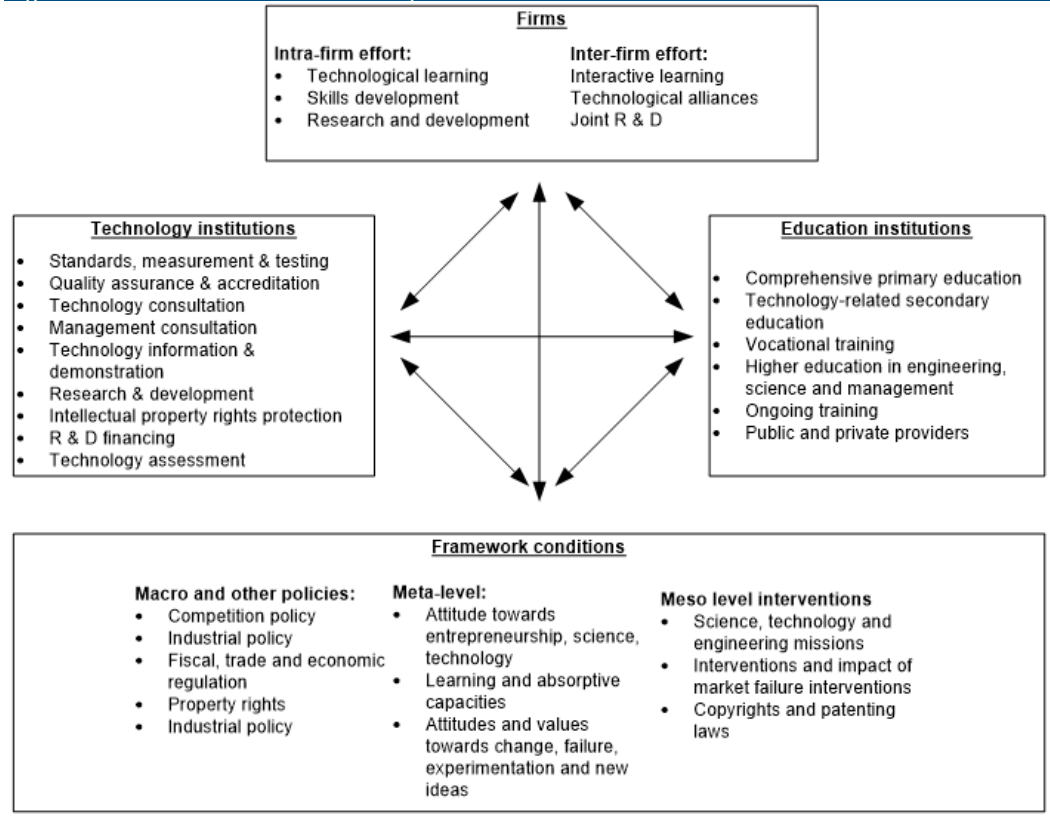
These preceding four lines of enquiry are shown in Figure 5. The next two lines of enquiry refer to the dynamic in the system within and between the different elements.

There are two further lines of enquiry that require emphasis in a developing country:

5. Investigation not only of the interaction and dynamics between individual elements in the system, but of the whole system.

6. Exploring poorly articulated needs or unmet demands that are not visibly pursued by the innovation system.

Figure 5: The Four Pillars of Innovation Systems



This model can easily be combined with other instruments frequently used in private sector or local economic development such as value chain promotion, cluster promotion, industrial policy development or regional benchmarking approaches. This framework is useful as it allows the micro-level actors (mainly firms) to identify areas in which they can improve their own performance. Furthermore, unmet technological as well as educational opportunities are identified which allow meso-level supporting organisations to respond with specific programmes to address bottlenecks and opportunities. This may even lead to macro-level policy refinement. All these interventions occur within a meta-level environment where attitudes towards failure, learning, critical reflection and entrepreneurial behaviour affect the innovative behaviour of firms and innovators.

4.3.1 First line of enquiry: factors affecting the performance of firms

This is where a large part of innovation takes place, and firms are the target of efforts to stimulate innovation. The measure of effectiveness of an innovation system is the extent to which firms use innovation to create a competitive advantage. While business owners, managers and engineers like to emphasise that their in-house effort is the main driving factor of innovation, research consistently shows that interaction with other firms, in particular suppliers and customers, is also a key driver of technological learning and innovation. Technology and innovation management is especially relevant at this level, which in turn depends on the competence and experience of firms to manage their enterprises and their continuous efforts to improve their performance.

A large part of the analysis of the firm level and its supporting environment can be achieved with mapping and diagnostic instruments typically also used during value chain diagnosis. Perhaps the main difference is that more attention is given here to the sources of ideas, inspiration, information and collaboration. Most of this information can be gathered through structured interviews and site visits to enterprises.

Important questions to ask are:

- Who is innovating based on learning-by-doing and experimentation?
- Which firms are actively trying to innovate?
- Which industries are actively trying to improve their dynamism?
- Which industries are expanding and growing despite the environment and the many constraints?

Source: adapted from Hillebrand et al. (1994)

4.3.2 Second line of enquiry: macroeconomic, regulatory, political and other framework conditions

This line of enquiry investigates the various regulatory and environmental factors that shape the behaviour of enterprises. It combines the meta level (sociocultural) and macro level (generic framework conditions) of the systemic competitiveness framework (Esser et al., 1995).

Specifically, it seeks to establish whether or not firms have to innovate through the incentives created in the broader environment. Firms' innovative efforts are not usually the result of enthusiasm for innovation but the outcome of necessity – firms have to innovate because their competitors are innovating too, and because they will get forced out of the market if they do not innovate. In turn, this means that firms that are experiencing little competitive pressure will often not be inclined to put much effort into innovation, which is perfectly rational as innovation always involves cost and risk.

While some of these issues can be identified through desktop research, interviews with key industry leaders or experts will quickly reveal which socioeconomic factors affect the investment and experimentation appetite of the business sector.

A second dimension to this line of enquiry relates to the incentives for other actors in the system to support the development of technological capability in formal and informal institutions. For instance, national-level policies direct universities to offer particular kinds of courses, but doe they provide the incentive for academics to develop teaching or research programmes that improves the capacity of enterprises or innovators?

4.3.3 Third line of enquiry: technological institutions that disseminate knowledge

Firms depend on a variety of public and private technology institutions in order to compete and grow. Examples range from access to basic research all the way to access to technical problem solving. The measurement, standards, testing and quality assurance (MSTQ) of a country is also assessed from this perspective. The density of interaction between various technology institutions, as well as the interaction between the firms and the technology institutions, is an important factor in the innovation trends in a sector. Various kinds of technical services such as knowledge-intensive business services play an important role in knowledge spill-overs between different firms.

Again, technology and innovation management are important from this perspective, as supporting organisations that are not aware of their effect on the broader system, nor of how their technological behaviour affects the environment in which they work, could negatively affect an innovation system. To this end they should ask questions such as:

- What are the main constraints that companies overcome by using your services or products?
- Which are the businesses that benefit from your services? How has this changed?

By visiting the technological providers identified by industry in the value chain or in the region, the reverse line of questioning could also yield important insights. The following are sample questions that could provide important insights into how the demands of industry shape the supply of these services:

- How do you provide industry with intensive or specialised knowledge?
- Which specialised or advanced knowledge are businesses asking for?
- How do you know which services and products to develop?
- How do you decide which technological services to provide?

The main difference here from typical private sector development approaches is the shift away from generic technological services provided by business development, extension and other support providers. The emphasis is now on the sources and flows of knowledge, technical expertise and specialist advice. With this line of enquiry it is necessary to understand the trends or patterns around the technological paradigm[5] that defines or anchors the innovation system or the regional identity. Where and how is this technological paradigm defined, and how is it "translated" into a service (or input) that is valued by industry?

4.3.4 Fourth line of enquiry: the role of education and training institutions

This line of enquiry tries to understand how formal knowledge through training and education shapes or influences industry. It includes education services by the public and private sector, as well as education services from beyond the region (such as international universities or online courses). In many industries specialised or specific training is provided by training providers other than that provided by the formal education system. The more diversified the economic or industrial system, the more demand there will be for highly adaptive and responsive training providers.

There is certainly some overlap with the third pillar, as some research institutions will do some training, and some training institutions (especially universities) may be involved in research and development. However, it is crucial to understand that the core mission of universities is education and training. In any case, it is important to distinguish between the different roles of the research centres in universities and the education services. In developing countries, the potential of universities to contribute to firms' upgrading efforts is usually very limited, and mainly takes the form of education and training. However, the relationships that exist between academics and students are important informal channels of support to industry.

A recurring pattern in developing countries is poor research and to some extent poor education relations between the formal education sector and industries. There are many reasons for the disconnect, which range from the aptitude and competence of education sector staff, all the way to the fact that many manu-

[5] A technological paradigm is about how people identify with a knowledge pool or a technology and with each other. It is shaped by knowledge bases, specific technologies and inputs and the different actors and networks that are systemically interacting, and the institutions supporting a specific industry. Thus a technological paradigm could span different industries, different kinds of firms and even different kinds of knowledge domains. An example is the green energy technological paradigm that includes solar, wind and other forms of alternative energy.

facturers in developing countries draw on education systems elsewhere. Often academics in developing countries are incentivised to participate in international conferences and publications, with the problems or constraints of the local private sector not being very attractive. Furthermore, academia tends to move towards more recent knowledge and learning, while industries might be faced for much longer with older problems (such as how to organise management). It isn't very attractive to academia to stay involved with "old" problems.

This line of enquiry is not only about what the education sector offers to industry, but also about how responsive or sensitive it is to demand from the private sector. Often the private sector is poorly coordinated and unable to express or articulate their needs to the education sector. This is a typical coordination failure, which often results in an education sector that is irrelevant to the private sector. Thus the line of enquiry in this pillar is not only to understand how educational organisations train their students or respond to the general needs of industry, but it rather concerns how different educational organisations keep track of new (often un-expressed) demands in industry, and how new courses, research areas or human capital can be created. Ultimately we want to find ways to make the education sector more responsive to the current needs of the private sector. At the same time, the education sector can play a crucial role in assisting industries to better understand the human capital requirements in the future. Many of the world's leading innovation regions are dynamic because of the active facilitation role played by various education institutions, not only in responding to training and education needs, but in actively creating a demand for and supplying new skills and technologies that are not yet in demand

Lastly, in developing countries, lecturers and academics often have incentives to provide consulting and training services to industry after hours. Thus the scale of demand on the formal institution is undermined by the shortage of consultants. Academic staff moonlighting as consultants to business undermines the development of local management and technical consulting provision to industry.

4.3.5 Fifth line of enquiry: investigating beyond bilateral interactions towards the holistic dynamic in the system

This line of enquiry is based on insights gained from complex adaptive systems. In a complex adaptive system, individual behaviour of actors is affected by the greater system. However, the choices these agents make also affect each other and the system. The choices that are made in the system can reveal themselves in patterns of behaviour.

This line of enquiry is about understanding how the choices of particular institutions affect other institutions, framework conditions (for instance policy options of government) or industries. It is about understanding how aware different actors are of the effect of their individual choices on the overall system, or how different actors are affected by the system and in turn affect the greater system. This line of enquiry attempts to understand how reflexive the local policy process is, how transparent it is, and how formal and informal channels of communication work. Very often actors make decisions about their resource allocation without considering the broader effect on the rest of the system. See Textbox 4 for an example.

Box 4: An example of a systemic response to an opportunity

If a particular metropolitan region is endowed with several higher education institutions, and it is decided to pursue a locational strategy of leveraging the presence of these institutions to position the region as a research and development hub, then we would expect to see the strategies of these institutions adapting to this strategy and affecting investment choices. We would expect to see the emergence of networks between these institutions to foster collaboration and more purposeful development projects aiming to leverage the co-existence of different institutions.

At the same time we would expect to see industries responding, contributing to and leveraging the presence of these institutions. We would expect the local authority to respond, for instance by updating their promotional material to reflect the presence of these institutions, or perhaps by making land available to allow the development of physical infrastructure in support of these institutions. We would thus expect to see many interactions, networks and collaboration in this system. If we do not see any change in the behaviour of these actors, then we can conclude that the innovation system is not functioning optimally, even if all the elements are present.

In conclusion, every enterprise in the local economy has an effect on the geography and the economy around it. Is it obvious what this effect is? At the same time, every enterprise is affected by the economic and geographic space around it. How? Lastly, entrepreneurs make decisions about where to locate their businesses and whether to continue investing locally. What are their decisions to invest in the local community? Do public officials, especially those involved in the governance of the metropolitan region, know the answers to these questions?

4.3.6 Sixth line of enquiry: poorly articulated needs or unmet demands that are not visibly pursued by the innovation system

To improve the innovation dynamic in a metropolitan region requires attempts to be made to involve actors who are currently not involved in innovation in problem solving, experimenting with new technology and building bridges between sources of knowledge, and actors who could benefit from that knowledge if it is presented in a suitable way.

There are two elements in this line of enquiry. The first concerns social issues that can be used to stimulate innovation and increase the interest of society, industries and civil actors to build their knowledge base and technological capacity. This involves identifying problems for which suitable solutions appear to be elusive, unconvincing or not suited to local conditions. These problems provide a unique opportunity to draw in communities often left out of technological capacity building such as schoolchildren, students, community organisations and employees. We cannot only depend on the ability of management of firms and institutions to make the right allocation choices. Pressure is exerted on management to create conditions more favourable to knowledge accumulation and innovation by employees, customers and suppliers.

The second element of this line of enquiry concerns investigating some of the information asymmetries that exist between different groups in the economy, for instance between sophisticated buyers (for instance the performance requirements of a manufacturer that exports its products) and potential suppliers, or between consumers and potential producers, or between rural farmers and urban smallholders. Information asymmetries create market failures and increase the costs of coordination between different economic actors. Many needs in a regional economy go unmet because the size and extent of the opportunity is unknown, the requirements of possible solutions are not explicit, or potential solution providers are unaware that an opportunity exists. The rest of the innovation system plays an important role in equipping society with the ability to learn from mistakes, to learn from experience, to absorb knowledge and innovation from external sources and to experiment with potential solutions by reducing the risk of failure.

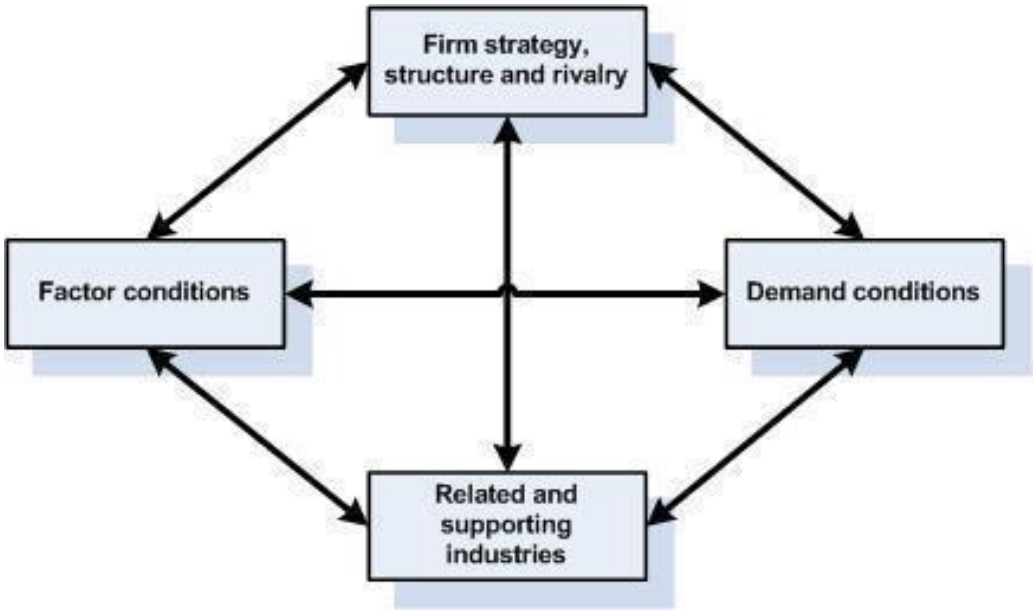
4.4 Using Porter's Diamond to diagnose industry structure and demand on the sector

When promoting regional innovation systems, pressure to work with selected industries, sub-sectors or clusters may arise. A powerful yet simple instrument to understand the factors that are driving the performance of an industry or a cluster is the Diamond developed by Harvard Professor Michael Porter.

Michael Porter's "Diamond" of competitiveness (1998c) attempts to isolate the factors that influence the competitiveness of industries and nations and is illustrated in Figure 6. The Diamond is frequently used in country and industry-specific competitiveness assessments and benchmarks, but it can also be applied to value chains, clusters or local economies and regional innovation systems.

For innovation system practitioners it has particular value as it highlights how demand conditions (and especially sophisticated demand) shape an industrial or a regional economic system, and in turn, how the industrial system might shape demand. According to Porter, demand not only shapes supply, it shapes the supporting institutions (which provide basic and advanced factor inputs), the industry structure and rivalry and factor conditions. In turn, each of the four factors of Porter's Diamond influences the other factors. It is a complementary instrument to the six lines of enquiry outlined in the previous section.

Figure 6: Porter's Diamond



Source: Porter (1998c: 72)

Porter explains that for each economic activity, goods are produced with a combination of factors that reflect the factor endowments of the entity in question. Thus, goods that can be produced with a relatively high proportion of labour to capital tend to be manufactured in countries where labour is relatively abundant. Arrow (1999: 17) adds that knowledge is becoming an increasingly important factor of production, which is affecting the ability of firms to remain competitive. While capital and labour are considered private goods, growth is achieved through increases in knowledge.

Table 3: Different factors of production

Factor type	Description
Factor conditions	Cover natural resources, climate, location, unskilled and semi-skilled labour, and debt capital
Advanced factors	Include modern communications infrastructure, highly educated personnel such as graduate engineers and computer scientists, and university research institutes in sophisticated disciplines
Generalised factors	Include the transport system, debt capital and well-motivated and qualified employees who can be employed in a wide range of industries
Specialised factors	Involve narrowly skilled personnel, infrastructure with specific properties, knowledge bases in particular fields, and other factors with relevance to a limited range or even just to a single industry

Source: Cunningham (2012) adapted from Porter (1998c: 77)

It is important for innovation system practitioners to recognise that non-traditional local factor conditions such as knowledge, relationships and motivation are increasingly making some areas become more competitive than others (Keeble & Nachum, 2002; Zack, 1999). Thus a local innovation systems perspective can help to understand how these tacit or difficult-to-explain factors can shape a region's innovativeness and competitiveness.

Many countries make the mistake of trying to preserve their traditional industrial base along the lines of outdated concepts of industrial economics (Stare, 2007). However, in industrialised countries governments recognise that knowledge, creativity and other soft factors (such as quality of housing, diversity of social activities and the overlaps between different knowledge bases) are increasingly important in driving innovation and the technological upgrading not of only industries but of whole regions.

4.5 Modes of intervening to improve the performance of innovation systems in metropolitan regions

A process to improve an innovation system can be undertaken by any actor in the system, provided they have the legitimacy or sufficient influence to mobilise the relative stakeholders.

Box 5: Examples of how different organisations can promote an innovation system

Business organisation: A business association sees the need to improve their services for their members and to support them in their modernisation process. They create specific working groups with enterprises to identify value chain linkages as well as cluster challenges. Based on the identification of knowledge requirements in these business networks the knowledge supply side is analysed. Who is providing requested knowledge in the surroundings? To what extent is the knowledge adopted to the needs of the enterprises? How can the delivery of the requested knowledge become more adopted and provided in a sustainable and not isolated way? What has to been done to promote a system of knowledge transfer and innovation support in the longer run? Based on this process the business association can start a relationship with universities or research institutes, perhaps also with certain knowledge-intensive suppliers and buyers to improve the formal or informal knowledge and innovation system around their members.

A research institute or technology transfer organisation is requested by the government to increase its knowledge transfer to the existing local business sectors. It starts to do an analysis of technology transfer or knowledge requirements based on company interviews and develops a portfolio of required process and product innovation opportunities. Based on this knowledge, it starts concrete research projects, alone or in cooperation with other local and regional knowledge institutions. It also starts to track knowledge flows and the delivery of technology and organisational solutions. This process can also be called “informal innovation system mapping”.

The local or regional government requests the promotion of a local and sectoral innovation system. It starts by contracting a consultancy company to do a first innovation system mapping based on interviews with enterprises and knowledge institutions. Interview questions especially ask for the existing knowledge transfer structures in enterprises as well as an analysis of the innovations in companies that would be necessary to increase the competitiveness of the sector or value chain. The information will provide, on the one hand, information about existing knowledge flows, and on the other hand, the required supply of adopted knowledge for the improvement of the competitiveness beyond current existing knowledge transfer activities. The interviews will provide the identification of interested entrepreneurs to participate in innovation projects and will also provide entry points of such projects. Additionally, they will be able to identify motivated groups of entrepreneurs interested in participating in innovation projects as well as dynamic knowledge carriers that are able to promote such projects. This could be a starting point for the identification of an innovation system.

For example, a buyer of a commodity, a university, a technology transfer centre, a business association or a local government official responsible for economic development, can all undertake improvement activities either on their own or in cooperation with others (see textbox 5 above).

This improvement process can be uncoordinated and piecemeal. Surprisingly, in very dynamic environments with sufficient resources and with sufficient external pressure to be innovative, this kind of unfocused and random process can yield results (albeit at great cost to the society in the short term). However, these preconditions often do not exist in developing countries. A more structured and coordinated approach is needed.

A structured approach to improve a metropolitan innovation system can either be done on a project basis with very specific resources allocated to very specific objectives, or it can be done in a more programmatic way, where an institution or network of organisations embark on an ongoing process to improve the system. It can also be undertaken as a strategic approach where a specific intervention is implemented that will change the local technological capability, or it can be focused on exploiting quick-win interventions that build the confidence of local stakeholders working together.

The following modes of intervention could be considered, or perhaps a mixed mode:

1. A collaborative approach pursuing **quick-win actions**, building the confidence and collaboration of different networks of actors. A quick win is defined as three criteria being met. Firstly, the resources to implement the improvement activity are available and decisions about them can be made by the stakeholders involved. Secondly, the results can easily be communicated to others, and better still if they are highly visible so that other people can imitate them or adjust their behaviour. Lastly, the first steps towards implementation must be made soon, if possible within a few days. Quick-win activities are typically spontaneous and do not require detailed planning as projects do. They should rather be seen as enabling steps.

2. A **project approach** is where selective interventions are carried out to improve specific aspects. Such projects should be implemented in a transparent way in consultation with different stakeholders to ensure that other agents can support, contribute and respond to the changed environment. Typically improvement projects with a regional innovation focus are undertaken by public stakeholders to ensure positive spill-overs and accountability. However, the private sector can also take on these projects if they are willing to collaborate with others and allow externalities to accrue to others.

3. Where stakeholders have some shared trust or experience of collaboration, it is viable to taken **an exploration approach** in which stakeholders purposefully explore alternatives and learn from their failures and successes. For this to work, institutions (and firms) must play a role in reducing the risks (or costs) associated with failure and must take steps to enable or incentivise creative thinking and experimentation. This requires creating formal experiments which can be safely allowed to fail so that people can take risks to explore alternative approaches to the same problem. Thus management cannot pay lip service to “learning by failure”; failure in this context is seen as valuable as it shows what is and is not possible. Based on current understanding of technologies, adjacent opportunities can be identified where existing capacities are extended towards opportunities that are within reach but may not yet have been explored.

A development programme should work in a collaborative way with local institutional actors to improve the dynamics of the regional innovation system. It must assist stakeholders to become more aware of the system dynamics, and must build local capability to diagnose and continuously improve the local innovation system through a portfolio of projects, quick-win collaborative activities and purposeful experimentation with creative solutions. The objective is not to fix a specific performance problem of any given stakeholder, but to attempt to improve the systemic relations and dynamics within the system. So if it is found that local enterprises are under managed and using outdated process technology, the solution is not simply to train management and provide them with subsidised equipment imported from abroad. This will undermine the ability to determine the role of different stakeholders to incentivise and build capability in the system. Thus underinvestment in better process technology and the lack of management are seen as symptoms of several failures within the system. Practitioners should ask whether it is possible to develop a portfolio of interventions to influence the quality of management which will create incentives for enterprises to try out, select and integrate better technology.

5. Recommendations for German development Cooperation to promote innovation systems in developing countries

Metropolitan regions in developing countries are expected to grow exponentially during the next two decades. Based on recent experience, this urban growth process will most likely have tremendous negative economic, social and environmental effects if solutions are approached sporadically when crises occur. Proactive as well as flexible systemic support mechanisms will be key to managing this development path in the most sustainable way possible. International donor organisations will play an important role in setting the urbanisation and metropolitan area agenda. They themselves, in cooperation with the national and regional partners, have to agree on a more systemic and aligned development approach that also takes the different contexts of the respective countries and regions into consideration.

This report introduced an innovation systems perspective as a way to respond to the upcoming territorial challenges in metropolitan regions. The German Development Cooperation (GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit) should become an agenda setter by creating awareness of such systemic approaches and also sensitising people to specific aspects that have to be taken into consideration also to overcome blueprint intervention approaches based on very different OECD contexts. The GIZ is well positioned to take over the setting of such an agenda due to Germany's diverse experiences and the experience of local and innovation promotion in organisations such as the GIZ.

5.1 The GIZ's advantages in regional innovation systems in metropolitan regions of developing countries

This section considers how the German experience in integrated local development is relevant to developing countries, and how the portfolio of German development expertise can assist developing countries in proactively integrating private sector development, governance and local development.

5.1.1 Leveraging the German laboratory experience of innovation system promotion

Germany is perceived as a highly innovative country whose competitiveness is mainly based on the promotion, development and production of knowledge-intensive sectors and products. As a result of strong decentralisation and an emphasis on leveraging regional potential, the country has become a laboratory for promoting regional innovation systems over the past 40 years. Over the past 15 years Germany has hosted several inward study missions from developing countries interested in learning about local economic development, good governance, regional innovation, regional infrastructure development as well as about Germany's higher education system.

The GIZ can become an agenda setter on the topic as it makes use of the profound learning experiences of failures and successes. Particular aspects of Germany could also be used to advantage by the GIZ to promote systemic interventions and become an agenda setter:

- During the past 10 years the German Government has promoted Germany's high-tech strategy. It focuses on the promotion of regional business clusters and excellence research clusters based on intensive network relations and synergies between regional core businesses, SMEs, universities and R&D institutions. At its core it is multi-disciplinary and knowledge intensive. Even if these clusters now look very impressive and capital intensive, they all started small (some more than 20 years ago) and slowly but surely grew due to the efforts of a growing collective of different stakeholders in the private and public sectors.
- Germany experimented with several decentralised regional promotion and governance models that were oriented towards promoting structural change, innovative planning formats and innovation in regions and territories. Several international building exhibitions, regional network and governance projects and change initiatives have been set up to promote more systemic metropolitan interventions instead of iso-

lated city solutions[6]. A valuable insight from these regional interventions is that the successful interventions were often led by temporary agencies with a diverse skills set combining public relations, marketing, engineering, sociology, business management and urban planning skills.

- Many multinational German companies are based in developing countries. Their headquarters are often drivers of German innovation systems and these offices can also become connection points for regional approaches. However, Germany's manufacturing sector is also built on small and medium-sized family enterprises. Often these family-owned enterprises have a multinational presence and they are very respectful of suppliers and customers in developing countries.
- Overall the systemic understanding of the promotion of regional innovation based on a specific local context is deeply rooted in German development logic. It became a key consideration especially in the past 20 years with strong decentralised top-down and bottom-up approaches to promote local and regional network governance and to link competitiveness, innovation promotion and green technology development.

The earlier part of this report highlighted the importance of context. We are not proposing that ideas and concepts from Germany be copied as best practice by developing countries. However, in our experience, German stakeholders are often very open to sharing their learning (which includes being open about failures) with counterparts from developing countries. In our experience, Germany also learns from developing countries and the reflection process of past experiences is often valuable for practitioners in Germany.

5.1.2 The competitive advantage of the GIZ owing to its competence fields

During the past two decades, one of the cornerstones of the GIZ instruments was the promotion of private sector development. The GIZ has a certain competitive advantage over other international donors when it comes to specific expert fields as well as a long track record of programme experience. The following points provide some insights into these advantages, which are relevant to the promotion of new trends within the international donor community and government partners:

- The GIZ has developed a diverse range of complementary expertise in relevant areas for the promotion of local innovation systems. This includes the promotion of local economic development, cluster and value chain analysis, business development services and the improvement of the business environment.
- All these different fields of expertise have been integrated into innovation and regional development programmes with long track records of experience.
- The GIZ has many tools to promote regional and participatory development approaches linking economic and also urban development aspects with each other.
- Several innovation programmes have been initiated that have also followed an innovation systems approach (e.g. a regional GIZ programme in the Middle East to promote innovation and innovation systems).
- The GIZ sector project on the promotion of metropolitan regions is integrating several complementary topics that are also relevant to the promotion of regional innovation systems. The project considers those future trends in industry and service production that will become relevant for smart cities and smart villages. This includes the trends in industry 4.0, smart specialisation, inclusive development and green environmental technology. It also considers multi-level governance structures for the promotion of regions that entail different administrative boundaries. All these aspects will also become relevant to the shaping of the innovation systems approach.
- Since the mid-1990s, the GIZ has promoted a systemic competitiveness approach. It goes beyond interventions mainly at the business level, and especially takes into consideration the role of supporting institutions, as well as regional and national policy actors as an integrative part of intervention. The systemic understanding is thus to a certain extent an inherited element in many programmes. The GIZ is distinct

[6] See for example IBAs in Hamburg, The Ruhr Valley, Saxony, Berlin, etc. (http://de.wikipedia.org/wiki/Internationale_Bauausstellung) or the "Regionale" approach in North Rhine-Westphalia (http://www.regionalen.nrw.de/cms/index.php)

from many other development assistance organisations in that it often combines a bottom-up approach with a top-down support approach, in other words a multi-layered approach.

This background of experience makes it easier for the GIZ to apply the innovation systems approach in support of the promotion of metropolitan regions in developing countries in a distinctive and at the same time novel way. The following sections outline some of the entry points for concrete realisation.

5.2 Elements of a GIZ agenda: ensuring a systems vs. an isolated approach in the development of metropolitan regions

5.2.1 Ensuring a systemic and flexible vs. an isolated and linear approach

The GIZ's priority of assisting metropolitan regions with innovation systems promotion should be to address systemic problems or patterns relating to the inability of the economic system to support the creation, absorption, retention, use and dissemination of economically useful knowledge through interactive learning or in-house R&D investments. The GIZ can offer to act as a unique broker and enabler. It can do this by positioning itself as a partner who contributes towards the understanding of the larger picture and at the same time promotes small and medium-sized change initiatives that contribute to the improvement of linkages and diffusion of knowledge between motivated enterprises and knowledge carriers. In this way it can combine a strategic with a very much implementation-driven approach. Thus a metropolitan region whose economic activities are not innovative, but which is willing to experiment with its public and private interaction would provide a good entry point.

Chaminade et al. (2009) identifies two main groups of issues related to the innovation system that can be addressed:

- **Problems related to the components of the system**: these deal with the organisations in the system and their competence, their ability to learn, to engage with others and to absorb knowledge from outside their organisations.
- **Problems related to the dynamics of the system**: these arise when organisations encounter technological problems or challenges that exceed their current abilities. They appear when organisations are confronted by technological shifts or requirements for capabilities that the system does not have.

The GIZ has the experience and the strength to address both these issues. The first can be addressed by a participatory and inclusive approach not only to planning, but also to strengthening development institutions at the meso level.

The second issue can be addressed through the GIZ's experience of development processes that start small and then gain momentum as the stakeholders gain confidence. Many donor and governmental projects focus on elements of the system (e.g. a university, industry association or local government unit). They tackle organisational development aspects, the improvement of supply-push and demand-pull activities within, for example, technology transfer or research organisations. Often these activities are organised in a rather isolated way (e.g. support of process or product innovation consultancy by one research institute for a number of businesses). No effort is made to improve the system itself and perhaps even to create competitiveness in the search for appropriate solutions. The same isolated approach can be identified when it comes to the improvement of the system dynamics, e.g. by involving outside research organisations such as cooperation projects with the German Fraunhofer Institute that deliver solutions but do not place certain dynamics inside the regional innovation system.

For the GIZ it is necessary to create awareness of such isolated approaches and at the same time provide process support to overcome fragmentation. One way to achieve this is to focus cooperation on solving specific local challenges or exploring optimal uses of local resources. A key criterion in this respect is a system perspective vs. the isolated intervention perspective. Strengthening the components or the dynamics of the system makes sense if the system as a whole is the focus area and if this system is better understood and strengthened due to the interventions.

Promoting components or dynamics in an innovation system must be seen as a change initiative that often breaks traditional linkages and power relations. Thus improving an innovation system sounds positive on its merits; however, stakeholders in the system might have good reasons to resist improvement activities. For instance, an industry association might express interest in any attempts to improve the economic performance of its members, but it might resist attempts to develop new enterprises or to introduce external competitors. A university might express a strong interest in offering its courses to industry, but might not want to change their delivery approach to meet the demands of industry. An intermediary organisation that plays an important role in consulting industry on a particular technological issue might not be impressed if a university or industry association starts to offer free advice to its industry. A contribution of the GIZ in this regard would be to support a medium to longer-term approach that also illustrates that tension and disagreements about approaches and priorities are not always a bad thing. Competing ideas of how to solve a problem or how to explore an opportunity can release creativity and mobilise stakeholders if facilitated in an open and transparent way.

In this respect the GIZ will have to adjust its role according to the partners they are cooperating with. Especially when following a systems approach, it will be necessary to follow a **flexible partner** approach where the GIZ works with multiple partners in a specific location. An innovation system evolves based on the dynamism of the main actors, the information flow between them and outsiders and on the application of this knowledge. Such an evolutionary approach cannot be planned in detail in advance where partners and roles are agreed in advance. It depends on the initial regional availability, motivation and competences of stakeholders and then on the learning process that follows. In general the main target groups would be businesses in different clusters and value chains, relevant knowledge institutions that can contribute to the diffusion of knowledge, service providers and policy representatives. Only in some places will a local government that is interested in promoting regional innovation be the best host.

5.2.2 Possible intervention levels and fields for the GDC

From a systemic perspective there are several intervention levels that have to be considered by the the German Development Cooperation.

Firstly, it is necessary to determine the current state of innovation systems in metropolitan regions in developing countries. It is important to start from the current level of the system, and then work at the pace of the local stakeholders to build capacity, confidence and momentum.

Secondly, a multi-partner and multi-level approach is required. Support must be provided at macro, meso and micro level, and insights gained at one level or in one area must be communicated and used in other areas. It can be expected that fragmentation and poor integration will hamper current efforts to coordinate reflexive location policy. The six lines of enquiry discussed in Chapter 4 that use the Four Pillars of Innovation Systems model in Chapter 4 as a reference point fit very well into the existing systems approach of the GIZ.

In the following list we use the GIZ intervention system approach, which focuses on interventions at the micro, meso and macro level. The meta level is included in the following descriptions of the levels:

- **Firm or micro level**: The promotion of innovation systems cannot be approached only on the micro or individual firm level. Like the Four Pillars of Innovation Systems model described in Chapter 4, it is essential to look at possible entry points, but always with the emphasis on consideration and improvement of the whole system. Thus one important aspect of driving systemic approaches is to **sensitise the donor community** and the respective governments to overcoming isolated approaches before considering the system perspective. Some donors and governments prefer the interventions at micro level to have a visible impact (e.g. the promotion of groups of enterprises to enter export markets). Such approaches can contribute greatly to the overall development as long as they do not at the same time undermine the improvement of the system. More systemic intervention fields could be value chain and cluster initiatives that provide a very network-driven approach. Many innovations at company level are delivered via buyers and suppliers, the relations with customers and via machinery investments (see Figure 4). Value chain approaches provide additional insights into upgrading opportunities and the knowledge of different kinds of businesses in the chain. Knowledge transfer between businesses, suppliers and business development services can be one aspect to consider. Nonetheless, to increase the impact of the system, it is be-

coming increasingly important also to integrate supporting meso institutions that are in general responsible for knowledge delivery and transfer.

- **Meso level**: The Four Pillars of Innovation Systems model emphasises a large number of institutions at the meso level, including quality infrastructure, standardisation, education and technology transfer, research, university, finance, etc. These institutions should become key knowledge flow promoters. However, their orientation has been driven by a deep understanding of current business innovation standards and the demands of business innovation. In developing countries and also in many developed countries, many institutions, even technology transfer and applied research institutions, lack deep insight into the systemic challenges of businesses in their production chains or sectors and emerging innovation trends.
- **Macro or policy level**: From a metropolitan region perspective it is important to promote governance models that ensure coordination between the different administrative levels and inter-municipal cooperation (including the primary city, secondary cities, towns, etc.) so that at a later stage the whole process is not politically undermined. The successful promotion of an innovation system depends very much on network governance formats, which enable alignment of certain political groups. However this does not also mean that it is necessary to include every political entity in the alignment process, which may lead to getting bogged down in bureaucratic procedures. Apart from the governance aspect, the definition of support programmes must include actors from the macro and the meso levels. Innovation systems promotion depend very much on specific incentives to strengthen cooperation between businesses and technology and educational institutions. The definition of support programmes must set the right criteria to encourage and enforce knowledge transfer between the main actors.
- **Meta level, including socio-cultural aspects**: Innovation in many metropolitan regions is still rather approached in a non-systemic and somewhat isolated way. The different players at firm, institutional and policy level act in a non-cooperative way. Often mistrust and competition exist based on past conflicts and behaviour experience. At the same time many donors also prefer isolated intervention approaches. The GIZ can play an important role here to promote the innovation system perspective through conferences, donor dialogue forums, cooperation with other donors and joint coordination efforts of several donor and governmental activities in line with an overall systemic approach.

5.2.3 Core competence fields of the GDC

Apart from the intervention levels, the GDC has a high number of core competence fields as well as programme products that are relevant for the promotion of innovation systems in metropolitan regions. The authors see the highest relevance for the promotion of innovation systems as being in the field of economic development and employment promotion. However, there are more competence fields which need to be considered and which should contribute to the systems approach. The following points list the key competences that are relevant in this context:

- **Sustainable economic development and employment promotion**: The field of expertise includes private sector development (LED, cluster and value chain promotion and migration aspects), skills development (technological and vocational education and capacity building), finance system promotion (including innovation finance) and economic policies (e.g. quality infrastructure, innovation policies, R&D policies, etc.).
- **Governance and democracy:** These competences tackle pro-poor governance, promotion of participatory governance models, decentralisation, urban and municipal development, and public management.
- **Urban development** includes the promotion of spatial planning procedures, the design of industry spaces as well as infrastructure aspects that connect industries and cities with each other
- **Rural development** is involved among others with standards and food safety, agro-processing, increasingly also alternative energies, mitigation and adaptation innovation requirements, etc.
- **Environment and climate change**: These include expertise in the fields of sustainable tourism, resource-efficient economy.
- **Sustainable infrastructure** includes renewable energy resources, energy efficiency and sustainable urban mobility

- **Quality Infrastructure** includes addressing institutions related to quality assurance, metrology, standards and related areas.

These fields involve knowledge synergies that should be used where necessary to promote the innovation system perspective and contribute to its realisation.

5.2.4 Key target groups and partners for the approach

The key target group in the innovation systems approach are businesses with growth potential and their supporting (meso level) institutions. It is logical that innovation promotion is effective mainly where innovations can also be realised. These are businesses in dynamic sectors and value chains within the metropolitan region. The relevant sectors and businesses differ from region to region. They can be small or larger enterprises, rural or mainly urban-based, formal or informal. Overall it can be assumed that existing interventions will be isolated and fragmented, or perhaps too generic and not sensitive to the constraints and realities faced by entrepreneurs and communities.

The partners in the promotion of innovation systems in metropolitan regions are diverse. As mentioned earlier, it is important to have a flexible partnership model also to enable cooperation with the main motivated and committed partners, and during the process perhaps with different partners. The following is a list of possible partners who might play an important role in this respect:

- Local government and government committees that represent the different administrative territories in the metropolitan region. It is important to have the decision makers on board and also the implementation units. In developing countries these are often located in the urban development and economic development departments.
- Research organisations in the territory as well as in the surrounding area which can provide sector expertise. These could be public or private.
- Universities and training and education institutions that provide the skills and knowledge that enable innovation or problem solving or that increase the absorptive capacity of the society.
- Technology institutions (see also their variety in the 4 pillar model) that are responsible for technology transfer and the diffusion of knowledge.
- Clusters and business organisations that are able to define a common demand but that are also strong promoters of knowledge transfer inside the region. They are typically able to mobilise enterprises and they spread information.
- Large and leading businesses in the region that involve many regional businesses in their supply chains. They often connect international markets with local capacity and create pipelines of knowledge into and out of the region.
- Specialised NGOs and social organisations that are active in the promotion of creative development solutions.

The promotion of an innovation system requires different entry points and supporting partners. The flexibility of the partner constellations also enables the definition of certain change coalitions, which means drivers of the process. It is advisable to start with a small group of stakeholders and then to grow the partnership network as interest in the activities increases.

5.2.5 Possible constellations of programme designs

The GIZ has developed and designed a wide range of programmes for private sector development. They involve the improvement of the business environment or investment climate, the promotion of regional economic integration, local economic development, organisational development, public-private dialogue and SME, cluster or value chain promotion. All these programmes address aspects of the promotion of an innovation system, but have at the same time a different focus. They look less explicitly at the promotion of innovation flows between the responsible actors, although the innovation system perspective can use these competence fields to ensure that a system perspective is the leading guideline.

The following components are seen as possible ingredients for a programme of innovation promotion in metropolitan regions:

- Value chain promotion in the driving sectors relevant in the metropolitan region
- Technology transfer promotion
- Cluster and innovation networks promotion
- Urban management and planning
- Applied science research promotion and application
- Organisational development promotion in technology transfer organisations
- Advice on the promotion of innovation policies

5.2.6 Initial suggestions for capacity-building requirements

The promotion of innovation systems in metropolitan regions require different kinds of information, capacities and expertise. There are different ways to develop expertise. One way is official skills development that provides codified knowledge, the other is tacit knowledge which is based on learning by doing and practical experience. The following suggested general capacity development requirements will always combine these different forms of learning:

- **Network management** is an essential part of the promotion of innovation systems. It involves facilitation of communication processes, the ability to involve and motivate different actors, finding a common language among different mind-sets (e.g. entrepreneurs, scientists, politicians). It also includes implementation management knowledge for the realisation of concrete results as well as methodologies for concrete project planning
- **Competences in the analysis of competitiveness factors** and in the identification of the innovation system in the region. A prerequisite for economic development interventions is the deeper understanding of challenges and opportunities in business development and market tendencies. For example, it requires knowledge about the application of rapid appraisals, data collection procedures, interview techniques of key stakeholders, information about trends and dynamics in specific sectors and the ability to identify innovation trends. It also involves capacities to analyse value chains and clusters and their dynamics and innovation requirements. There are several approaches that can provide knowledge in this respect such as the RALIS methodology (Rapid Appraisal of Local Innovation Systems) developed by Mesopartner. Other instruments such as cluster analysis and value chain promotion (Valuelinks) can also be valuable.
- **Knowledge about market failures.** Most interventions in regard to the promotion of economic development and innovation are justified when certain market failures exist and the market is not able to provide solutions itself. A deeper understanding of market failures, how to identify them, how to react to them using certain interventions without distorting them will provide better guidance for many supporting organisations as to their main tasks as well as the distribution of work between organisations.
- **Governance clarification in the promotion of innovation systems.** In many metropolitan regions the roles and responsibilities in the promotion of the innovation are unclear. Promoting a deeper understanding of the actors involved in a generic innovation system and reflecting with the stakeholders on the roles and expectations will clarify for all the involved partners who should be doing what and who is expected to contribute what. This also involves the identification of uncoordinated work and duplication of efforts. The clarification of roles also provides the opportunity to strengthen network governance efforts and to define better joint initiatives.
- **Organisational development in key institutions.** Many actors in the innovation system are relevant but are not able to assume a more effective role in the system. For example, universities or research departments have to start to orient themselves more strongly with the demands of businesses, and contribute towards basic research rather than applied research strategies. Business organisations have to become more service oriented instead of mainly work-driven. Many training institutions are not supplying skills development activities that are demanded in the location. As mentioned previously, improving some components of the system might also involve capacity building of organisational development aspects.

- **Economic planning competences.** The analysis of economic and innovation opportunities and challenges has to be followed by concrete implementation. Implementation in many programmes follows project logic instead of change management logic. Project logic emphasises the realisation of the project or initiative, whereas change logic attempts to change behaviours and traditional ways of doing things within a time frame. The latter is thus very much driven by impact orientation with the final objective clearly in mind.
- **Bottom-up industrial policies and innovation policies.** The design of implementation-driven innovation policies as well as bottom-up industrial policies at the metropolitan region level will have to be very much defined according to the local requirements. Such policies cannot be defined at the national level only. The policies will be responsible for improving overall private sector framework conditions in the metropolitan region. Most important will be the competence of developing supportive policies and programmes to increase interaction of the relevant stakeholders and technology and knowledge diffusion in the system in the most concrete way possible. Thus such a capacity-building will involve the design of support programmes based on a good understanding of market failures, existing supporting institutions and the demand of the businesses in the dominant sectors of the region.

The capacity-building activities mentioned above can be seen as a first reference. In the life cycles of innovation system dynamics there will always be additional skills requirements, e.g. to overcome crises, to keep the dynamic, to institutionalise certain procedures in the process of professionalisation of the system, etc. The mentioned capacity-building activities above provide a first overview that can be defined in more detail.

5.2.7 Cooperation and partnership approaches

Cooperation between different stakeholders is central to the promotion of innovation systems. Instead of starting with a checklist of potential partners it is relevant to make use of the inquiry and the questions related to the six mentioned lines of inquiry. The following partnership groups are rather preliminary suggestions. In reality other motivated partners (like e.g. NGOs, less formalized business and research networks) might become visible as the process unfolds. Nonetheless different partnership groups should be identified at an early stage. The following suggestions focus on regional, national as well as international partnerships.

Partnerships with donors: It has been mentioned that donor coordination can be an important role for the German Development Cooperation to play in the creation of awareness of more systemic and coordinated development approaches, as well as in the promotion of alignment of programmes, work distribution and synergies. Providing a stronger voice and leadership in donor committees as well as in donor coordination groups could be an entrance point. The development of joint intervention criteria within the country often also leads to a stronger alignment of activities and methodologies.

Partnerships with universities and research and technology institutions: In general, partnership networks should be created with the regional knowledge institutions. They then can become part of the strategy to promote innovation flows in the system. Nonetheless a concrete analysis of the competences of these institutions as well as of their motivation is required in advance. It does not make sense to just start with partnerships at a high level if there is no expectation that the contributions of these partners in regard to knowledge and innovation transfer are fundamental or can be strengthened rapidly.

Partnerships with business organisations and leading companies: To ensure market and enterprise orientation, it is imperative to involve networks of business and industry organisations early in the process. These organisations provide the opportunity to gain access to the demands of the businesses as well as to identify key innovation challenges in specific sectors. Business associations as well as sector representatives are not the only relevant players here. It is also necessary to involve possible research centres inside relevant leading companies and the identification of key champions or change agents within the private sector. Many of these actors only become visible as the process of improving the dynamics in the innovation system is already underway.

In summary, the GDC has the opportunity to become an agenda setter in the field of innovation system promotion in metropolitan regions. At first it will be important to identify the key relevant players according to the above mentioned groups in order to get improvement process underway. To identify these players and to analyse their linkages in the system it the six lines of inquiry will assist to understand the

knowledge, social and collaboration networks. Through this process it will be possible to differentiate the possible partners according to their existing dynamic, motivation and expertise. Based on the results, a selection of partners and the promotion of developing synergies between different stakeholders can be supported, thus moving from joint insight to joint action. Within the developing country or metropolitan region, the GDC can network with other donors focusing on specific issues, and offer a coordination role between local issues and international competencies.

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