Reflections of global cities and on the connections between them

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Abstract: The modern society beacons a visible trace at the night sky. The sources of these blips are growing into massive entities. Global cities are often explored according to their inner characteristics and their relative importance to the world economy. As the societies are becoming more interconnected international air traffic is also becoming more vital. Air traffic can be seen as a concrete expression of the network society. In this review I use GIS- and statistical methods to demonstrate the relation between the night-time brightness of a city area and the average distance of direct scheduled flights. This relation also depends on the infrastructure of the city's international airport. In addition the study illustrates the extent of developed city-regions where one could expect a need for long-haul international flights to exist. The analysis shows that New York-Philadelphia, Los Angeles and Greater Tokyo are top city-regions, or megalopolises, in the brightness hierarchy. Nevertheless, it is highlighted that for historical and cultural reasons the most important service enterprises are not always located in the most luminous city-regions.

Outline

At night-time the world's largest city-regions are covered with an enormous blanket of light. On moonless nights particular satellites can observe the light pollution of roads, buildings, factory sites, fishing fleets, and forest fires. Artificial lighting is an expression of modern society although the abundant use of electricity in order to produce safe city spaces by night does not necessarily make city-regions globally important. When one looks at the electric blushes beaconing among dark rural or natural areas, at least one thing comes to mind. How these light sources are connected? No city is an island, and in the globalizing world flows between cities, whether economic or material create hierarchies between places. In this review I will present a discussion about global cities and the relations between the placing of global service enterprises, night-time lights and scheduled air transport.

From world cities of production to global cities of world economy

Writing about global cities has spiralled since the start of the 20th century. In urban geography the term can be traced to Patrick Geddes (1915), who coined the term *world-cities* in reference to big cities with a proportionately large amount of world trade. Some have traced the origin of the word as far back as to Goethe. According to the Human Geography Dictionary a world city is "characterized by the range of its economic, financial, cultural and political power and influence on a global scale. It may, or may not, be a large capital city, but its role in the world is dynamic and dominating through the strength of its interconnections." (Clark 2002: 463). Geographer Peter Hall (1960: 7) wrote that world cities are sites of international banking and nodes of international airports. The term was formulated into a paradigm when John Friedmann and Goetz Wolff (1982: 310) maintained that there are a small number of massive city-regions on the top of the city hierarchy and named these cities *world cities*. These city-regions are tightly entwined in decision-making and world economics and they control production and the widening of markets. Hence, the economic production is what defines the world city. According to sociologist Saskia Sassen (2001) the world stock exchange never stops (except for weekends), and because of the stock markets in the three most influential global cities capital is in a constant flow. Sassen (2001: 330) maintains that the importance of London, New York, and Tokyo as the centres of global commerce and finance will only grow. However, Josef Gugler (2004: 1–3) states that this global city conversation has been very unilateral, for it concentrates only on the western world. As most of the population growth occurs in developing countries, it is necessary to view all global cities without highlighting cities in certain regions. On the other hand, it is argued that western global cities are characterised more by multiculturalism and a certain kind of detachment from the nation-state (cf. Sassen 2001: 312).

The evolution of global city networks has made Beaverstock & al. (2000) to challenge the Ptolemaic view of the nation-state mosaic. The writers demand a new metageography, which would treat city-regions as organic beings, to whom connections to other city-regions are more important than connections to the state itself. In the centre of this proposed paradigm shift is that societies should be seen as intercity networks. Adding to this view, if we forget politics and observe the Earth with the help of satellites, the only man-influenced things that we can see are the night-time lights of the cities (Beaverstock & al. 2000: 123, see also Gosgrove 1994: 278).

Geographer Peter J. Taylor (2004: 7) insists that the nation-state ideology has disturbed the natural interaction of cities. Without strict borders, cities and intercity networks could grow in an expected way, whereof the 12th century banking and courier networks and the Venetian galley routes are prime examples (Spufford 2002: 26, 398). Perhaps the most influential argument for the new processing of cities is placed by sociologist Manuel Castells (2000: 411), who states that we cannot deal with the functioning of the global cities only with regards to the top of their hierarchy. Hence, the global city is not a place, more so a process. Furthermore, Taylor (2004: 8) states that there is no such thing as a global city or then all cities are global (2004: 42). Cities are networks; individual cities have hinterlands but these are not sufficient enough to maintain an isolated city. Sociologist Immanuel Wallerstein (1979) has previously stated the majority of local and regional economic systems will assimilate and integrate into on single world economy, making at the same time the notion of national economy more intangible. But whether the world should be seen as flat (Friedman 2005) or spiky (Florida 2005) is a debate I leave now for other texts.

Contemporary globalisation is constructed on the skeleton of world city networks, of which Taylor (2004) offers an extensive and systematic analysis. Taylor analyses one hundred most influential global service firms located in 315 cities in the branches of accountancy, advertising, banking, insurance and law, and consulting and the way the selected cities are interacting via the service firms. Taylor (2004: 69, 99, 218–220) asserts that at the top of the list of global connectedness are London, New York, Hong Kong, Paris, and Tokyo. Hall (2001) also gives a fine example of the research of the hierarchies of global cities. The previous studies especially support the undisputed position of London, New York, Tokyo, and Paris at the top of the hierarchy (Taylor 2004: 60).

Despite the European Union's integration development, Europe still has many national centres, which considering their size, have more tasks than the big cities of larger countries. In addition, some of Europe's cities have clear traditional metonym-like functions and appellations, such as the Banking-Zürich and Art-Paris (Hall 2001: 64). Because of historical reasons the importance of these cities is overemphasized in a non-hierarchical way in relation to their population. Global cities outside Europe, when estimated according to their global service firms, are usually rich in population (cf. Beaverstock & al. 1999: 456, GaWC 2005). Still many international organizations and especially UN organizations locate mostly elsewhere than in the centres of world economy (Taylor 2004: 99). Still, the global city is not defined in its internal factors. Instead the connections to and the interaction with other bigger cities are important.

Making connections

Geographer Peter Gould (1991: 4) maintains that there is no geography without connections. Recently the mobilities turn has twisted our attention more to the direction of movement, in the circuits and pathways created by the need to move (Cresswell 2006, Urry 2007). Through these linkages places 'communicate' and determine their relation to each other. Today the longest air traffic route is flown from Singapore to Newark New Jersey; 15 344 kilometres along the great circle. Routes connecting cities of over 10 000 kilometres distance demand both special aircraft and a clear gravity relationship between global cities. One way to measure this gravity is to investigate the location of multinational corporation headquarters and R&D. Still the infrastructural gravity factors do not necessarily inform of the attractedness of the creative class. Richard Florida (2002) maintains that it is because of this creative class innovations develop and as a cause-and-effect technological development and economical growth move into so called 'sun belts' or socially liberal regions.

Nevertheless, acquiring a spot among the real global cities is tricky, with or without creative people. It is argued that there are just a few top-tier global cities, (Beaverstock & al. 1999: 456) however, many are on the verge of becoming a global city. This may tell a lot about capitalist monopolization (Hall 2001: 71), but it also illustrates the development of lower networks, where a city can be a centre of or belong to a network of certain culture and be in that context globally important (Hall 2001: 72).

Most often global cities themselves are so magnetic that they further the concentration of the communication technology structure (Graham & Marvin 2001: 317). The information and communication technologies are becoming ever more important, as are the immobile platforms that facilitate the face-to-face meetings of people themselves. Through international airports, city-regions gather international experts and are economically attainable. There is a clear commitment in the largest metropolises to airport infrastructure. For instance, runways longer than four kilometres indicate that the city-region is connected to the worldwide network and serves a very vast geographical area. In addition, the development of the hub-and-spoke –system and the concentration of airliners have made for example Kuala Lumpur and Frankfurt far more important in respect to global flows than the size of these cities would indicate. The forthcoming analysis has a few weaknesses that emerge from geographical variables, the nature of the cities and the organization of airports in larger cities. Nevertheless, scheduled flight connections are increasingly used to depict the world city networks (Rimmer 1998: 460, Derudder & al. 2007, Taylor & al. 2007). The methods and statistics used in these analyses have furthered in recent years, though the statistic quality and ephemeral nature of the data still skews the global city network (Hall 2001: 65).

Some researchers argue that the increase in attainability of different cities has made the world a smaller place (see McHale 1969). Although most of the rest of the world could be reached with a 17-hour continuous flight, it is only cities with airports of reasonable size that become more important. The network structure of globalization is especially visible at the local level in the placement of the multinational enterprises near international airports or in the new edge cities while the historical centre loses its proportional value (Garreau 1991, Hall 2001: 73–74).

Night-time lights as indicators of the modern city

The big cities of the world are alive even at night. Being distinct from the dark natural environment at night city-regions delineate themselves with lighting. At sunset the streetlights are lit and people lit their apartments in order to expand the natural rhythm of the day. Cities emit light into the atmosphere so much that most of mankind cannot see the Milky Way with their bare eyes and the night sky is vanishing (Cinzano & al. 2001: 689, Klinkenborg & Robinson 2008). But there are advances in light pollution too. In the 1970s Thomas Croft (1973: 376–377; 1978) suggested that satellites could be used to observe the city lights and other Visible Near Infra-Red, VNIR, sources. Roy Welch (1980: 8) added that through the differences of artificial lighting we could explain the relations between the population and built areas and the electricity consumption of cities.

The night-time lights data is collected by DMSP/OLS (Defence Meteorological Satellite Program / Operational Linescan System) satellites, which can detect even the faintest sources of visible and near infrared radiation (NOAA 2008). The satellites circle the globe 14 times in a day in a pole orbit and identify artificial sources of light in cloudless nights. In theory one OLS-sensor could structure a global night-time light image, but this is not always possible owing to the clouds (Elvidge & al. 1999: 78). The data available was collected during nine months in 2001 (ESRI 2004) and the detection times were approximately at 9 o'clock in the evening (Elvidge & al. 1999: 77–78). Furthermore, the data was collected in wavelengths between 0.51–0.86 μm, and then transmuted into RGB-form (cf. Lillesand & al. 2004: 86). Black and white values are formed by combining the values of the additional colours i.e. bands of red, green, and blue. The compiled night-time pictures show the lights of cities and towns, of factories and the traffic, and of big fishing ships and gas and forest fires (Elvidge & al. 2001: 82).

The DMSP has been producing digital pictures since 1992. But the application of the data into research has been fairly thin, although night-time lights can be seen as a sign of the centralization of human activities and of a modern society. The main reason for this has been the low resolution of the data, although advances are expected to take place in this field (Elvidge & al. 2007). Beaverstock & al. (2000: 123) discuss that the globality of the modern world is clearly seen in these pictures, where city lights delineate the shapes of the cities. Also Chase-Dunn and Jorgenson (2003) see that one can perceive the astonishing density of cities in most continents. Although the creation of the night-time lights data includes a multitude of problems, for example reducing the effect of the clouds and mapping of the forest fires and northern lights (Elvidge & al. 2001: 91), nevertheless it opens up many opportunities for applications. Elvidge & al. (1999: 86) portray that the lightness of cities is proportional to the consumption of electricity and to some extent to the population of the states in the United States. Geographer Paul Sutton (2003) has examined how urban sprawl can be explained using nigh-time lights data. Elvidge & al. (2001: 95–96) show that areas with high lightness values correlate well with gross domestic product and CO_2 emissions. There are also examples of analysing the interaction between societies and the natural environment with the help of night-time lights data (cf. Imhoff & al. 1997: 362, Elvidge & al. 2001: 97–98).

When reviewing the data worldwide, the accurate boundaries of cities do not necessarily go together with the city-regions indicated by OLS-sensors (Henderson & al. 2003: 607), because cities at the different levels of development use lighting in different ways. Therefore the lights tell more of the urbanization and development of urban areas than population density (NASA 2005). It is hard to define unequivocally whether studying the night-time lights of cities is a suitable way to illustrate the development of a city and city hierarchy, for many cities have metonymic, internationally important functions and clear infrastructural differences that one can not see comparing the night-time lights. It is also important to note that the exiguous use of lighting in a city-region can also be noted as development as it is at the same time surplus of electricity (cf. Isobe & al. 2001).

Reflections of global cities

Night-time lights- data can be used in order to delineate city-regions that have the highest lighting values and to compare the size of these regions. This raster data is formed of 5 * 5 km pixels that are valued from 0 to 255, the latter being the brightest value. The data is rather low in its resolution and the pixels burn out easily because of single light sources.

The data is compiled into WGS-84 coordinate system, which skews the latitudes of regions near the poles. Seong & al. (2002) argue that the best way to analyse a global raster data is to use a sinusoidal projection, where latitudes are of a natural length and the near polar values are not elongated. For this reason I reprojected the data into sinusoidal projection and in order to decrease data loss I reconfigured the cell size into 2.5 * 2.5 kilometres.

I defined the biggest cities by reclassifying the data so that the functional area of the cities is formed by those pixels that have values of over 229.5. In other words, the urban areas are formed by those pixels that are included in the most brightly lit tenth in the data. This threshold value is arbitrary, and there is no limit for urban areas (see Sutton 2003: 354). To figure out what the threshold would be, we would have to define what is urban in the first place. Further, the pixels that had a value of over 229.5 were used to create a vector shaped polygons.

I compared the city-regions by summing up the values of the pixels that fall inside the respective polygons. The areas of the city-regions are thus weighted with respect of the intensity of their night-time lights, and then given ordinal numbers for a rank analysis of the city-regions. Figure 1 illustrates the lighted city-regions in a part of Western Europe. The sinusoidal projection in the index map exemplifies the projection that distorts the shape of the world but presents the areas as equal-area. Altogether there were 13 212 regions that were formed from one or more pixels valued greater than 229.5. From among the cities that Taylor (2004) analysed only Monrovia, Kabul, and Sarajevo could not be detected.

I compared the values of the lighted areas with Taylor's list of world cities. The summed ordinal numbers of the lighted areas and world city regions (2004: 218–220) for the 40 most important city-regions are

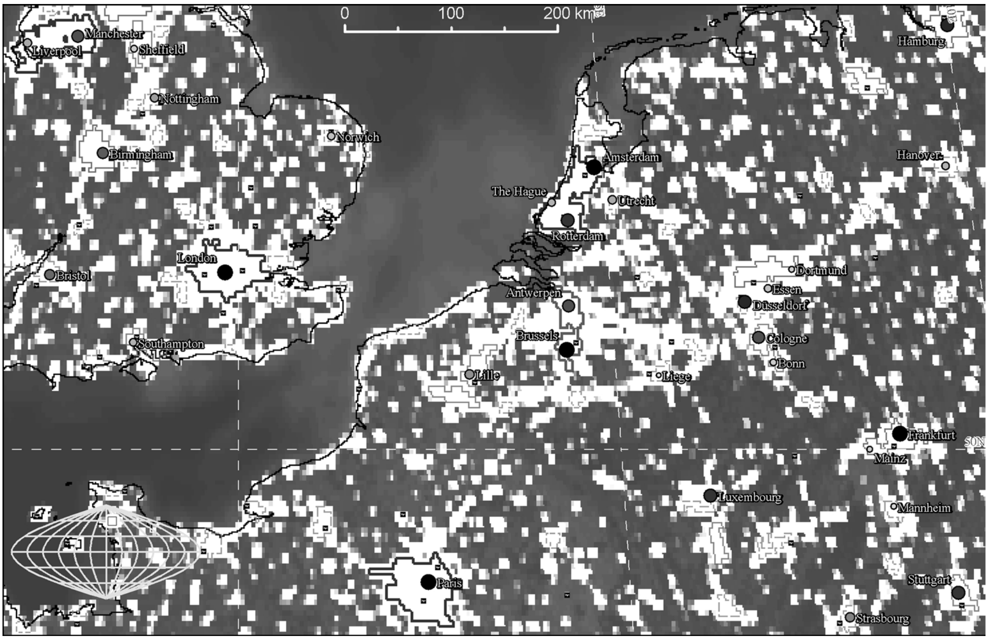

Figure 1. Some global city-regions in Western Europe. The larger and brighter the city-region is, the higher its rank is in Table 1. The bounded areas were formed by pixels that had values greater than 229.5 (scale 0–255). Rank in the global connectedness list is expressed by the size and darkness of the city marker. The map is in sinusoidal projection where the parallels are in actual length.

presented in Table 1. Some of the most important global service cities do not rank as high in the vastness and brightness of the city-region. It is notable, that many North American and Japanese cities, such as New York, San Francisco, Washington, D.C., and Tokyo form massive city-regions and they are melted into other large cities, such as Philadelphia, San Jose, Baltimore and Yokohama, respectively. In Table 1 these merged city-regions are represented as one entity, but the ranks of these cities global connectivity (Taylor 2004) are expressed separately for each city.

Many North-American cities use a lot of energy for lighting, but strong lighting clusters can also be found in the developing countries. The greater night-time brightness values, especially of the United States, can be explained by traffic infrastructure and by the number of private cars. The night-time lights tell about development and about the (sub)-urban way of life. Elvidge & al. (1999: 87) state that population density is calculated by the place of living and not according to workplace. There-

Table 1. Comparisons of global city-regions: (1) Taylor's (2004: 218–220) order of cities according to a location analysis of 100 global service enterprises, (2) the order of the night-time lighted city-regions, (3) the sum of the ranks, (4) the longest runway of the city-region (km).

World city-region	-1	-2	-3	-4	*World city-region*	-1	-2	-3	-4
New York–Philadelphia	2., 77.	1.	3	4,442	Bangkok	28.	38.	66	3,7
Tokyo – Yokohama – Kawasaki	5., 230., 303.	3.	8	4	Montreal	47.	20.	67	3,658
					Dallas	61.	8.	69	4,084
Chicago	7.	4.	11	3,962	Houston	62.	7.	69	3,658
Los Angeles	9.	2.	11	3,685	Sydney	13.	61.	74	3,962
Miami	25.	5.	30	3,962	Melbourne	24.	51.	75	3,657
San Francisco – San Jose – Palo Alto	17., 161., 171.	14.	31	3,618	Seoul	41.	40.	81	3,75
					Boston	60.	22.	82	3,073
Paris	4.	29.	33	4,125	Singapore	6.	82.	88	4
Washington, D.C.– Baltimore	37., 137.	9.	46	3,506	Rio de Janeiro	69.	24.	93	4
					Seattle	68.	26.	94	3,627
Toronto	10.	27.	37	3,68	Minneapolis	77.	18.	95	3,355
Mexico City	18.	21.	39	3,952	Detroit	85.	13.	98	3,659
Buenos Aires	23.	16.	39	3,3	Moscow	34.	71.	105	3,794
London	1.	39.	40	3,962	St. Louis	81.	25.	106	3,359
Atlanta	33.	11.	44	3,624	Barcelona	32.	78.	110	3,552
Taipei	20.	34.	54	3,66	Mumbai	21.	95.	116	3,445
Johannesburg–Pretoria	43., 240.	12.	55	4,418	New Delhi	52.	67.	119	3,81
Madrid	11.	46.	57	4,35	Vancouver	65.	55.	120	3,505
São Paolo	16.	45.	61	3,7	…				
Milan	8.	54.	62	3,92	Dublin	30.	269.	299	2,637
Hong Kong–Shenzhen	3., 200.	59.	62	3,8	Helsinki	70.	258.	328	3,44
Jakarta	22.	41.	63	3,66	Prague	29.	408.	437	3,715
Amsterdam – Rotterdam – The Hague	12., 75., 219.	52.	64	3,8	Zürich	19.	451.	470	3,7

fore, the lights do not inform of the spread of living, more so of the functionality of the city, that includes airports, industrial and commercial centres, lighted recreational sites and stadiums and sometimes spot lighted art pieces. For this reason it is premature to draw conclusions of the social problems inside cities on the basis of satellite pictures (cf. Sutton 2003: 368). In many European cities there is a subway system far more developed than in most of the North-American cities which lessens the need for lighting and traffic above the ground. Most of the old European cities or city centres have not been designed for automobility (Beckmann 2001). Thus the population density and value of land can hinder the spread of the night-time lights. Many of the North American cities do not rank highly in Taylor's hierarchy of global connectivity. The reason for this might partly be that New York, Chicago, and Los Angeles are so dominating that a non-U.S. company can be pleased with a foothold in one of these cities (Taylor 2004: 204). Another interesting point is the existence of small runways in cities that rank high in the night-time lights- list but have fewer global service firms. Examples for this are Cleveland, Nagoya, Newcastle, and Buffalo.

Reflections on the connections between global cities

The night-time lights image collages can be seen as a way to illustrate urbanization and the extent of the development of the city infrastructure. In this section I try to investigate whether the night-time lights values and the average distance to destinations from a main airport of a city have a correlation through a sample of 31 European and Asia-Pacific airports. One thing that has a high influences on this pattern is the infrastructure of the airfield. For example Horonjeff and McKelvey (1993) state that the size of the runway is a clear indicator of how the airport, and at the same time the city, is able to serve larger aircrafts and the traffic flow between cities. For example Boeing 747 and Airbus 340 require over three kilometres of takeoff run at MTOW. Although many other things influence the functionality of an international airport (Faulks 1999: 75), I used the acreage of the main runway as a measure of the airport's ability to handle larger and long haul aircrafts.

Figure 2 illustrates how the night-time lights of the selected cities within a 30 radius and the acreage of the main runway correlate with the mean distance to the airport's scheduled destinations. The mean distance of destinations here is calculated by the connections the particular airports had in the first two weeks of July 2005 (OAG 2005). Altogether the data I gathered include over 2 800 scheduled routes. The estimation figure must be understood as tentative because the night-time lights values were calculated in nine months in 2001 and the runway sizes and the

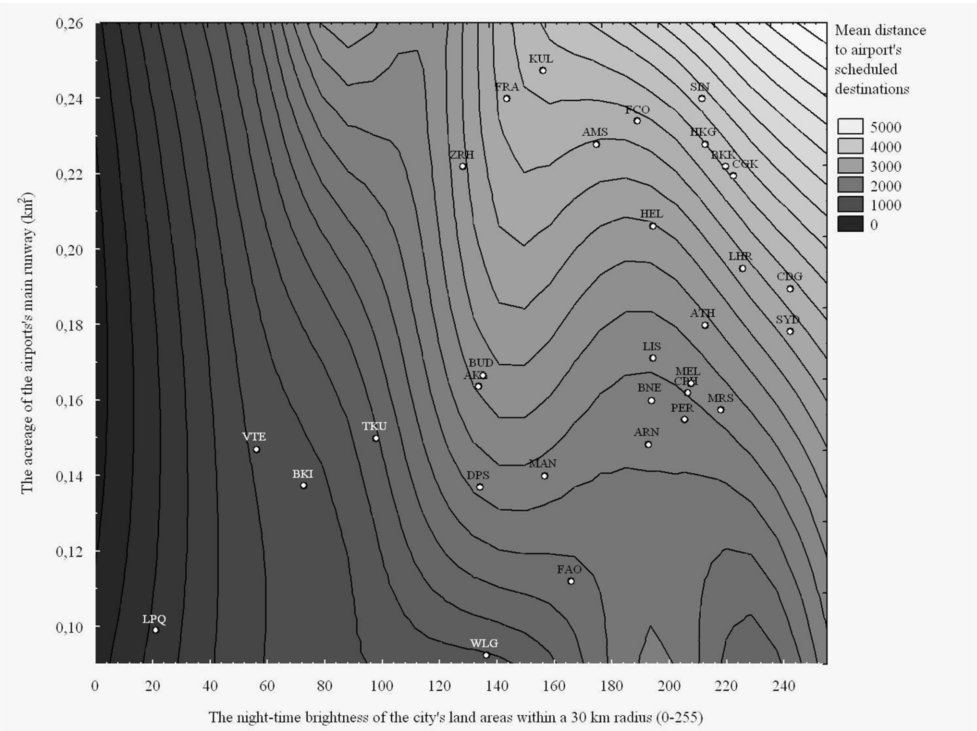

Figure 2. The estimation of the mean distance of the scheduled destinations from an international airport by the intensity of night-time brightness of a city (r=30 km) over land areas and the acreage of the main runway. The correlation coefficients between the mean distance and brightness were 0.450 and 0.633 between the mean flight distance and the main runway acreage. The IATA-codes for the international airports (and the represented cities) are AKL (Auckland), AMS (Amsterdam), ARN (Stockholm), ATH (Athens), BKI (Kota Kinabalu), BKK (Bangkok), BNE (Brisbane), BUD (Budapest), CDG (Paris), CKG (Jakarta), CPH (Copenhagen), DPS (Denpasar), FAO (Faro), FCO (Rome), FRA (Frankfurt), HEL (Helsinki), HKG (Hong Kong), KUL (Kuala Lumpur), LHR (London), LIS (Lisbon), LPQ (Luang Prabang), MAN (Manchester), MEL (Melbourne), MRS (Marseilles), PER (Perth), SIN (Singapore), SYD (Sydney), TKU (Turku), VTE (Vientiane), WLG (Wellington), and ZRH (Zürich).

scheduled flights, along the great circle, were gathered in 2005.

I examined the city lighting first by determining the centre of the selected cities and then constructing a 30-kilometre radius for the city. Both of these definitions are arbitrary: the centre of the city and the choice of the radius. But I would argue that by defining the centre by coherent means and using the same radii make the cities comparable. In addition, the areas occupied by the sea were separated from the spheres of the cities with the help of a 1*1 km world elevation dataset, where the sea pixels have no data. It could be argued that the seas are not areas of permanent infrastructures, though the harbours too belong to the functional area of the city. Elvidge & al. (2001: 94) note that the city lights reflected from the water distract the overall lighting. Moreover the dark seas, except for the fishing fleets (see Klinkenborg & Robinson 2008: 110–111), are not primary spaces for human living.

In Figure 2, a non-stiffened Spline contour model, the correlation between the intensity of the lighting and the mean distance to destinations is 0.450 and between the acreage of the main runway and the mean distance is 0.633. Both correlations are statistically significant when $p<0.05$. The multiple regression, R, of the selected features over the independent variable is 0.786. The standard error of this estimation is 713 kilometres.

We must notice that some cities get rather similar lighting and runway values, for example Auckland and Budapest, but the destinations of the cities are at different distances. The figure is influenced by the geographical location, primarily by how close other cities are, but also by the commanding status of the city. For example Turku Airport is fairly regional as Stockholm Arlanda and Helsinki-Vantaa Airports compete for the longer haul flights. In addition, the estimation is prone to the city's 'resortness'. For this reason Faro Algarve and Denpasar Bali Airports have more distant destinations than the city size or airport infrastructure would imply.

Discussion

The hierarchy of the global cities is an endless struggle between cities. As the neoliberal doctrine removes barriers from the global economy, the majority of the economic growth is seen as the expansion of cities and in the development of intra- and intercity mobility structures. Sassen (2001) has argued the global cities are reminiscent more of each other than of the countries in which they are located. To some extent this evolution is also visible at international airports. The information and communications technology and night-time lights have changed profoundly our perception of time (Cairncross 2001: 5, Klinkenborg & Robinson 2008). Still, the world has by no means got smaller.

The connections between places can make them more similar. Whether we call this network diffusion, globalization, or the spatial fix our experience of place and the world we live in reflects this interconnectedness. Figure 2 gives an indication on how the brightest city-regions also prefigure the extent of the city's connections. It is also evident that when the global economy connects cities despite the distance, the functional extent and the capability of the international airport to handle both passengers and cargo are signs of global urbanization. Nevertheless, there are different views on to which direction this hierarchy is taking. Today's two biggest aircraft manufacturers, Boeing and Airbus, count on totally different strategies on new aircraft development and on the development of intercity aircraft demand (Airliner World 2004: 45–49, King 2007). For Boeing the future air traffic demand is structured according to the point-to-point model. The new 787 Dreamliner fleet, carrying 210–290 passengers also tries to answer the efficiency call of carriers by reducing consumption with 20 per cent. On the other hand, Airbus reasons the development of the A380 model with the dominance of the hub-and-spoke system. A380 enables flights of 525–960 passengers, and it promises to dismantle the congestions between global airports, and at the same time promising fewer emissions per passenger kilometre. It is clear that neither of these aircraft manufacturers want to give up a niche in the wide-body market, but the struggle also exemplifies the paradox of globalization. On the one hand the world seems to be a smaller place as the connections between different cities increase, but on the other the status of the large hubs and global cities grows stronger (Hargittai & Centeno 2001: 1545, cf. Martin 2004: 148–149).

The largest global cities will maintain their status at the top at the hierarchy if there is movement between these cities (ACI 2004: 13). In the future it will be more central how smaller cities that have global city-like characteristics construct links to other cities (Beaverstock & al. 1999: 456). One sign of the dismantling of the hierarchy of air traffic is the low cost carriers operating between secondary airports that have more free slots to manage and do not collect as high airport taxes. I would state that in the global economy the importance of air traffic will be emphasized even more.

The night-time lights data is a proper measure of the spread of urban, somewhat unsparing lifestyle and of the need of being in contact with a wider geographical region. But its use has a few weaknesses. And maybe the most problematic of these is the different use of lighting. The lavish use in Las Vegas cannot be compared to the energy saving practices in some developing countries. Nevertheless, the night-time lights define the border between cityscapes and natural or rural landscapes and are at the same time a sign of belonging to a broader network.

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