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THE HOTSPOT—A NEW TECHNOLOGY, BUT IS IT ALSO A NEW, GEOGRAPHICAL FACE OF THE INTERNET?

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Abstract: While an analysis of hotspots might identify aspects that are spatial, technical or sociological, this study disregards the last two (non-geographical) areas of research, in order to concentrate on the spatial distribution of hotspots, albeit on reference levels that are global or else local (related to Poland). In fact, however, analysis of spatial aspects to the location and functioning of hotspots encountered a significant obstacle in regard to the accessing of reliable and comparable data. Beside attempts to assess free sources of data on the subject, the study focuses on the structure of types of place, as well as on the spatial diversity of locations where this type of Internet access is concerned. Although hotspots do not need to be connected with the ”hard wire” Internet, like their prototype, they seem to copy socio-economic reality and diversities on all reference levels. Nevertheless, like the Internet at the beginning of its existence, they seem to display characteristic elements typical of their development.

Key words: hotspot, Wi-Fi, Internet, world, Poland

INTRODUCTION—OUTLINE OF THE PROBLEM

The Internet is less and less often identified with intangible, virtual reality. It is no longer a different, isolated world, and we users are not now facing a dilemma as to which of the worlds we want to inhabit. For the virtual reality does co-exist with the physical space (Kitchin 1998), and does constitute an inseparable element of every individual's daily life (see Ilnicki and Janc 2008). We are aware of the differences in functioning between Internet space and the domain outside it. However, more and more frequently the two time streams intertwine. By being a part of the Internet, we evolve with it, both mentally and infrastructurally, in the process becoming less physically attached. However, an important geographically-located element by which the wireless Internet is accessed is the so-called hotspots.

A hotspot, i.e. a "point" thanks to which users may obtain a broadband Internet connection, can be described as the next step in the development of the Internet. The new technology, by making the user independent of a particular physical location, seems to confirm the definition of cyberspace coined by Gibson "*There is no there, there. They taught that to children explaining cyberspace…*" (Gibson 1989, p.48). A traditional Internet connection is located explicitly and has its physical form. In contrast, the use of the signal emitted by hotspots is only possible in a "non-stationary" way.

Thus, hotspots give the feeling of freedom, of reaching beyond the frames of space. Like other wireless information and communications technologies (ICTs), hotspots expand time flexibility. They may also contribute to a change in the traditional "centre-periphery" spatial division, at each level of spatial reference, or even to a redefining of social exclusion (see Kwan 2006).

It needs to be stressed that, from the very beginning, wireless access to the Internet was perceived as panacea for the problem of "*the last mile*", which is concerned with the cost of the so-called ultimate connection to the Internet. These are the costs incurred by the individual customer, which are ultimately the highest. Compared to the traditional connection (wiring), hotspots are associated with very low installation costs. However, according to Johnston and Snider (2003, p.1), due to limited coverage of the area,… *Wi-Fi only breaks the chains on the last hundred feet of the telecommunications network. The rest of the last mile is still in chains*". Thus, the problem of the last mile still remains to be solved. Despite some weaknesses of this solution (the use of hotspots as "sources" of Internet access), it is distinguished by dynamic changes. Setting aside the technical aspect of the issue, there are still two levels of analysis of this phenomenon—the sociological and the spatial (see Torrens 2008). As these aspects are poorly represented in the subject matter literature, there is an incentive for this issue to be dealt with with a view to our understanding of this phenomenon in geographical terms being enriched.

PURPOSE, SCOPE AND SUBJECT OF SUCH RESEARCH AND CONDITIONS UNDER WHICH IT CAN BE CARRIED OUT

As has already been indicated, geography is tending to lag behind other disciplines more or less connected with ICT where research into hotspots is concerned. Spatial perspectives on the hotspots issue are still mainly limited to analyses of their occurrence across urban space (see Torrens 2008). For example, the above-mentioned work of Torrens (2008) analyses the density of hotspots, characteristics of their ranges and differences in signal strengths in urban space. The subject is also addressed on the urban scale in the works of Grubesic and Murray (2004), Fuentes-Batista and Inagaki (2006) and Powell (2009). In contrast, works that have thus far considered the spatial diversity of hotspots on a scale larger than the are Gorman and McIntee (2003), *Mapping the existing…* (2005) and Ballon (2007).

The idea of hotspots functioning in urban space as access points which can be "set" by anyone translates into a lack of control over their actual number, and consequently their spatial distribution. There is no single, reliable source of data covering all hotspots on a global scale, or in particular countries. The vast majority of available free databases exist thanks to the keen interest shown by members of web portals. It is usual for these databases to be created by the community of wireless Internet users (see Sandving 2004). A similar situation occurred as the Internet took root in Poland and was concerned with cybercafes (see Ilnicki 2002). The key issue here is not so much the system of registration itself as the revision of its state and completeness of the data on offer.

Equally, databases concerning hotspots are also created and shared by wireless Internet providers, the key issue here being the obvious confinement to hotspots offered by that given provider. Some databases are also created and developed by private companies and redistributed commercially.

Overall, none of these databases is able to guarantee either quality, or completeness, or topicality, and this is true of practically all levels of spatial reference.

The main purpose of this paper has thus been to present the spatial distribution of hotspots at two levels of spatial reference, i.e. the global and the local (Poland). Such an analysis of spatial aspects of location and of the functioning of hotspots encounters a significant barrier in the form of access to

the data concerning geographical location, especially when credibility and comparability are concerned. Apart from the obvious attempt to assess free sources of data from this field, analysis also centres on structure as regards the types of places in which hotspots are situated.

THE GLOBAL CONTEXT

The majority of European hotspots are located in towns, and in parts characteristic of them (i.e. cafes/restaurants, hotels and public institutions), as well as at transport interchanges in the broad sense (petrol stations, airports, railway stations and bus stations) (see Ballon 2007). This statement is also true for "*in-depth*" analysis of hotspot locations around the world (Fig.1).

Nearly 35% of all hotspots are situated in cafes/restaurants, and almost ¼ in hotels. In further positions, with much lower proportions of locations, we find public spaces and shops (about 6–7% each) and offices (4%). Relatively the least well-represented categories involve places designated for business, education and transport (airports, railway stations). Despite the fact that there are many places in which hotspots can be located, we need to emphasise the "location specificity" noticeable in the analysis of particular countries[1]. Hotzones[2] are characteristic of Japan and Switzerland, and respectively account for 20 and 37% of the total number of hotspots. In Russia, 92% of hotspots are characteristic of so-called public space. Office buildings as locations for hotspots achieve significant shares of totals in Asian countries, especially South Korea (35%), as well as China and Indonesia (18% each). South Korea also has the highest proportion of hotspot locations in shopping centres (25%). The location of hotspots in shopping centres is at a somewhat lower level in Slovakia (18%), Thailand (15%) and Taiwan (14%). Other places in which wireless Internet is located are: schools and higher education institutions (Chile 11%); petrol stations (Latvia, Denmark, on average 22% each). Unusual places for the situating of hotspots are phone booths (21% of the total), also in Latvia.

The examples quoted above may be identified with strategies and priorities used in the shaping of wireless access to the Internet. However, where the spatial locations of hotspots are concerned, it is mainly hotels, bars and restaurants that are involved. Hotspots are now becoming standard equipment of institutions, especially among a wide range of service-related business entities. Like other new technologies (credit cards, on-line shopping, etc.), hotspots are becoming an element indispensable to the functioning of service outlets. Very frequently it seems to matter little whether anyone ever actually makes use of the possibility of entering the Internet. Rather, the sheer fact that such a possibility exists is more important, and enhances the value of the place. Also from the point of view of the "provider" of wireless Internet, it is not only the potential benefits of having hotspots that are important, but the fact that a possibility of their being used has been offered. The hotspot is thus turning into something as familiar and common as the credit card terminal.

The available free databases vary as regards the numbers of hotspots that may in fact be functioning around the world. Records are available for between 33,000 locations (www.hotspot-locations.com) and 100,000 (www.boingo.com), and even a million-plus if the WiGLE database is to be believed (www.wigle.net). The database used in this study (www.jiwire.com) identifies unambiguously nearly 250,000 hotspot locations, which is quite a large number compared with what other, non-commercial databases have to offer. The attendant spatial distribution

[1] The analysis is confined to countries with at least 100 hotspots.

[2] Hotzones are at the centres of hotspots that are by nature continuous. In this way, the area is fully covered by the signal (Johnston and Snider, 2003). Shamp (2004) additionally proposes a division into Wi-Fi zones and Wi–Fi clouds, depending on the type of coverage of an area by a signal deriving from a hotspot.

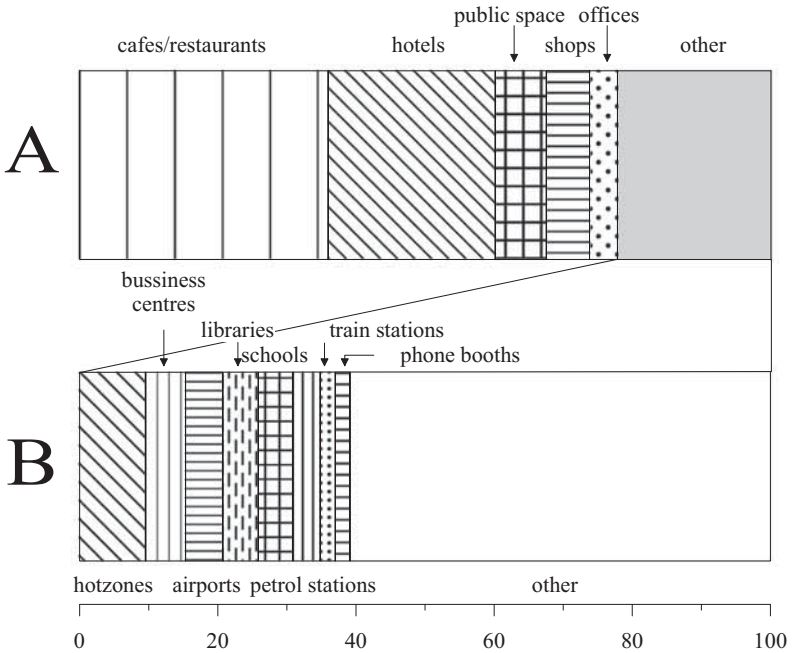

Figure 1. Types of hotspot locations in general (A), and with emphasis on other location structures (B).

Source: own study based on <http://www.jiwire.com/>

of hotspots around the world corresponds to the dichotomous division of the world into a "rich north" and a "poor south" (Fig. 2), a situation analogous with the distribution of Internet users, and hence the digital division of the world (see Ilnicki and Janc, 2008). The complete lack of hotspots in most African countries needs stressing, and where these countries do have hotspots at all, there are usually no more than 20 of them. The exceptions to this rule are South Africa (over 1000 hotspots) and Egypt (over 160). The world's most "saturated" countries are in turn Switzerland (70 hotspots per 100,000 inhabitants), the United Kingdom, Sweden and Singapore (over 40), and Ireland, France, Macau, Hong-Kong and Liechtenstein (over 30) (see Fig. 2). The United States concentrates 27% of all hotspots on its territory. Indeed, nearly half of them in the world as a whole are located in just three countries (the USA, UK and France). When we add in the next seven countries, we have accounted for ¾ of all hotspots. This asymmetry is reflected in the spatial distribution of the phenomenon, and is characteristic of it.

On the basis of previous observations concerning the spatial diversity of hotspots, a correlation with the level of economic development can be discerned on a global scale. Confirmation of this assumption is offered by the link between the number of hotspots per 100,000 inhabitants, the level of GDP per capita and the level of development of ICT[3] (Fig. 3). The value of the Pearson linear correlation coefficient between GDP per capita and the number of hotspots per inhabitant, which is +0.85, is sufficient to make it clear that wireless Internet remains

[3] In the study, the measure of ICT is the component obtained from four variables: Internet users; telephones—main line in use; mobile phones; hosts per 100 inhabitants of a given country. This component accounts for nearly 70% of common variability of features.

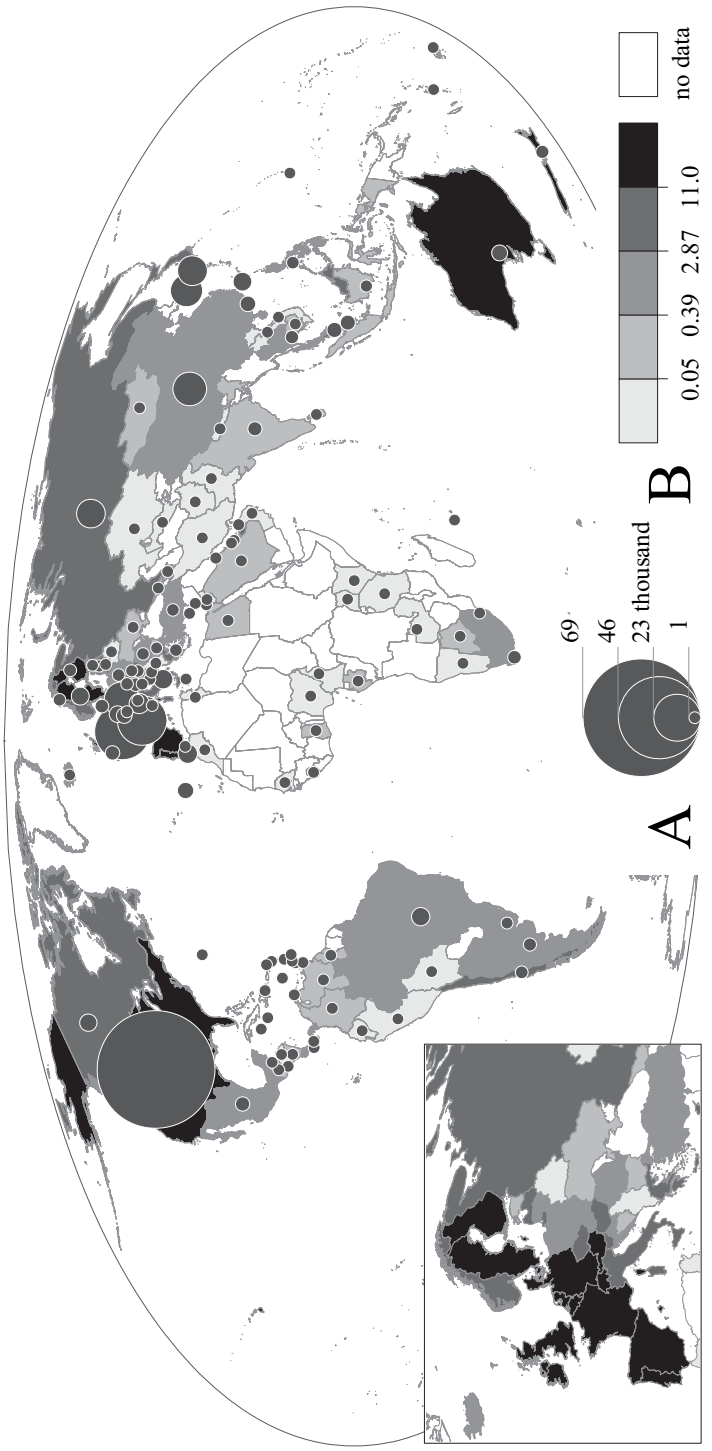

Figure 2. Number (A) and intensity (B) of hotspots per 100,000 inhabitants (2009).

Source: own study based on <http://www.jiwire.com/>; <https://www.cia.gov/library/publications/the–world–factbook/>

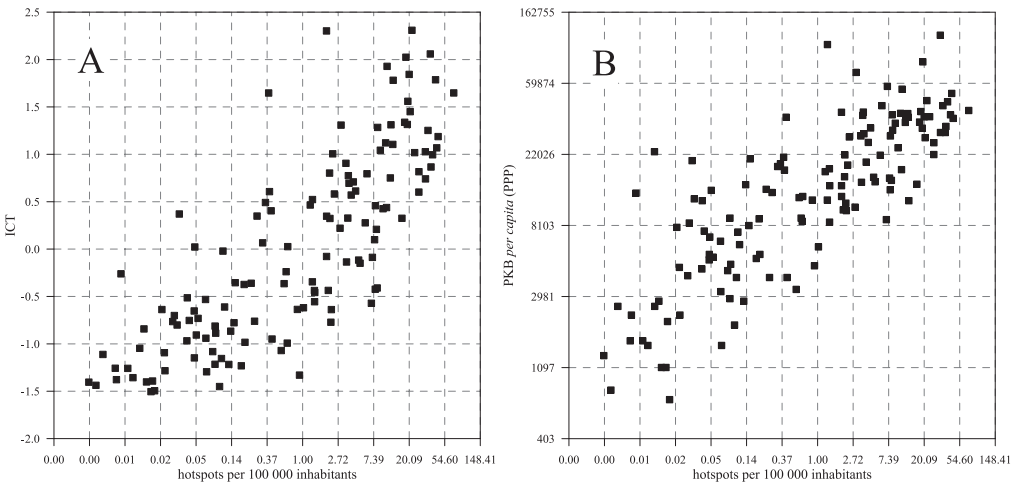

Figure 3. Hotspots in relation to the level of ICT development (A) and affluence of societies (B).
Source: own study based on <http://www.jiwire.com/>;
<https://www.cia.gov/library/publications/the–world–factbook/>

a "commodity" for the rich. The occurrence of hotspots is "naturally" also dependent on the level of development of telecommunications infrastructure ($r_{ij} = +0.62$).

THE LOCAL CONTEXT—POLAND

As on the global scale, so also at a lower level of spatial reference, it is hard to identify an exact number of hotspots functioning in Poland. This fact reflects two elements characteristic of so-called new phenomena, i.e. the lack of official statistics that could also provide information on the scale of a phenomenon that is hard to assess or verify, as well as the way in which the process is subject to strong dynamics and changeability over time. These factors are enough to ensure that the statistic which is the number of active hotspots will forever be an approximate one, with a varying margin of error.

Where the reference is to the presence of hotspots in Poland, what needs to be borne in mind is that these appeared as early (or as late) as in 2003. At the end of the latter year, there were no more than 100 hotspots (<www.tur-info.pl>)[4]. By the end of 2004, this number had increased almost fourfold (Table 1). In turn, at the present moment (mid-2009), we may speak of nearly 2000 actively functioning hotspots (<www.hot.spots.pl>—1856; <www.pdaclub.pl>—1594). However, the discrepancies concerning their numbers are significant, as they involve almost 1500 locations. This difference appears when we compare information coming from national and foreign sources. One of the foreign sources estimates the number of Polish hotspots at no more than 500 locations (www.jiwire.com). Taking into account the way in which access to sources is limited, and encumbered with an unknown margin of error as to the actual number of hotspots, it is hard to identify the regularities they are governed by.

As can be assumed, both now and at the beginning of the period during which hotspots began to become popular, these were not solely characteristic of cities. It also

[4] <http://www.turinfo.pl/p/ak_id,10602,hot_spoty_w_polsce,hot_spot,na_stacjach_benzynowych,restauracja,internet.html>

Table 1. Basic information on the number and potential of hotspots space

Specification	2004 (1)	2005 (2)	2009 (1)	2009 (3)
	locations—number			
Total	74	116	392	324
Cities in general	61	84	250	239
Cities of over 100,000 inhabitants	35	33	43	43
	potential—number			
Total	349	525	1856	1594
Cities in general	335	487	1677	1493
Cities of over 100,000 inhabitants	283	399	1160	1026
Warszawa	69	104	219	171
Kraków		30	107	99
Poznań	29	36	83	73
Wrocław	29	35	69	68
Szczecin	23			

Source: own study based on: <http://hot.spots.pl/> (1); <www.computerworld.pl/hotspot/> (2); <www.pdaclub.pl> (3)

needs to be stressed that, not being found in all cities, they are not a true "attribute" by which cities can be defined or identified. Nevertheless, 67% of the total number (some 320–340 in absolute terms) are characteristic of cities, though the dominance of urban locations has been decreasing steadily. Still, the main "mass", i.e. hotspots are typical of cities to the tune of 90%. At the same time, the concentration of hotspots in cities is stronger than the concentration of urban population. It seems that the process by which disproportions between the concentration of the number of hotspots and of the population are reduced has actually slowed down, leaving a situation in which an overconcentration of hotspots is still indicated. It further needs to be stressed that nearly 70% of urban hotspots are characteristic of cities inhabited by at least 100,000 people (see Table 1). In the lead, among cities with the greatest numbers of hotspots are four cities (appearing in varying order), i.e. Warsaw, Kraków, Poznań and Wrocław. Not surprisingly, Warsaw tops the list. It has at least double the number of hotspots of the runner-up.

Both the general description of the phenomenon and the spatial diversity determined for hotspot locations require, on the one hand, a global approach based on available sources, and on the other, flexible and cautious process of drawing conclusions. This results from the fact that various sources, even when unanimous as to the number of hotspots, give two "different" pictures of their spatial distribution (Fig. 4). Despite this, we can state with near-certainty that the present shape and spatial distribution of hotspots was initiated from the very moment of introduction of this Internet access facility. An advantage enjoyed by this type of concentrated Internet access remains noticeable in the largest cities, with a clear dominance of Warsaw. However, the dominance of the capital over remaining locations is declining steadily. The spot-type distribution of hotspots over the space of the country is matched by areal-type distribution in Śląskie Voivoship (the province-region of Silesia).

Locations and distributions of hotspots are thus less correlated with population distribution, even if an indirect connection cannot be ruled out.

Hotspots can be viewed as elements of space created by inhabitants for "non-inhabitants", the latter being the majority users of the places in which they are located. However, as in the case of business environment services—recently called professional services—the occurrence of the analysed phenomenon should be connected with places—areas characterized by an increase, not only in the level of activity and economic attractiveness, but also in tourism and learning. These services are connected with particular types of place that are highly centralized. This can be confirmed by locations which are not urban in character and where exceptions confirm the rule (see Fig. 4 B). At first sight, their locations can be described as random but this is in fact a reflection of the small number of locations and number of hotspots connected with them. However, after a thorough analysis, it seems that their occurrence should rather be linked with the location and identity of parts of Poland renowned as attractive to tourists (i.e. Małopolskie, Podkarpackie, Pomorskie, Zachodniopomorskie and—in part—Warmińsko-Mazurskie voivodships). At the same time, it needs to be stressed that the occurrence, and in particular the number, of hotspots is not a straightforward function of centrality and the position of a given centre in the settlement hierarchy. Here, examples of this might be Rzeszów (Fig. 4 A) and Szklarska Poręba (Fig. 4 B). In these cases, initiatives are undertaken by administration alone—the authorities in Rzeszów, or by way of co-operation with private initiatives (in Szklarska Poręba).

In Poland, hotspots are most often located in cafes, restaurants or pubs, which account for 37% of the total, or a very similar share to that noted in locations around the world <www.hot.spot.pl>. Hotspots existing in public space are also well-represented (at 20%). In further positions are: hotels and guest houses (17%), shops and shopping malls (over 10%), and schools and higher education institutions (nearly 10%).

Hotspot space in Poland has been shaped by two processes, i.e. major growth in the numbers of locations already having many hotspots (albeit with a lesser dynamic than in cities with a smaller number of hotspots), plus a process whereby new locations are created, i.e. "the beginnings" of a popularization of the phenomenon.

However, it needs to be emphasized that the popularization phenomenon should not be attributed to the creation of new hotspots outside towns and cities. All of these claims are reflected in the following figures (see Figs. 4 A and 4 B).

SUMMARY

No matter in which field of study, the examination of new phenomena is fascinating. Equally, it is more and more common for us to bear witness to phenomena that are short-lived, inasmuch as that they are subject to change at a fast pace. This means that a phenomenon is noticed, develops significantly—sufficiently for research to become possible, but then is subject to a reduced dynamic, to the point where it may very often give way to another phenomenon that is more spectacular, and thus more worthy of a researcher's attention. Thus geography is encountering increasing difficulties with examining new phenomena, questions revolving to an even greater extent around "where" (i.e. the places of occurrence) than around "what and how". This in turn assures that research is more and more likely to be based around unofficial sources of data (as without them it is hard to envisage phenomena in which we creators on the one hand and recipients on the other being analysed). An example of such a phenomenon is the hotspot.

There is no doubt that both the geography of hotspots and the phenomenon itself remain subject to a process whereby character is shaped, along with a spatial image of their diversity. This is true at both the global and lower levels of reference. On the one

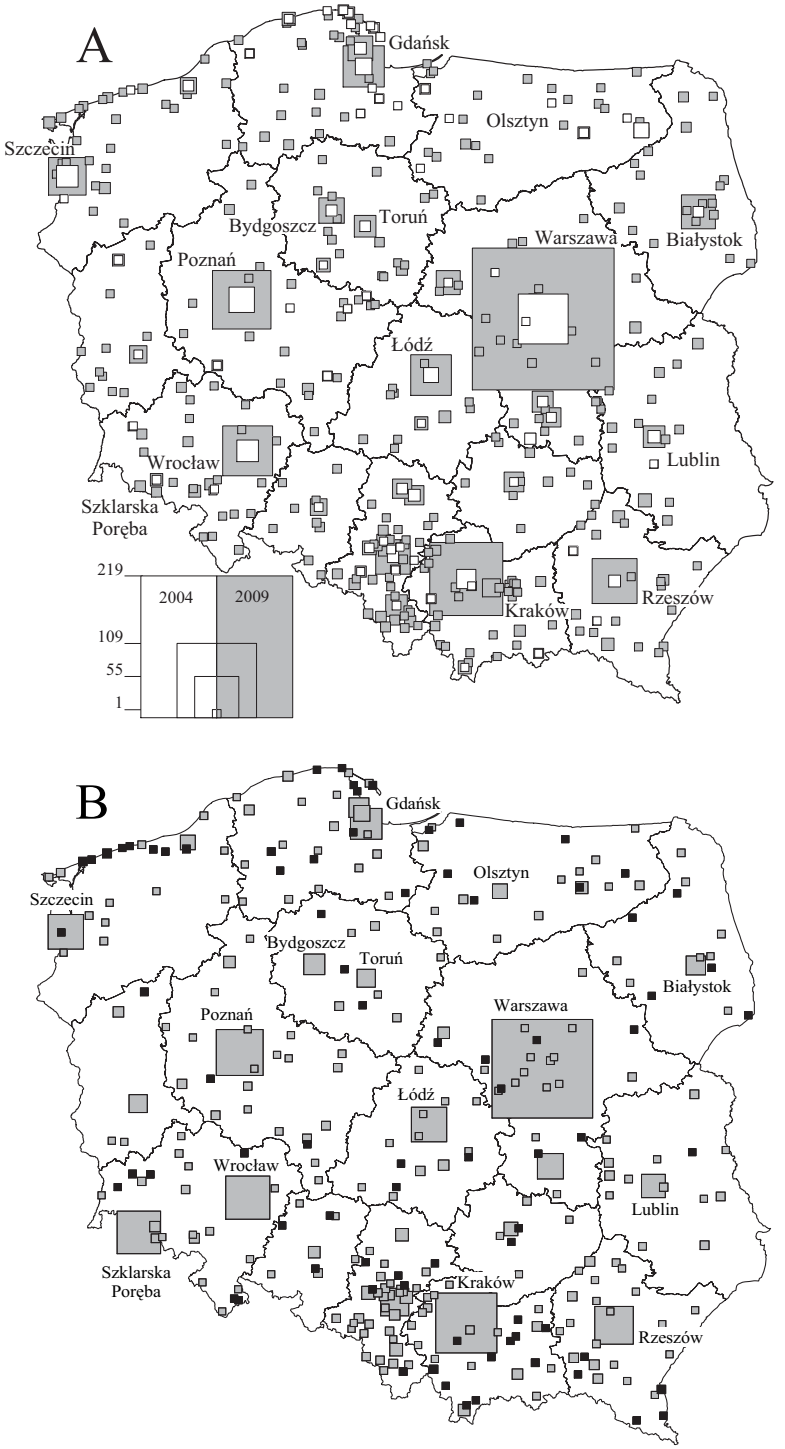

Figure 4. Spatial distribution and change in the numbers of hotspots in Poland between 2004 and 2009
Marking: (1) out-of-town locations are marked in black; (2) linear scale.
Source: own study based on: <http://hot.spots.pl/> (Fig. 4 A) and <www.pdaclub.pl> (Fig. 4 B)

hand, hotspots resemble the Internet from which they arose in confirming the "traditional" division of the world into a "rich north" and "poor south". This division is much stricter than that as regards the diversity of Internet users on the one hand, or the number of computers within one network o the other. In the context of the phenomenon under analysis, the African continent is not even on the outskirts of the Internet galaxy. Rather it is the proverbial *terra incognita* on the map of possibilities for entering the digital world. Despite being at an introductory stage of popularization, wireless Internet access using Wi-Fi technology does not create its own geography. This fact can be said to bind the geography of hotspots with the level of economic and technological development. However, this situation seems paradoxical when it is recalled how low the costs of installation of such means of Internet access are. It remains a solution determined by wiring, and encumbered by costs of the notorious "last mile" type. It thus needs to be emphasized how high a level of spatial concentration is characteristic for hotspots. On a global scale, over half of the entire total are in one or other of just three countries. Therefore, as at lower levels of spatial reference, we are dealing with an overconcentration in relation to population. Hotspots are located in places characterized by centrality and a surplus of significance. This type of connection remains more typical of urban space than of out-of-town space. Indeed, the few out-of-town locations that are present are of such nature as merely to confirm their centrality and "urban character" *de facto*.

When talking about the structure as regards particular locations one needs to recall that, in the context of countries of the world, there is a noticeable trend for them to be placed in characteristic places that mainly put them at the disposal of "non-inhabitants", or else inhabitants (users) of space present between the place of work and place of residence.

It needs to be stressed that, while the different sources of data made use of in this study present alternative versions as regards the number of hotspots at various reference levels, a more thorough analysis shows how conclusions that take shape are coincident or complementary.

Overall, both the Internet—as a postmodern medium—and elements of its reality—its tissue continue to represent promising issues for research in geography. In the case of the study of the Internet, this would seem of necessity to denote a move beyond the case study, in order that the constantly appearing new aspects may be addressed.

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