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## THE LOCATION AND ENVIRONMENT OF ADVANCED TECHNOLOGIES IN BERLIN

### 1. Introduction. Berlin as an innovation-friendly place

After decades of functioning as two separate cities (the eastern part as the capital city of the German Democratic Republic and the western one as an isolated enclave – the former occupation zone of the Western Allied Forces), processes of Berlin's unification reached a controversial level. The divergence between social and spatial-economic aspects are still visible. Despite those problems, the city is developing, not only endeavoring to be the capital for the German nation, but also aspiring to become the most important urban area of the whole uniting Europe. Modern way of development, by favoring the most promising branches of industry – medical engineering, whole Life Sciences sector and telecommunication technologies, should transfer Berlin into a high-technology centre of international importance, comparable not only with European cities, but also with global players. Berlin, as a nodal type of region [Drozdowski, 2004] dominates the surrounding space – also with new industry location, which probably will rise the whole region's competitiveness.

High technologies as signs of the level of economic development are nowadays often main goals for local and regional policy [Benko, 1994]. Probably, even a more important thing is that they can be perceived as indication of how modern and globalized city's (in this case Berlin's) or region's economy is [Gaesler, 1999, 2000]. Life Sciences, optical technologies, medical engineering or other advanced technologies are common branches existing within Berlin's boundaries. In this place the main question and research objective of this article is what causes Berlin's popularity as a high-tech location place and how advanced technologies are distributed within its urban area.

## 2. Berlin as an advanced technologies centre – location factors

Germany's capital city seems to be innovation-friendly. Owing to the fact that it was made the creating as a capital city of the united German Federal Republic, Berlin has profited because of its taking over capital-related functions from the former capital of Western Germany – Bonn. This situation caused also the headquarters of worldwide known companies and enterprises to be moved to Berlin, thus generating a powerful impulse for development of the city. [Florida, Gates, 2001].

The level of innovation in European regions shows that the city (existing in statistics as an individual region) belongs to the main group (Table 1). The difference between Berlin and other European capitals relies on strong competition with other German cities and regions, those with much longer experience with advanced technologies – especially with Frankfurt am Main and Munich. Competition between the capital city and economically strong regions or cities is nothing new in the whole European space. Berlin's problems are its internal socio-spatial differences linked with the process of unification of the western and eastern parts of the city.

**Table 1.** Index of innovation, niveau and dynamic – Berlin as a European region

Index of Innovation			Index of Niveau			Index of Dynamic		
Rank	Region	Index	Rank	Region	Index	Rank	Region	Index
1	Baden-Württemberg	70	1	Baden-Württemberg	79.5	1	Départements d'outre mer	84.4
2	Berlin	64.6	2	Berlin	70.4	2	Noroeste (E)	69.8
3	Schweden	62	3	Schweden	70.3	3	Centro (E)	66.3
4	Île de France	60.3	4	Île de France	70	4	Northern	57.0
5	Bayern	59.8	5	Bayern	64.6	5	Zypern	56.4
6	Finland	57.1	6	Finland	62.5	6	Thüringen	54.7
7	Hessen	55.6	7	Hessen	60.8	7	Nord – Pas-de-Calais	54.5
8	Dänemark	51.5	8	Hamburg	54.5	8	Noreste (E)	53.2
9	East of England (UK)	49.1	9	Dänemark	54.3	9	Griechenland	52.3
10	Hamburg	48.9	10	East of England (UK)	52.3	10	Sur (E)	52.1

Source: <http://www.statistik-bw.de/Europa/EUinnovIndex.asp>

Berlin's central European geographic location works also as a major development factor. This kind of location seems to be important for East-West relations, especially as regards economic cooperation – investors from eastern countries are interested in Berlin.

Several factors form Berlin as Europe's HUB:

- three airports, which serve Berlin and whole region of Berlin-Brandenburg: Tegel – the biggest one, Tempelhof – the oldest one, which will be closed next year and Schönefeld – the largest in spatial meaning with visible potential for development

- Berliner Ring (Berlin's ring road), which links the city with 6 highway routes

- modern railway transportation system within the boundaries of metropolis (U-Bahn – subway, S-Bahn – city railway and Deutsche Bahn – German national railway).

Transportation infrastructure works as the greatest location factor for modern industry.

The above-mentioned transportation solutions, which make Berlin available for customers, investors and tourists, create a system, whose physical nodes like airports [Stratford, 1973] or highways can work as possible advanced technology concentration areas. Berlin-Schönefeld Airport seems to be the best example of such a process. Its rebuilding and developing is strongly connected with close neighborhood of campus Adlershof.

Because of its scientific potential Berlin is often described as a “city of knowledge”. A high concentration (Fig. 1) of universities and other kinds of research centers impact on the level of human capital. Research institutes (those connected with large universities, but also small and often private research centers) are concentrated in four main areas. The city centre – especially Mitte district – can be described as traditional location space for science in Berlin. It is also clearly visible that areas of research centers concentration are specialized. The western part of the central area is dominated by institutions of economic sciences and more traditional engineering branches, with a small number of Life Sciences institutes, functioning rather as some kind of complementary units. The eastern part is much more diverse – with domination of institutes, which represent Life Sciences and also information and communication technologies.

The old buildings of Berlin's universities perform more often a representative function. Newly-established research centers, especially campuses with a need of adequate surface and theoretical prospects for spatial development are located in external districts of Germany's capital city. They are based outside of city's noise and traffic, in natural, human-friendly landscape with relative good availability of the centre. As experience shows, after a few years of existing, service sector (banking, commerce) also develops in such areas.

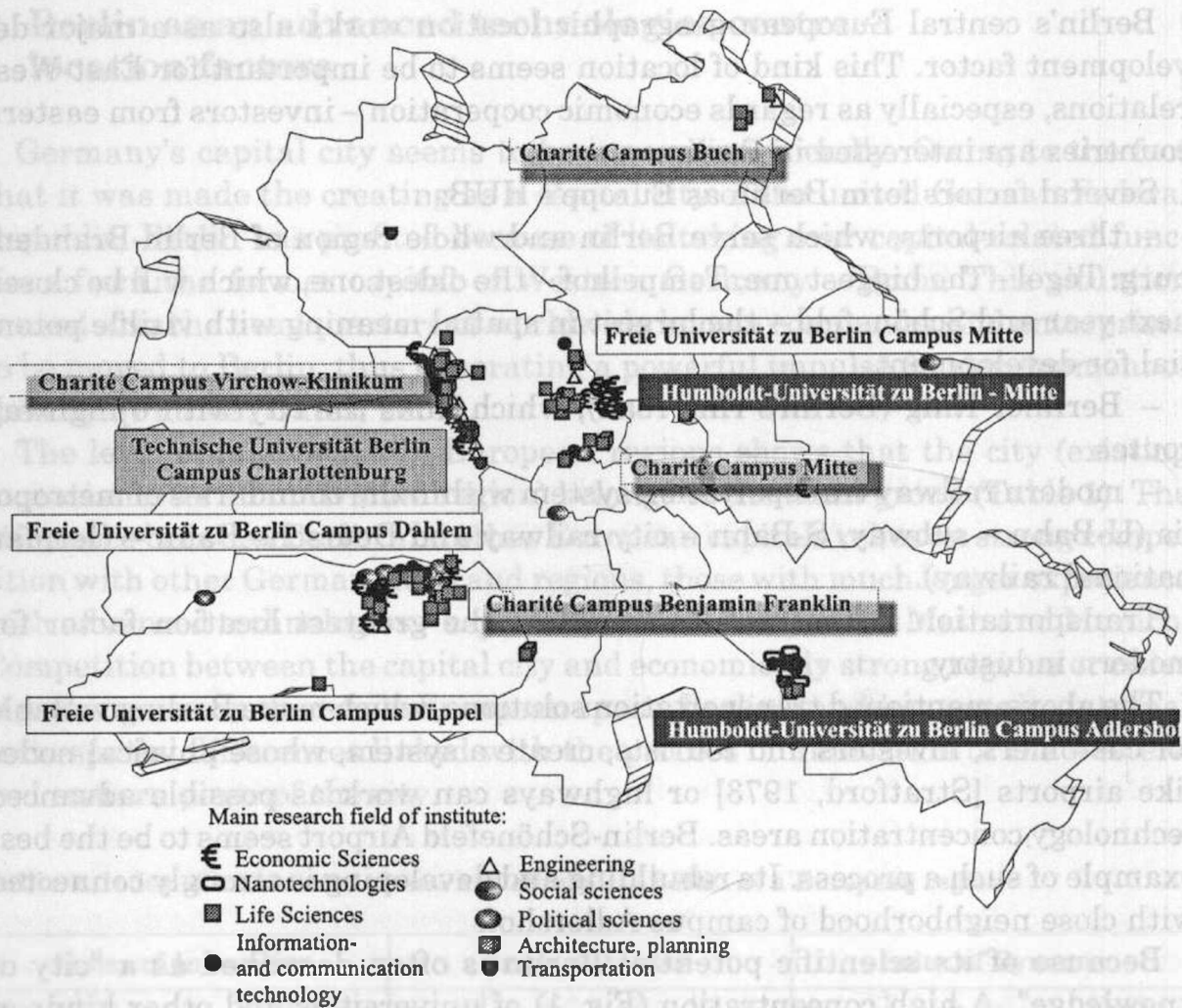


Fig. 1. Spatial concentration of research institutions in Berlin in 2006

Source: author's own elaboration.

Berlin's universities present different research directions:

- Humboldt-Universität zu Berlin as the most traditional one, with law, philosophy but also mathematics and economics departments,
- Freie Universität Berlin (Berlin Free University) – geography, chemistry, mathematics and political sciences,
- Technische Universität Berlin – transportation engineering, biotechnology and economics departments,
- Charité – Universitätsmedizin Berlin – Berlin's Medical University – the biggest in Europe, existing in many networks of innovation.

Four worldwide-known universities with institutes and research centers (public and commercial) build potential for developing sciences, especially those, whose products can be directly implicated (from the economic point of view the most desirable). Berlin is also a location place for Germany's greatest research institutions: Max-Planck Society, Helmholtz-Association, Leibnitz-Association, Fraunhofer Society.

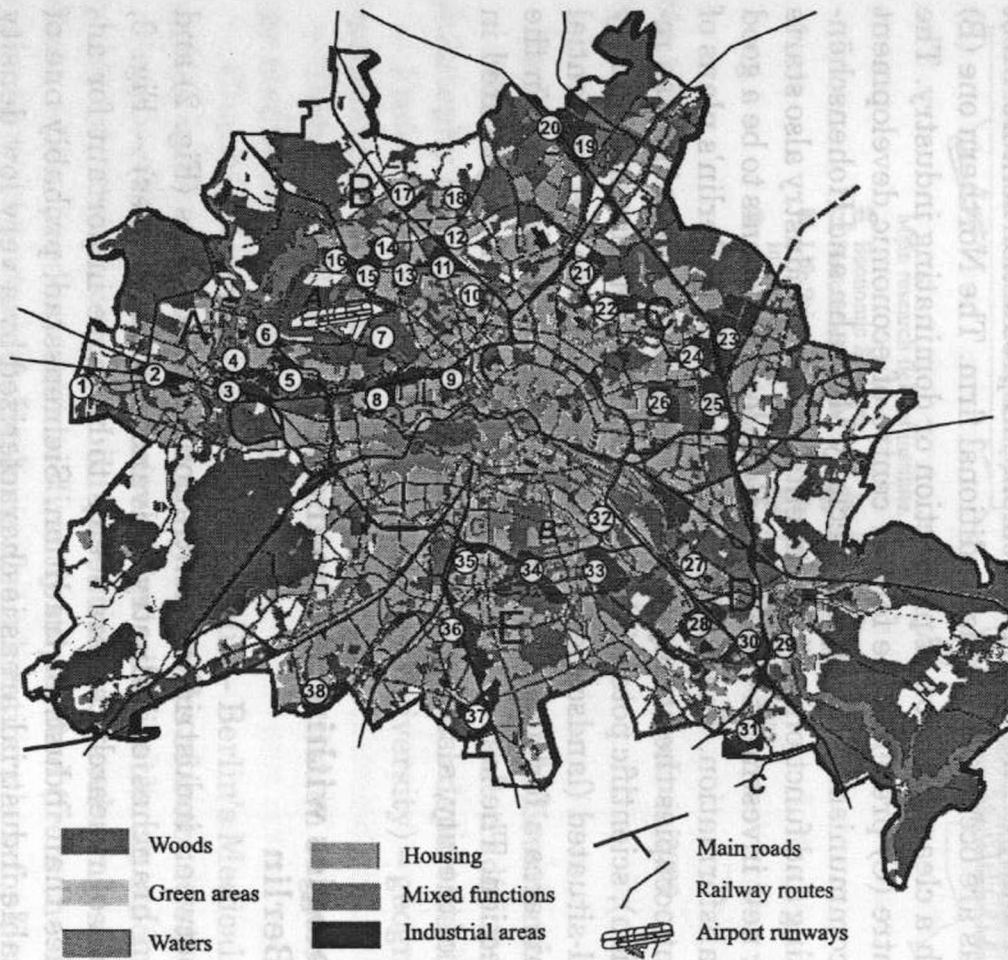
This concentration level of universities and other research centers has had a strong influence on Berlin's economy – not only because of employment for researchers and services staff. Berlin produces over 13% of all German's patents. Such a potential makes this city very important in getting innovative enterprises to open for patents and technologies.

### **3. Berlin's (traditional) industrial landscape**

There are 38 industrial areas which exist within Berlin's administrative boundaries (Fig. 2). Their geographic location has quite often traditional roots. The best example is Siemensstadt – an old city district from the beginning of the 20<sup>th</sup> century – functioning at the beginning of the 21<sup>st</sup> century in almost the same buildings but adapted to new production reality. Because of their close neighborhood, the industrial areas create 5 non-formal industrial centers (Fig. 2). The Western one (A) – concentrated in Spandau district, including Siemesstadt, close to Tegel Airport is mainly connected with Siemens AG production centers. Most parts of those areas are occupied by this traditional firm. The Northern one (B) does not have such a clear direction of production or dominating industry. The North-eastern centre (C) presents the former centre of economic development from the times of communism. This area (especially Marzahn and Hohenschönhausen) with existing and functioning “monuments” of heavy industry also starts to be attractive for new investment – Mercedes Benz location seems to be a good example of this transformation. The South-eastern area (D) in Berlin's plans of urban development occupies the strongest place. The location (especially as regards transportation), scientific potential (Humboldt University campus), fairly adequate and well-situated (landscape factor) space to manage the residential function makes this area a forthcoming engine for the city development in the south-eastern direction. The last area of industry concentration (E), located in the southern part of the city, also has a long industrial past.

### **4. High technologies within city boundaries – the case of Berlin**

A comparison between industrial concentration area locations (Fig. 2) and density of modern branches of industry (advanced technologies) – Fig. 3, shows that location of research centers seems to be more important for advanced technologies than industrial tradition. Siemensstad, probably one of the most recognizable industrial areas is characterized by a very low density of firms from Life Sciences or optic technology branches. The highest values of advanced technologies density are observed in two types of areas – central



**Industry concentration areas:** Western - A, Northern - B, North-eastern - C, South-eastern - D, Southern - E

**Airports:** a - Tegel, b - Tempelhof, c - Schönefeld

**Fig. 2. Industrial landscape of Berlin in 2006**

Source: author's own elaboration

Industrial area	Location features		
	distance to the Tegel Airport	distance to the Schönefeld Airport	distance to the city centre
1 Staaken	26 km	39 km	20 km
2 Klosterfelde	24 km	37 km	16 km
3 Charlottenburger Chaussee	13 km	30 km	12 km
4 Am Jolusturm	13 km	38 km	18 km
6 Sionerstadt	11 km	32 km	22 km
6 Gartenfeld	8 km	33 km	22 km
7 Friedrich-Obricht-Damm	7 km	31 km	11 km
8 Jungfernheide	7 km	29 km	9 km
8 Pennstraße	8 km	26 km	4 km
10 Kühnemannstraße	8 km	36 km	9 km
11 Flottenstraße	10 km	36 km	9 km
12 Wilhelmruh	6 km	37 km	14 km
13 Kurt-Schumacher-Platz	4 km	32 km	11 km
14 Breitenbachstraße	1 km	35 km	24 km
16 Föhlerstraße	2 km	34 km	23 km
16 Bornigkamm	3 km	36 km	25 km
17 Oranienburger Straße	10 km	22 km	13 km
18 Quickborner Straße	5 km	42 km	13 km
18 Sonderstandort Buchholz	40 km	31 km	16 km
20 Schöneler Straße	39 km	33 km	16 km
21 Heinersdorf	14 km	26 km	12 km
22 Berliner Allee	22 km	25 km	9 km
23 Marzahn - Nord	19 km	33 km	17 km
24 Hohenschönhausen	19 km	30 km	17 km
25 Marzahn - Süd	19 km	29 km	14 km
26 Herzbergstraße	19 km	23 km	9 km
27 Schöneweide	30 km	12 km	14 km
28 Johannisthal	30 km	11 km	18 km
28 Grünauer Straße	37 km	11 km	20 km
30 Adlershof	37 km	9 km	20 km
31 Sonderstandort Bohnsdorf	31 km	3 km	21 km
32 nördliche Sonnenallee	26 km	14 km	17 km
33 Neukölln	27 km	11 km	9 km
34 Teltowkanal	23 km	23 km	12 km
36 Schöneberg	19 km	18 km	6 km
36 Großbeerenstraße	28 km	24 km	11 km
37 Motzener Straße	29 km	14 km	14 km
38 Zehlendorfer Stieckkanal	27 km	24 km	21 km

districts and those most external. In both situations direct closeness of scientific potential works as a main factor. Both sites of innovation process, research and production exist in specialized networks. This kind of physical closeness can be observed in Berlin's technology parks (Fig. 3):

- The Biocampus Berlin-Buch – since the mid-1990s this Charite campus location works as a place for advanced technologies companies to settle,
- berlinbiotechpark – pharmaceuticals research and production location with neighborhood of Tegel Airport as a factor of development,
- Focus Mediaport – medical engineering centre,
- Adlershof Science and Technology Park – with a complex of residential area and commerce center for science, but also for campus workers and district's inhabitants.

Location of the most important branches (Fig. 4), which build an advanced technologies group, like biotechnology, optic technologies, nanotechnology, microtechnology, environmental industry and medical engineering, presents different spatial arrangements [Castells, Hall, 1994]. A very important conclusion is that location of high-technologies is not connected with East-West Berlin relations, in spite of many processes, especially the social ones, where differences between the western and the eastern districts are still very deep. It means that advanced technologies exist also in former Eastern Berlin – also within old industrial areas. On the other hand, several possibilities were created within post-communist part of the city – like location of Charité Campus Buch and Campus Adlershof. The age of the companies based in this part of the city can be recognized as a proof – the largest number of all kinds of advanced technology firms having been located there in the middle of the 1990s. From this point of view, the western part of Berlin is characterized by many older examples of companies dealing in high-technologies, which were operating in the pre-unification period.

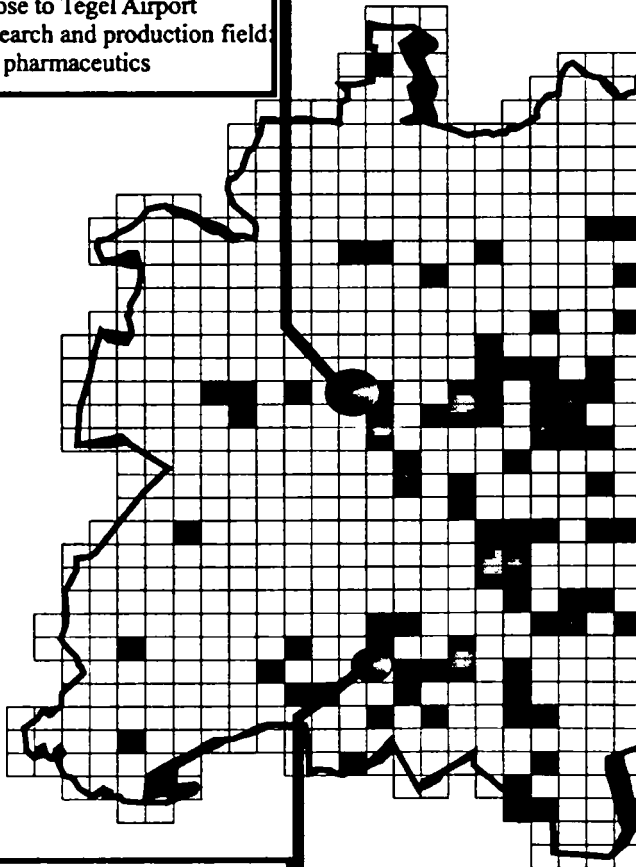
Biotechnology firms exist in many industry-concentration areas. The most important one is localized in Charité Campus Buch, which can be described as effectiveness of the idea of the whole Biocampus. Smaller concentrations are observed in almost all Berlin's districts.

Nano- and microtechnologies occur in much smaller concentrations. A similar situation refers to environmental technologies. In this case, the main difference consists in a higher number of the latter found in the eastern part of the city. Very often those firms are situated close to huge, old and still important power stations and heat engines.

Berlin's main center for microtechnologies production and research is Campus Adlershof. The area of Adlershof Science and Technology Park (WISTA) presents huge diversity of the enterprises located there. All kinds of recognized on Berlin's surface advanced technologies are localized also (or only) in this area. Other microtechnology firms can be found in both – Western and Eastern part of the city.



**berlinbiotechpark**  
\* close to Tegel Airport  
\*\* main research and production field:  
pharmaceutics



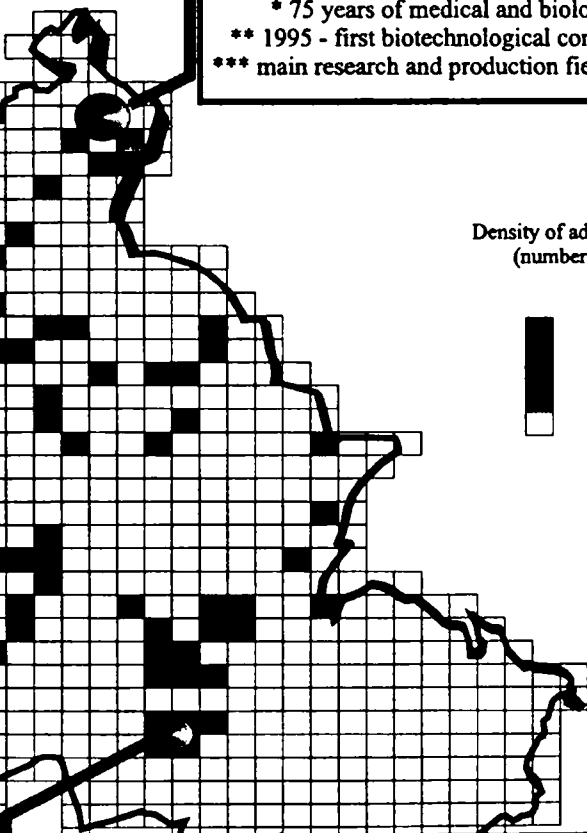
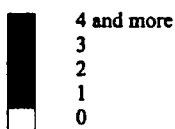
**Focus Mediaport**  
\* within sight off the Charite Campus  
\*\* main research and production field:  
medical engineering

**Fig. 3.** Density of modern branches of industry in Berlin in 2006  
Source: author's own elaboration

### The Biocampus Berlin-Buch

- \* 75 years of medical and biological researches
- \*\* 1995 - first biotechnological companies have settled
- \*\*\* main research and production field: molecular biology

Density of advanced technologies  
(number of firms / km<sup>2</sup>)



### Adlershof Science and Technology Park (WISTA)

- \* 75 years of medical and biological researches
- \*\* 1909 - first German airfield - since 1912 air transportation researches
- \*\*\* main research and production field: optical technology, biotechnology, IT

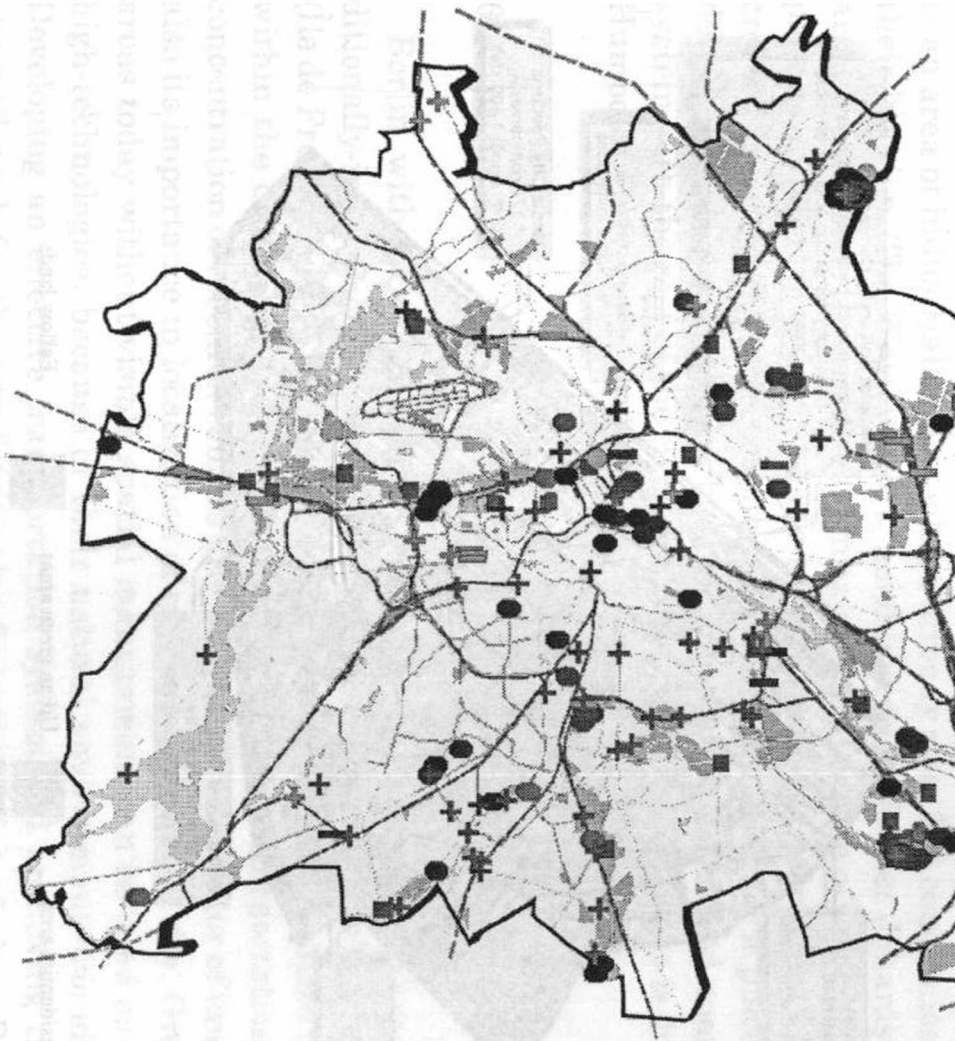
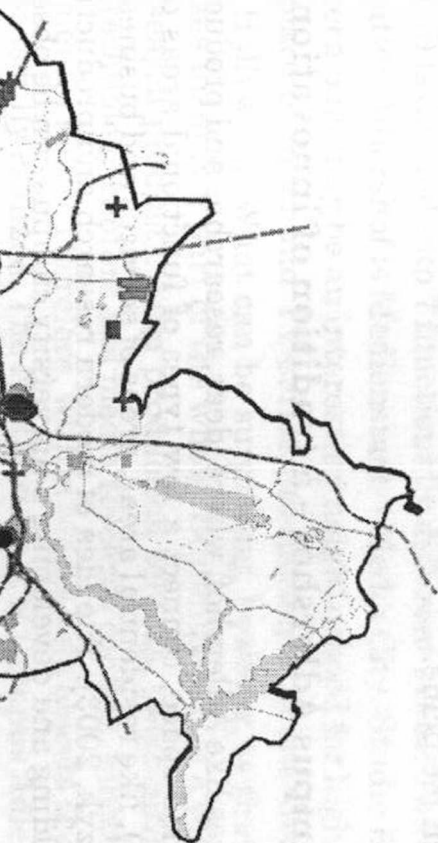


Fig. 4. Age and location of advanced technologies in Berlin

Source: author's own elaboration

Before 1989	1990 -1994	1995 -1999	After 2000	
●	●	●	●	Biotechnology
■	■	■	■	Optical technology
●	●	●	●	Nanotechnology
■	■	■	■	Microtechnology
—	—	—	—	Environmental industry
+	+	+	+	Medical engineering



Many examples of medical engineering producers present a long tradition of working in this field – even about a century-long. Location of those firms is very often observed out of industry concentration centers. Many of them are localized in the city center – especially those, whose main research and production fields are concentrated on software or laser techniques. An important branch connected with medical engineering is production of software used in modern medicine.

### 5. Campus Adlershof – a tradition of innovations

Places like Adlershof, where ideas, researches and production coexist within the same space, connect a few types of functional areas on the city surface (Fig. 5), like residential areas, areas of services and business, industrial areas [Słodczyk, 2003]. The idea of modern research and production center realized by building and developing a university campus can be observed in the south-

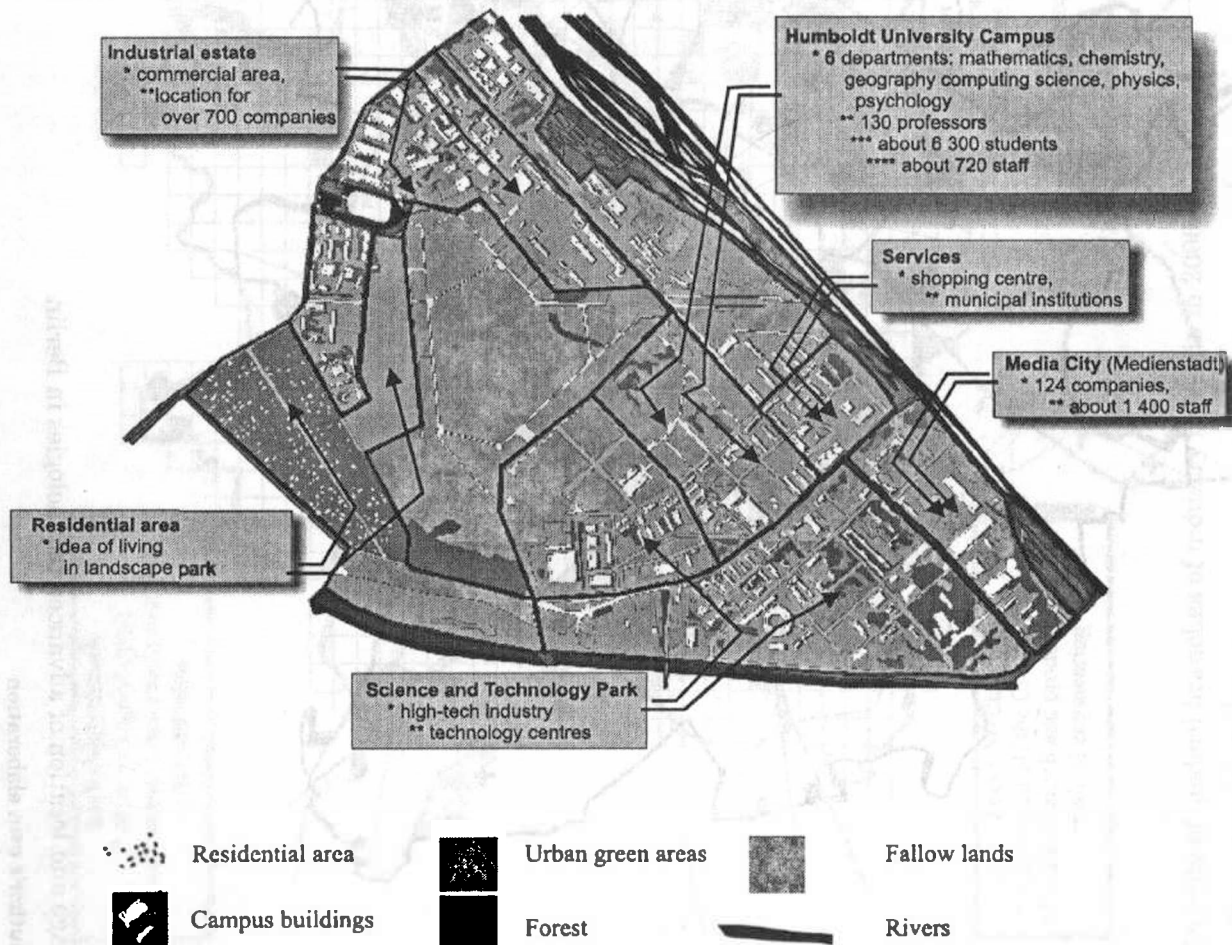


Fig. 5. Campus Adlershof concept

Source: author's own elaboration

eastern part of Berlin – in Adlershof. Campus Adlershof, located near the city boundaries has a long tradition of research and innovations. Within this area exists the oldest (the first) German airfield – Johannisthal with almost 100 years of air transportation research tradition. The airfield, closed down in 1995, functions today only as a green area – with plans for its revitalization and transforming, probably, into a recreation area.

The Campus (Fig. 5) is divided into 7 functionally different areas. The nearest to the S-Bahn station Adlershof is Medienstadt – Media City. Studio Berlin located in the southern part may be an interesting neighborhood for high-tech industries. It is a place of films and TV-series production – in the German satire, the Berlin's Hollywood. What can be surprising, however, is that this kind of activity makes up only a part of the whole: Studio Berlin is a place of implementing of research products. Film production centers, neighboring on telecommunication technology centers and media research centers, function as some kind of experimental fields. Therefore, within Media City objects the idea of innovation process is fully realized. The Northern part of Campus Adlershof is an area of industrial estate, where already over 700 companies have found their location. The Western part, neighboring on former Johannisthal airfield area, functions as the main residential space. The idea of living in a landscape park can materialize fairly easily because of natural environment effects of created green areas. The residential area is planned as a place filled with detached and semi-detached houses, with a well-developed communication system with the rest of the city. The main area of the campus is dominated by Humboldt University institutes.

## 6. Conclusion

Berlin, with its index of innovation, stands on the top of the rank with traditionally-innovated German (Baden-Württemberg, Bayern) and non-German (Île de France, East of England) regions. The location of advanced technologies within the city boundaries shows how important transportation nodes and concentration of research centers are. The traditional factor of innovation has also its importance in localization of new industry in the city. Great external areas today without visible spatial management can be used as location for high-technologies, because of their natural environment-friendly features. Developing an effective transportation system and improving this existing one will work for the city future also from this point of view. Berlin's fight for Europe's capital city title can be victorious. It seems that soon it can be too late for other central European cities (especially capital cities) to reach a comparative level.

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