

## **Urban Space of emerging Cities in the Knowledge Economy Context - Three Case Studies on the Arabian Peninsula**

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### **Abstract:**

Global knowledge economy networks significantly influence spatial development on different spatial scales. This research project argues that non-physical, relational geography and morphological, urban development are mutually interdependent. Two aspects of the research concept are innovative: First, a knowledge economy network analysis forms the basis for investigating the urban space of emerging cities on the Arabian Peninsula. Second, the empirical methodology is a newly defined method triangulation, setting an example for systematic analysis of local urban development in a global context. The method triangulation combines three different research angles: A knowledge economy firm perspective, an on-site observation perspective and a planner perspective. Dubai (UAE), Doha (Qatar) and Manama (Bahrain) are selected as case studies. Empirical results show that emerging cities on the Arabian Peninsula have rapidly gained a significant role in global and regional knowledge economy networks due to various favorable location-specific development drivers. At first glance appearing as competitive knowledge economy locations, the cities are developing specific strengths, which might enable them to become complementing knowledge economy locations in the future. The important role of these cities from a non-physical, relational geography perspective influences their morphological, urban space. Entire city districts are dedicated to the knowledge economy, creating global attractiveness for advanced producer services and high tech firms. However, fulfilling the urban space requirements of knowledge workers remains a challenging task for emerging cities. Results of this research project demonstrate that non-physical, functional networks and morphological, urban space strongly influence each other.

**Keywords:** Knowledge economy, relational geography, urban space, Arabian Peninsula

## **Introduction and research question**

A few years ago there was nothing else besides sand. Cities on the Arabian Peninsula have emerged in a very short timeframe and have gained global importance in the knowledge economy network. We have rarely observed such a rapid spatial transformation before.

The importance of cities on the Arabian Peninsula within the knowledge economy network has grown in parallel to the development of urban space. Therefore, case study cities on the Arabian Peninsula seem to be the suitable place to answer our central research question: How does the global significance of emerging cities in the knowledge economy context affect the development of local urban space and vice versa? To answer this question we use a framework consisting of four parts:

1. We discuss theoretical approaches associated to relational geography and urban development in an economic context, leading to the three main hypotheses of the project.
2. We outline the newly developed method triangulation, proposing a feasible empirical approach for a systematic analysis of local urban space in a global context. In addition, the process for selecting case-study cities is outlined.
3. We present the results of our empirical research in the three case-study cities Dubai, Doha and Manama by discussing the initially suggested hypotheses.
4. We conclude by synthesizing the major findings of the research project and by giving an outlook of the future proceedings.

### **1. Related theoretical approaches and research hypotheses**

Our research project is innovative in bridging the scientific fields of non-physical, relational geography and morphological, urban development. This chapter aims to provide a rough overview of the two areas. For further details we refer to our recent publication "Emerging Cities on the Arabian Peninsula: Urban Space in the Knowledge Economy Context" in the International Journal of Architectural Research (Thierstein, Schein, 2008).

***Theory of relational geography and definition of knowledge economy***

Relational geography is a relatively new scientific discipline, analyzing the importance of locations within the global city network in the knowledge economy context. Manuel Castells and his publications about the space of flows are highly influential for nowadays studies on relational geography. Manuel Castells argues, that " our societies are constructed around flows: flows of capital, flows of information, flows of technology, flows of organizational interactions, flows of images, sounds and symbols..." (Castells, 1996: 412). He developed a new perception of spatial and urban development by identifying the space of flows as the underlying concept of spatial development rather than the space of places, represented by world cities and other territorial spaces.

Castells` theory built the basis for several studies on location strategies of knowledge economy firms, which aim to identify non physical, global knowledge flows and networks. The growing knowledge economy has been identified as a major development driver within the space of flows (Raspe, van Oort 2006; Thierstein et. al., 2006). Knowledge economy as defined by Thierstein is an interdependent system of APS firms, High-Tech industries and knowledge creating institutions such as universities and research establishments (figure 1). Combining science-based knowledge and operating experience is characteristic for innovation and thus for the knowledge economy.

Peter Taylor developed an empirical research method, to quantitatively identify inter-locking networks of the knowledge economy and measure the non physical connectivity of cities by analyzing intra-firm company networks (Taylor, 2004). He used the networks of Advanced Producer Service (APS) firms, one pillar of the knowledge economy, to come up with a ranking of world cities regarding their connectivity degree.

An analysis of the location behavior of knowledge-intensive economy (KIE) firms is also part of our research project. The focus of the analysis in this case lies on the following two pillars

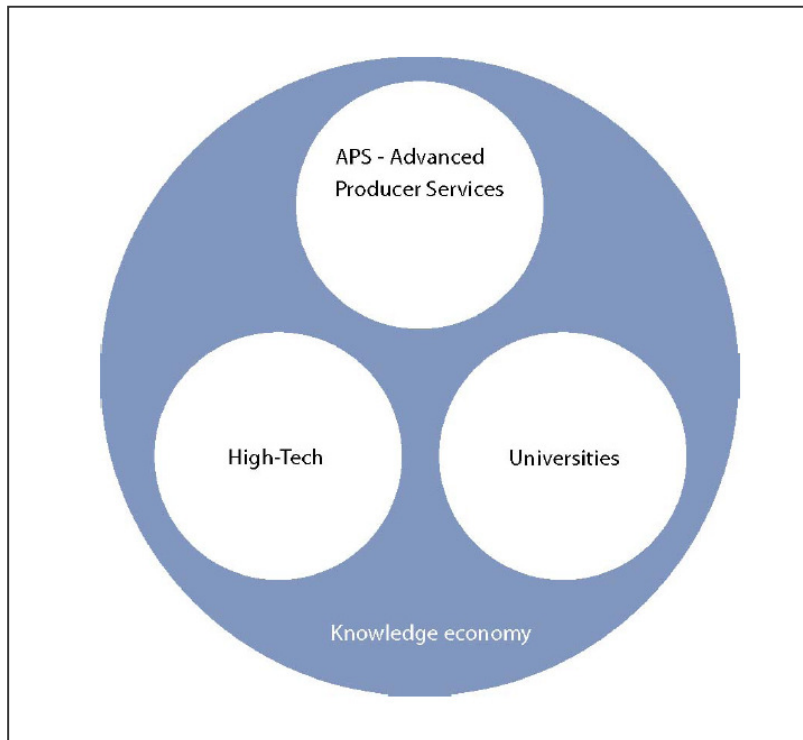


Figure 1: Structure of the knowledge economy. Source: Thierstein et al. (2006).

of the knowledge economy: Advanced Producer Services (APS) firms and High-Tech firms. In this paper we will refer to these two sectors with the term knowledge-intensive economies (KIE). Universities and academic research institutions are omitted in this context since these institutions do not in general display a very dynamic multi-branch, multi-location behavior like the otherwise private firms in the APS and High-Tech sectors. We have defined KIE on basis of the international NACE classification (Nomenclature générale des activités économiques). As mentioned before, Manuel Castells initiated relational geography research with a focus on "space of flows" analysis. However, we believe, that the "space of flows" and the "space of places" are strongly linked. In order to properly understand the multi-scalar simultaneous development of large-scale urban structures, one has to consider a dual view of space: The "space of flows" conceptualizes the relational world of non-physical, functional inter-locking networks of knowledge-intensive firms, while the morphological, physical side of localized urban nodes of the same inter-locking networks is to be considered as "space of places".

***Urban development in an economic context and definition of urban space***

From a historic perspective economic change has had significant impact on urban development and urban space. Europe, for example, has faced its highest emergence of new cities back in the 13<sup>th</sup> century, when technical inventions in the agricultural sector and a flourishing trade economy have stimulated growth (Gross et al., 2004).

Another example for the impact of economic change on urban development and planning is the industrialization age. Industrialization created the demand for a city-wide spatial segregation of urban functions. Ebenezer Howard developed the garden city as a segregated place for living with low density (Howard, 1902). However, the functional division, as manifested in the Charter of Athens, as well as the low density degree in certain city spaces created disadvantages like an increased commuting traffic and the loss of city enlivenment around the clock. Later on Jane Jacobs postulated traditional city spaces with a high degree of functional intermixture and density (Jacobs, 1993).

But not only historic examples show, that economic change has an impact on urban development and urban space. Nowadays the growing importance of the knowledge economy strengthens the role of cities as nodal points of exchange for "tacit knowledge" (Polanyi, 1964) within the global space of flows. But how can cities fulfill the requirements of a globally connected location and what exactly are the requirements of the knowledge economy towards urban space? A closer look at emerging cities on the Arabian Peninsula is expected to help in answering this question. These cities have been free of boundaries from the above described historic urban developments, as their history of ascension is still very young.

If we want to analyze the impact of the growing knowledge economy on urban spaces, we first need to define the term urban space. As Boesch outlined, space has three different dimensions (Boesch, 1989): First, the dimension of distance, which reflects the proximity and

availability of urban functions as well as the density of buildings, people and inhabitants. Second, the dimension of functionality, which consists of the existence of urban functions, the degree of functional diversity and the morphology. We define morphology as the sequence of open and closed spaces and the typologies of buildings (e.g., high rise, one-story solitaire building). Third, the dimension of process, which considers the urban development over time and the agents involved in the urban development and planning process.

***Bridging the gap between existing research: The three central hypotheses***

We have so far given some background on the two scientific areas of relational geography and morphological urban development. In order to answer our central research question, we will bring the two scientific approaches together and show their interdependence. Our three central research hypotheses are:

- **Hypothesis 1:** If cities with a high functional connectivity rank in global city networks have emerged on the Arabian Peninsula in recent years, then this is due to a rapid growth of knowledge-intensive economies influenced by various favorable location-specific development forces.
- **Hypothesis 2:** If an emerging city on the Arabian Peninsula is attracting knowledge-intensive economies, then a specific urban space aiming to fulfill the demand of knowledge-intensive economies is created there.
- **Hypothesis 3:** If the urban space of emerging cities on the Arabian Peninsula is fulfilling the demand of knowledge-intensive economies, then these developments can teach western-European cities important urban requirements of knowledge-intensive economies.

The term "global city network" in the first hypothesis is based on Peter Taylor's previously described analysis of intra-firm APS networks for measuring the non-physical connectivity of cities or "functional urban areas". When talking about "favorable location-specific

development forces" we are not only referring to advantageous oil and gas resources, but addressing geo-strategic, political, economic and social factors. The third research hypothesis focuses on Western Europe, since the authors of this paper are of Western European origin. However, theoretically the third hypothesis can also be applied to any of the so-called developed regions other than Western Europe.

## **2. Method triangulation and definition of study area**

The method triangulation developed and applied in the described research project proposes an applicable empirical approach for a systematic analysis of local urban development in a global context. Our methodological approach reflects the three perspectives of urban space described by Lefebvre (Lefebvre, 1991): Space is lived, perceived and conceived. The method triangulation therefore consists of three complementary research methods:

- Survey with knowledge-intensive economy firms (*lived urban space*)
- On site observation of urban structure and space (*perceived urban space*)
- Content analysis of planning process and material (*conceived urban space*)

The three research methods were applied in the above-described sequence. For further details regarding the outline of the research methodology we refer to our recent publication "Emerging Cities on the Arabian Peninsula: Urban Space in the Knowledge Economy Context" in the International Journal of Architectural Research (Thierstein, Schein, 2008).

We conducted the empirical work during a nine months stay on the Arabian Peninsula in 2008. More than 200 knowledge economy firms from the Arabian Peninsula have participated in our scientific online survey, allowing us to draw quantitative results.

Furthermore, we have conducted 30 qualifying interviews with knowledge economy firms in their company locations on site and another 15 interviews with major public and private planning organizations.

***Defining the study area: Three case-study cities on the Arabian Peninsula***

Three case-study cities on the Arabian Peninsula have been selected: Dubai (UAE), Doha (Qatar) and Manama (Bahrain). A comparison of the results from our method triangulation across all case-study cities enabled us to determine the validity of our initial hypotheses on a broader basis. The following criteria have been used for selecting the set of case-study cities:

- Absolute and dynamic importance of cities within the global city network
- Favorable influence of location-specific development forces (geo-strategic position, politics / regulation, financial investments / economic growth, history and culture)
- Diversity of institutional context (nation state)
- Operational possibility of conducting research (taking into consideration the social restrictions in some nation states)

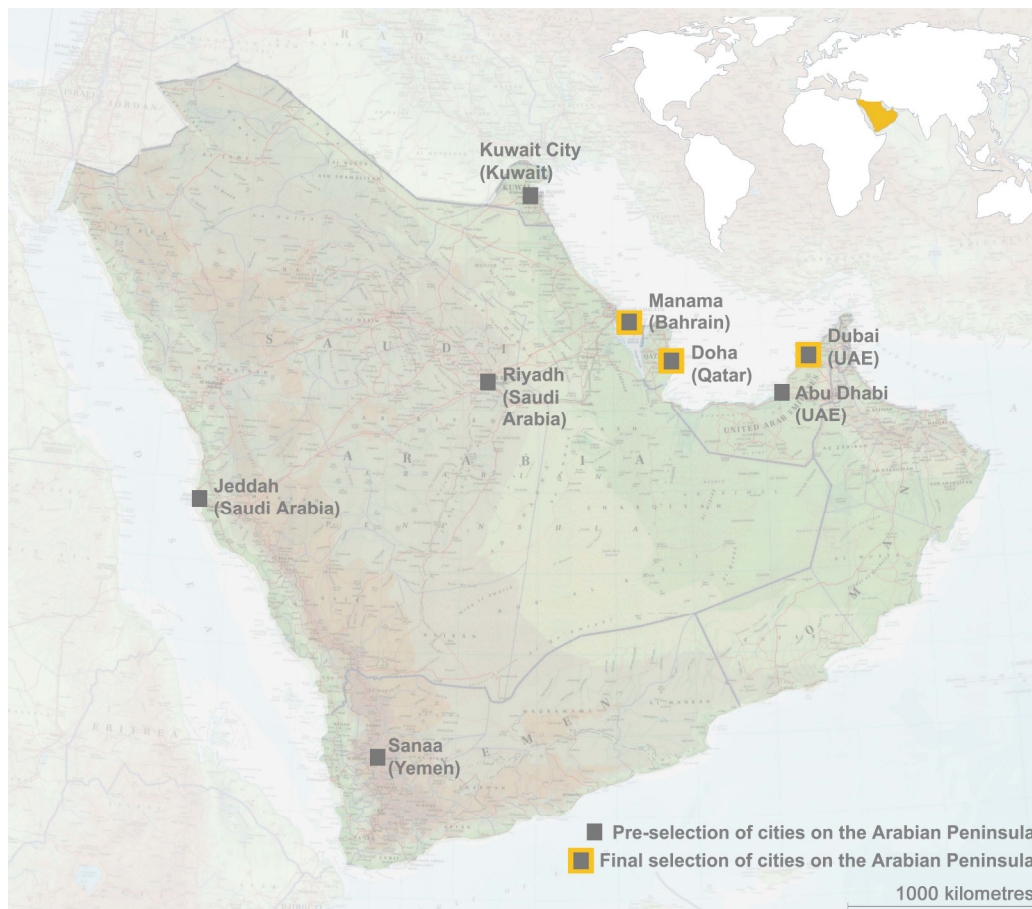


Figure 2: Map of Arabian Peninsula, highlighting the preselected and finally selected case-study cities. Source of map: Own development



For the purpose of evaluating emerging cities on the Arabian Peninsula on basis of these criteria a pre-selection of seven cities contained in the Top 200 "World City network" ranking has been made (Taylor, 2004). This ranking outlines the best connected cities within the global network of APS firms. Figure 2 shows a map of the cities.

### **3. Research results from Dubai, Doha and Manama**

In this chapter we summarize the research results of our empirical work on the Arabian Peninsula. In parallel we discuss the initial research hypothesis.

#### ***The status of emerging cities on the Arabian Peninsula in the global and regional network economy***

To elaborate on the status of Dubai, Doha and Manama in the global and regional network economy an online survey with 213 knowledge intensive economy firms (174 APS and 39 High Tech firms). Out of the 213 data points 106 were collected in Dubai, 55 in Doha and 52 in Manama. The size of Dubai with 2-3 times larger inhabitant numbers explains the difference in the total number of responses. Furthermore, 30 qualifying interviews with managers of KIE companies located in the case study cities were conducted on site. The following multi-layered results were gained:

The history of growth of KIE firms is young and rapid in all case study cities. On average the survey firm respondents have established their company subsidiary in Dubai 8,6, in Doha 12.6 and in Manama 11.3 years ago. City selection for firm location in the case study cities has been driven by various geo-strategic, political and economic criteria, in particular: Availability of important international airport hub, ease of market entry for foreign companies and people, low taxes/duties and high financial subsidies, favorable political and economical climate and stability.

Furthermore, all case study cities show a high importance within the global and regional city networks in terms of the so-called connectivity degree of KIE.

- Based on survey responses it was possible to measure the inter-firm network connectivity of Dubai, Doha and Manama to global locations on other continents. Around 80-90% of the responding KIE firms have firm subsidiaries in locations other than the Arabian Peninsula while all three case study cities established a very good connection to Europe (on average each firm respondent has around 15 subsidiaries in Europe). Besides Europe, Dubai shows a high connectivity to North America, while Doha and Manama are strongly connected to Asia (figure 3).

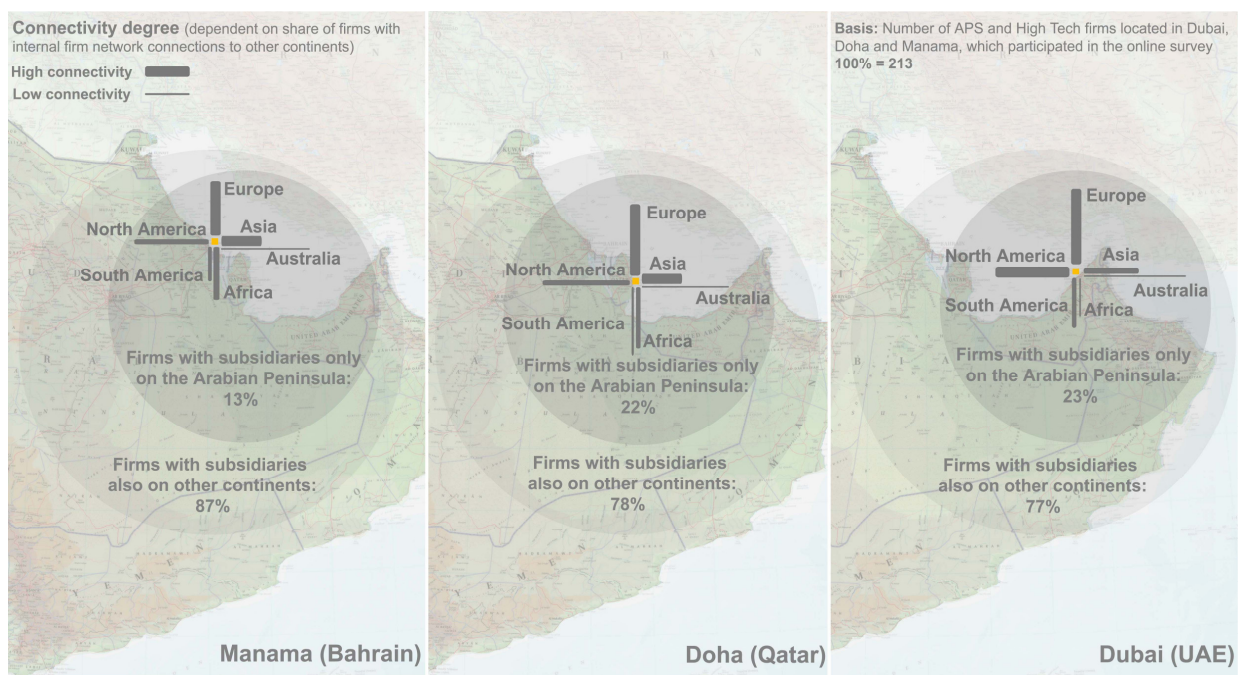


Figure 3: Global, non physical KIE firm network connectivity of Dubai, Doha and Manama

- 123 out of 213 firms participating in the online survey have indicated one or more additional firm subsidiaries on the Arabian Peninsula. All case study cities show a large KIE connectivity to other cities on a regional level: From a Dubai KIE perspective Abu Dhabi plays a large role in terms of connectivity degree, while Doha and especially Manama play minor roles. From a Doha KIE perspective Dubai as well as Manama are seen as heavily connected KIE locations. From a Manama KIE perspective Dubai and Riyadh are the best connected locations, while Doha plays a minor role. The high connectivity between Manama and Riyadh has one major reason: The liberal country of

Bahrain partly acts as an international intermediary for the restricted country of Saudi Arabia. In general, geographical closeness plays a large role for connectivity degrees between cities on the Arabian Peninsula. This partly explains the rather low connectivity of our case study cities to places like Muscat, Sanaa and Jeddah (figure 4)

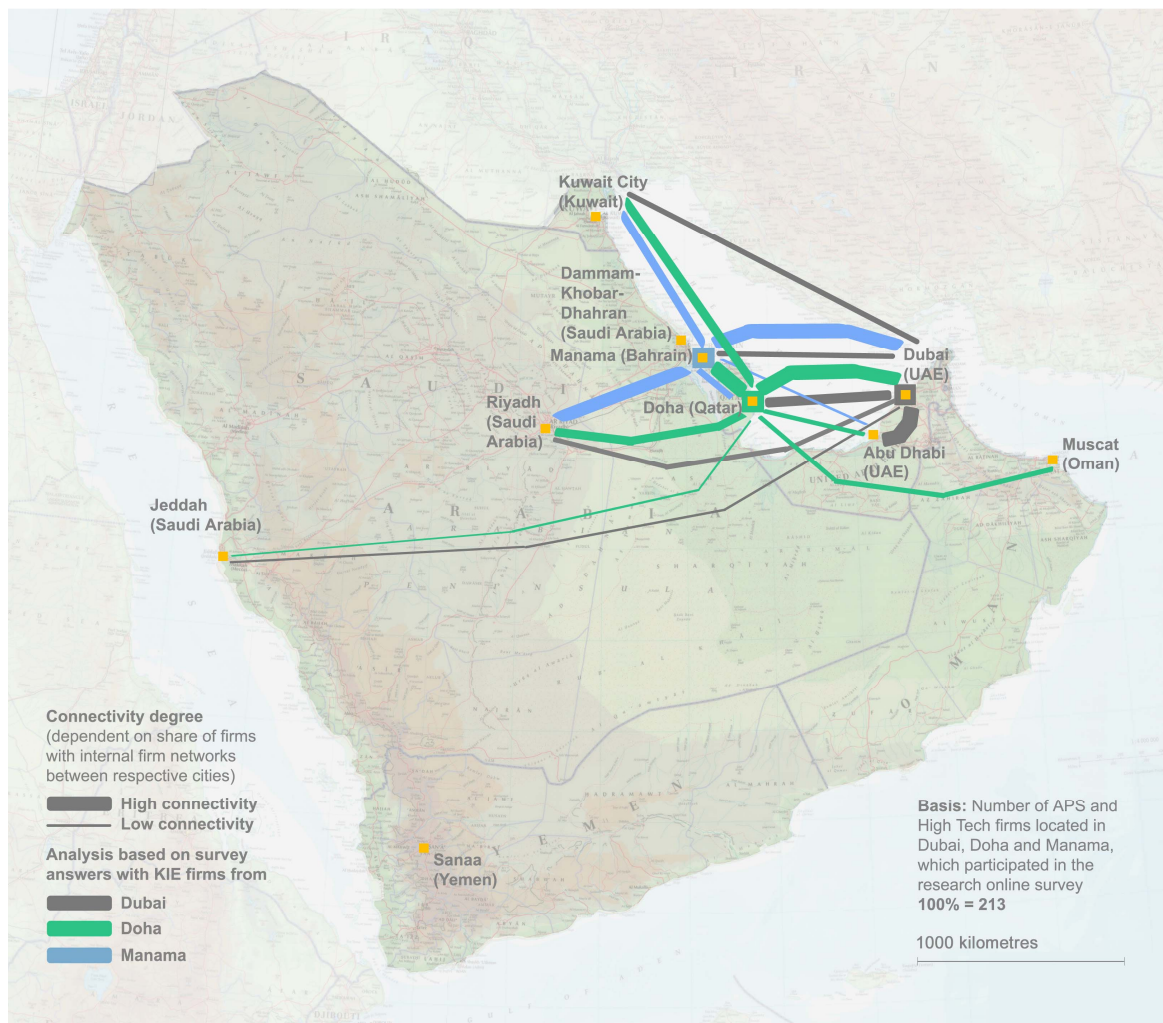


Figure 4: Regional, non physical KIE firm network connectivity of Dubai, Doha and Manama on the Arabian Peninsula

The qualifying interviews with KIE firm managers gave a rationale for the co-existence of several firm subsidiaries on the Arabian Peninsula in around 60% of all survey responses: Even though certain functions of the value chain (research, development, production) and cross-sectoral functions (operations, finance, IT, HR) are often centralized in one firm location on the Arabian Peninsula, the market oriented functions of the value chain (customer

service, distribution, marketing) require non-central firm locations responding to local market conditions and differing cultural backgrounds in the respective nation states.

Interview partners from KIE firms also articulated that a war for talent in KIE businesses between emerging cities on the Arabian Peninsula is quite noticeable. In this context the quality of urban space plays a significant role. We will come back to that in the next chapter.

Even though emerging cities seem to compete for qualified personnel, they develop to complementary locations seen from a higher level economic perspective: Manama today builds on its early on developed strength in the financial sector. Companies appreciate Manama's well-developed financial regulatory standards. Doha on the other hand is still heavily dependent on its wealth coming from large oil and gas reserves. Its economy is starting to diversify into knowledge economy sectors. KIE companies therefore often choose Doha as business location, to capture a large market share as one of the first players on the market. On contrary, Dubai is further advanced in the diversification process. Companies with locations in Dubai see economies of scale and scope as an advantage.

The above mentioned survey results verified our first hypothesis: The significance of emerging cities on the Arabian Peninsula within the global KIE city network is a result of rapid KIE growth in the latest years due to various location-specific development forces. However, not all case study cities show identical significance, but certainly cities have established their preferred cooperating cities and their economic spike. This leads to a highly interesting pattern of a partly competing and partly complementary city network.

### ***Requirements of KIE firms and workers regarding urban space and actual urban space***

The online survey with knowledge-intensive economies (KIE) has disclosed the distribution pattern of firm locations across the case study cities. In addition, the KIE firm requirements

regarding urban space have been articulated. The distribution of firm locations across the case study cities shows that KIE firms are mainly accumulated around certain city districts:

- In Dubai the district with the largest accumulation area is the Dubai International Financial Center (DIFC) (figure 5). The basis for figure 5 were 70 out of 106 survey responses (55 APS and 15 High Tech firms) who provided information about their business building location in Dubai.

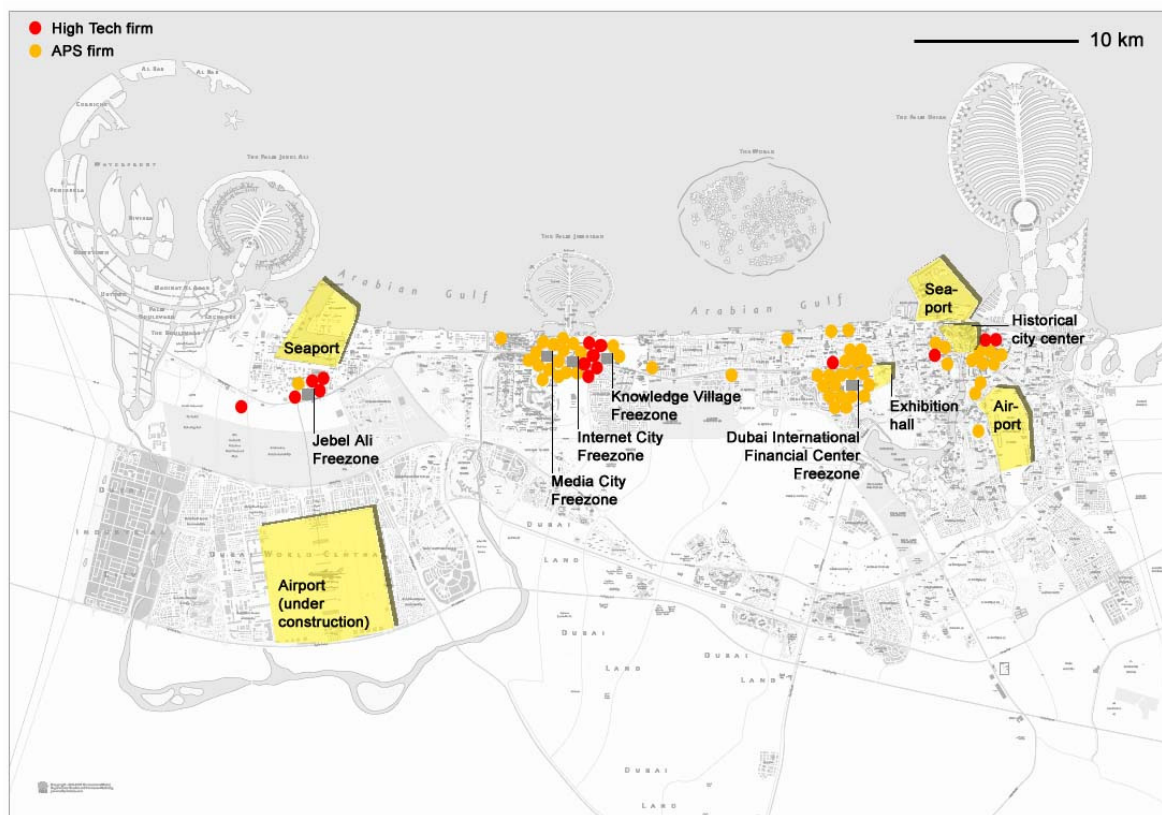


Figure 5: Map of Dubai indicating KIE business building locations. Source: Own development

- In Doha the district with the largest accumulation area is the West Bay area including the Qatar Financial Center (QFC) (figure 6). The basis for figure 6 were 30 out of 55 survey responses (26 APS and 4 High Tech firms) who provided information about their business building location in Doha.

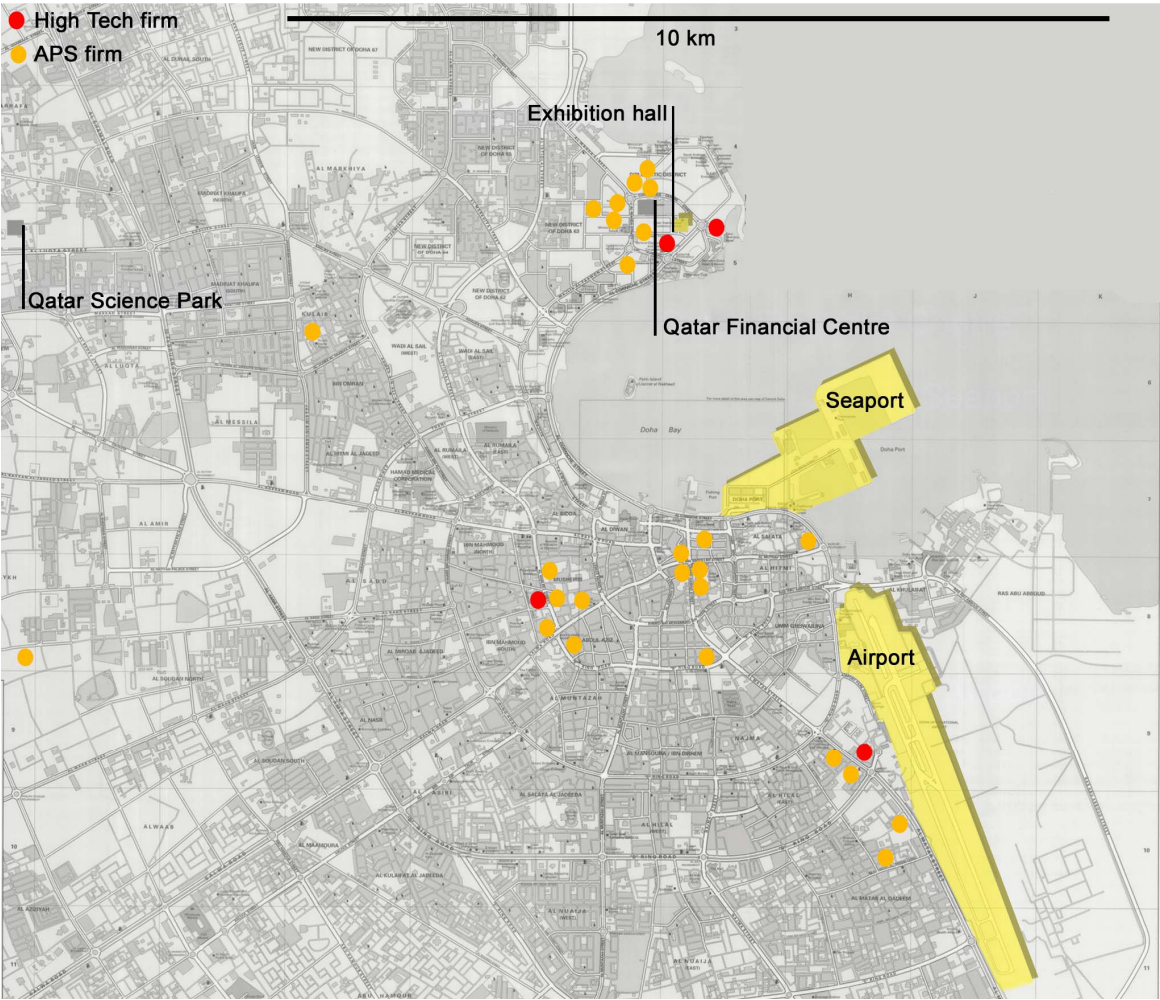


Figure 6: Map of Doha indicating KIE business building locations. Source: Own development

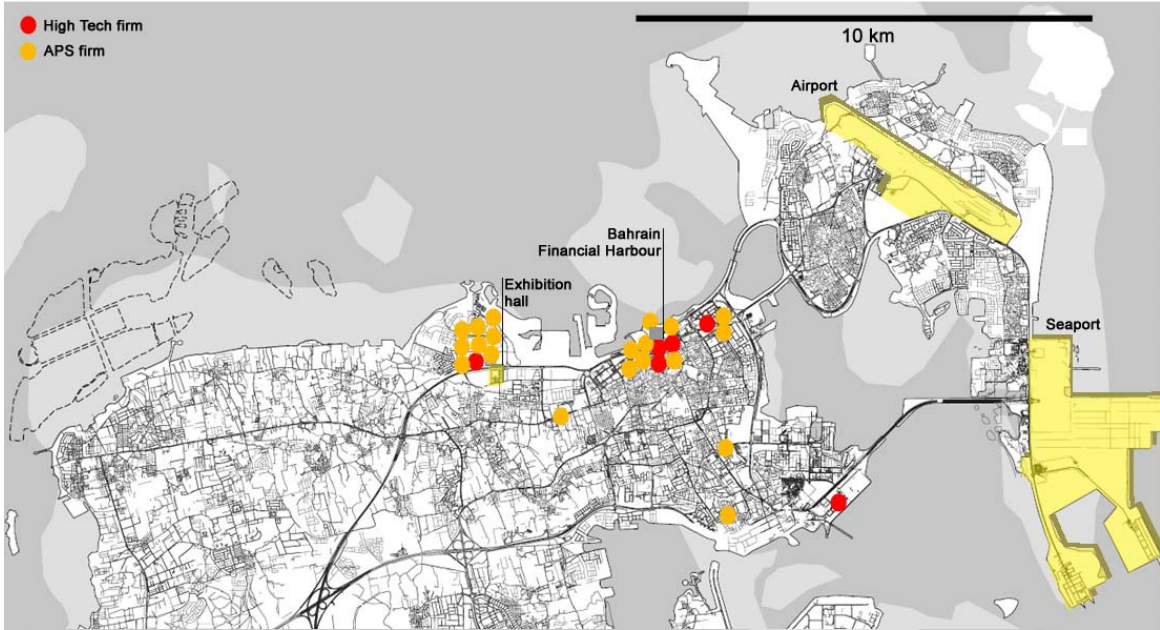


Figure 7: Map of Manama indicating KIE business building locations. Source: Own development

- In Manama the district with the largest accumulation area is at and around the Bahrain Financial Harbor (BFH) (figure 7). The basis for figure 7 were 26 out of 52 survey responses (20 APS and 6 High Tech firms) who provided information about their business building location in Manama.

Figures 5-7 underline the interdependence of non-physical, functional networks and morphological, urban development: The rapidly gained global significance of our case study cities within non-physical, functional knowledge economy networks enhances the development of city districts and spaces with a high accumulation of KIE firms and international reputation, like Dubai International Financial Center, Qatar Financial Center, Bahrain Financial Harbor. These highly prestigious urban districts – dedicated to KIE – enlarge the attractiveness of emerging cities on the Arabian Peninsula for knowledge economy firms. Figure 8 illustrates in a general way the interdependence of non-physical, functional networks and morphological, urban development.

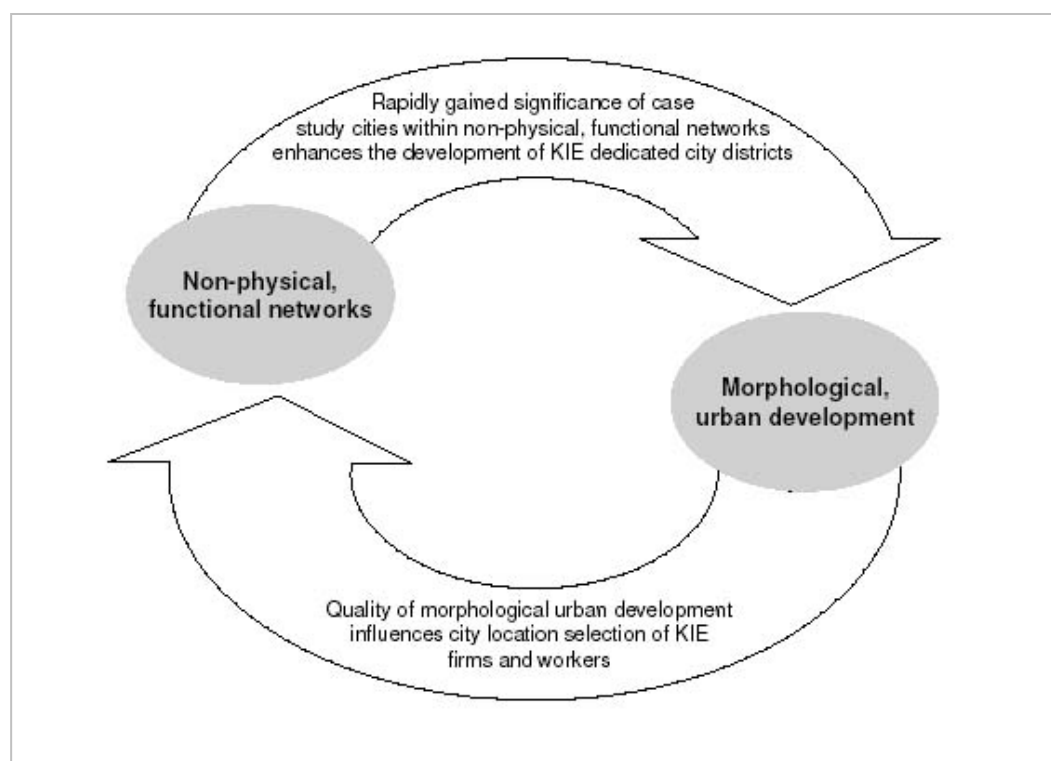


Figure 8: Interdependence of non-physical, functional networks and morphological, urban development. Source: Own development

The described city districts (DIFC, QFC, BFH) are specifically designed to attract firms of certain sectors to Dubai, Doha and Manama. Advantages of being located in such zones are a high facility and maintenance quality and exemptions from taxation. The ease of market entry, which is one major criterion for selecting the cities of Dubai, Doha and Manama as a company location, is increased in these city districts through access and visa support for foreign companies. City districts like Dubai International Financial Center are moreover internationally visible through adequate marketing. Not only the characteristics of the city as a whole are relevant for global KIE firm location selection: In particular the attractiveness of selected city spaces, which specifically answer the needs of KIE firms influence global firm location selection.

Another interdependence of non-physical, functional networks and morphological, urban space results from the global and regional war for talent. KIE locations are dependent on KIE knowledge workers. The quality of morphological, urban space is a highly influential criterion for KIE workers, when selecting a city for living. In addition, the flexibility of KIE workers in terms of moving from one city to another nowadays is quite high. Cities have to fulfill the requirements of KIE workers and their families, to ensure sustainable supply of a qualified work force. As articulated in our interviews, especially in nowadays times of financial crisis the distinguishing factor of well-established and performing urban spaces is expected to become more and more important for cities.

Results from our empirical research with KIE managers have disclosed quite a high satisfaction degree regarding the outline of urban spaces on a city district scale at and around their business location. The findings from behavioral mapping and photographic observation in the city districts DIFC, QFC and at BFH underline this. As figure 9 shows, the people density in the observed urban spaces differs around the clock. However, the spaces have never been observed empty during the ten minutes observation periods. This adds value to



the experience of the public space, since it enlivens the spaces and creates a high safety factor.

KIE managers in interviews articulated moreover, that they like the KIE clustering in KIE dedicated city districts: In this way companies can ensure the exchange of knowledge with similar associations and companies and customers looking for certain businesses are easily served by KIE designated city districts.



Figure 9: Photographic observation in DIFC, QFC and BFH on a workday

A sound mix of urban functions in walking distance around the business location has a high relevance for KIE firms. KIE dedicated city districts are generally fulfilling this requirement. Especially DIFC with its shadowy, outdoor shop and restaurant walk-ways is a very good case example of a successful functional mixture in a KIE dedicated city district. During behavioral mapping on site a bundle of various activities have been observed there, which are stimulated by the offered broad range of urban functions outdoors in walking distance (restaurants, shopping facilities, green spaces, infrastructure): Walking, standing, phoning, sitting, eating / drinking, smoking, talking to other people, shopping.

The high density of buildings and people in the observed KIE dedicated city districts is seen as a further advantage by KIE managers: It creates many opportunities for knowledge exchange and a faster access to all urban functions by foot. Urban density and also the built morphology are especially seen as highly relevant by customer-oriented sectors (e.g., banks). These sectors articulated the advantage of a high people density for enlarging their customer base on a small area and the advantage of stand-alone buildings for creating proper attention.

Regarding urban morphology from a general KIE perspective, the requirement of horizontal urban development was articulated, since this would increase the opportunity for knowledge exchange. In this context a KIE interview partner pointed out: "Why would you want towers? [...] We need more horizontal growth. This would give more scope for communities to mingle with each other. A lot of business prospects would happen." Rather horizontal urban development can be experienced partly in DIFC. QFC and BFH are rather based on vertical building structures. However, BFH borders on the historic city center of Manama, which is a very vivid, rather horizontally experienced urban space.

Besides the mainly positive perception of KIE dedicated city districts KIE managers also articulated certain negative aspects about urban space, especially in the overarching case study cities. A major urban disadvantage of all case study cities has been recognized in the

configuration of single city districts to the overarching cities. Former function separating zoning approaches (e.g., Dubai structure plan, 2003), the bundling of affordable housing at the city outskirts and a lack of public infrastructure in all case study cities are reasons named for high traffic congestion. This is influencing the quality of living and the attractiveness of emerging cities for knowledge workers. In general time and quality of commuting is rated to be more important than distance (even though distance still matters for urban functions which are used on a daily basis during business life e.g., restaurants, living location). KIE managers at the moment see a large issue in time-consuming traffic. Especially Dubai through its relatively wide, linear spread across a large area is already heavily congested. Our interview partners only partly expect that the currently built metro system will solve the problem, since the metro system is incomprehensive and not serving all parts of the city.

Another negative point articulated by KIE managers is the lack of urban functions for leisure and recreation, which is especially important for private satisfaction with the quality of cities. This is said to be one major reason for expatriate KIE workers to limit their stay in the case study cities to a certain timeframe. Shortage of skilled labor competence is expected to be the consequence. Doha`s currently untitled public seafront in the center of the city is an exception from the above described lack of recreational facilities.

Finally, KIE managers in emerging cities miss urbanism and historic pattern. Fast, mainly formally planned growth only rarely allows informal development with overlapping historic urban traces. It becomes clear, that the process of urban development has an impact on the final perception of urban space by the user. This also will be part of further investigation in the next chapter, which summarizes our experiences from interviews with planners.

Before we move on to the next chapter, we summarize our latest findings: The interdependence of non-physical, functional networks and morphological, urban space has become evident from a KIE business and a KIE worker perspective. Our initial second hypothesis has been shown to be mainly provable on a city district scale in all case study

cities. However, looking at the cities from an overarching perspective, urban space currently lacks important infrastructural and recreational factors to be and remain attractive for KIE workers on a long-term basis.

***Planned urban space in the context of a growing knowledge economy***

Most emerging nations on the Arabian Peninsula have a concrete vision for the future with objectives related to the growth of the knowledge economy. So does the emirate of Dubai and the countries of Qatar and Bahrain. The Dubai Strategic Plan 2015 outlines the objectives of "turning Dubai into a vibrant science and technology hub" and "attracting and retaining highly skilled employees" (Dubai Strategic Plan 2015, 2007: 22). Bahrain moreover articulates in its Economic Vision 2030 the interdependence of global location significance in the knowledge economy network and local urban space: "Many factors combined make a country attractive for investors in high-value-added industries: a high-quality public service, a cutting-edge infrastructure and an appealing living environment are among the vital ingredients. Bahrain will need to offer them all."

The satisfaction of KIE with urban space in emerging cities can be seen as one enabler for reaching the above described visions. Interviews with major organizations involved in urban planning in Dubai, Doha and Manama helped to elaborate on the satisfaction degree of the knowledge economy with urban space. Planners gave reasons for the KIE perception of well designed city districts, which however are described as being disconnected on an overarching city level: Governmental authorities put private and semi-governmentally owned development companies in charge of designing and developing certain city districts during the last years. Examples for such development companies are Emaar from Dubai, Qatari Diar and Bahrain Bay Development. Cutting the cities into districts partly with specific functions attached (Dubai structure plan, 2003) has helped to attract foreign investment for specially marketed city areas and has increased the pace of city development through

parallel planning approaches. Figure 10 visualizes the pace of city development by showing the city ground plans of Dubai, Doha and Manama in different time spots.

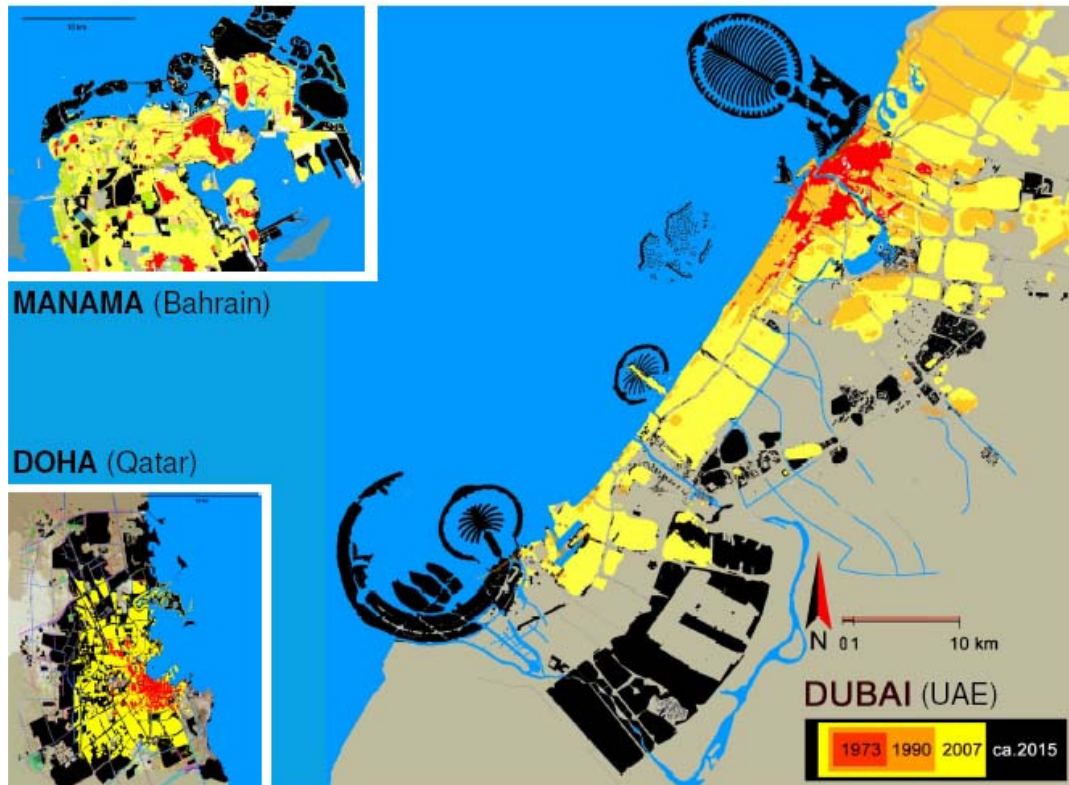


Figure 10: Map of Dubai, Doha and Manama indicating urban development.  
Source: Own development

Emerging cities might experience a certain slow down of future projects through the current global economic crisis. The press has released the news of some postponed or cancelled real estate projects already. However, the overarching impression of rapid urban growth during the last decade remains.

The missing link of city districts is seen as a disadvantageous consequence of the above-described organization of city planning on the Arabian Peninsula. Therefore in all case study cities, the urban planning authorities and supporting consulting companies currently work on urban master plans with visions for the upcoming years: In Dubai the Urban Planning Committee together with the private consulting firm Urbis is currently working on a Dubai master plan for 2020. The Urban Planning and Development Authority in Doha is at the

moment developing a National master plan. The Economic Development Board Bahrain in cooperation with the private architecture firm SOM prepared a National Plan document, which was finalized in 2006 but never published. It contains a masterplan vision for 2030. All case study cities try to implement a public transportation system within the upcoming years. However, especially for Dubai with its wide, linear spread across a large area (see figure 7) and its large ecological footprint, a successful implementation is a big challenge.

In general, addressing the requirements of KIE regarding urban space as outlined in the KIE survey results in this context should be seen as one success factor for strengthening the emerging cities as attractive locations for the knowledge economy. In addition, collaborative planning approaches of functionally connected emerging cities on the Arabian Peninsula (figure 4) could enrich urban planning from a regional, normative perspective.

#### **4. Conclusion and research outlook**

Emerging cities on the Arabian Peninsula have gained global significance in the knowledge economy context. This significance within global non-physical, functional networks and the morphological, urban space of emerging cities strongly influence each other. Globally visible, KIE attractive urban spaces on a city district scale contribute besides other factors to the global attractiveness of emerging cities for KIE firms. The observed urban spaces at main business building locations fulfill the requirements of KIE firms. However, emerging cities on the Arabian Peninsula have urban space deficits – especially visible from an overarching city perspective. The disconnection of city districts leading to infrastructural problems as well as the unavailability and poor quality of leisure and recreational facilities. These areas pose a threat for the talent market in the knowledge economy sector of the case study cities.

These results and further details have been gained through the application of our newly introduced method triangulation. The combination of methods has proven to be a successful way to test hypotheses from various viewing angles on different spatial scales. Only through

the multi-layered perspectives the research can describe the complexity of local urban space in a global knowledge economy context.

While this paper has certainly disclosed many insights about urban development from an economical and partly ecological, macro-urban perspective, one does not have to forget the social aspects within emerging cities on the Arabian Peninsula. Saskia Sassen already wrote about the dualism of global cities (Sassen; 2001) : Rich and prosperous knowledge society lives next to the poor working class. Certainly this dualism is also present in emerging cities on the Arabian Peninsula. Our study has not investigated the implications of a spatial transformation in the knowledge economy context for social sustainability. This is a necessary field of further exploration for future research projects.

In our further proceedings of the ongoing research project we will test our third hypothesis by transferring our findings from the observed emerging cities on the Arabian Peninsula to western European cities. The final outcome of this research project is seen to be valuable for a number of different organizations such as governmental and educational institutions dealing with urban planning and development in Arab and Western European locations, representatives from global knowledge-intensive economy firms as well as people with a personal interest in regional and urban planning and development in locations on the Arabian Peninsula.

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