Chapter 8
Assessing the Impacts of the Global Financial Crisis on Major and Minor Cities in South and Southeast Asia: A Hyperlink Analysis

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Abstract We used the number of volume of hyperlinks, that is, electronic data from Google, for 19 large cities in South and Southeast Asia to demonstrate their national (in the case of India), regional, and extraregional linkages. The results can be used to illustrate the degree of intraregional and interregional flows of information about the global financial crisis between major and minor cities within South and Southeast Asia and other major global economic powers. Singapore, without doubt, is the major city in these regions. Kuala Lumpur, Bangalore, Bangkok, Delhi, and Mumbai are in a second category; Lahore, Karachi, Kolkata, and Dhaka are in yet another category. Indian cities exhibit strong national linkages. The accompanying tables, maps, and graphs illustrate the vast contrasts between cities in these two regions.

Keywords Global financial crisis • Hyperlink analysis • Regional linkages

8.1 Introduction: Daunting Challenges

The visual and print media, government analysts, and financial institutions have reminded us frequently in the past 2 years that the current financial slowdown or crisis has far-reaching effects on the lives of individuals and businesses and

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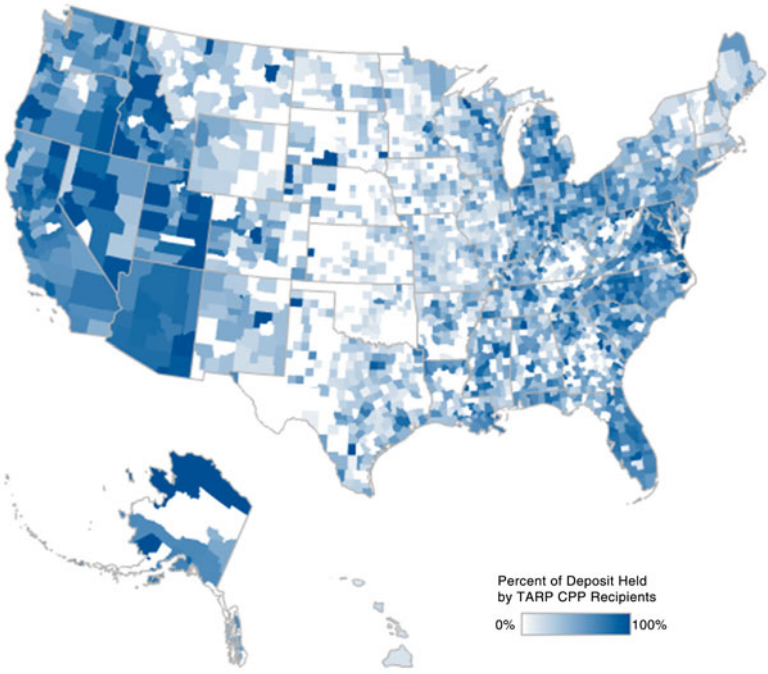

Fig. 8.1 Percent of deposit held by TARP CCP recipients (From subsidyscope.com)

organizations in urban and rural areas. They have also reported, with human interest stories, about high unemployment, homeless populations, and closed factories, in the world's largest cities as well as in small towns and rural areas (Fig. 8.1). Few countries and regions on the planet have escaped the financial crises that appear frequently in national and international newspaper and television reporting. Aside from the reporting by journalists and governments, scholars in the various social and policy sciences are beginning to examine the multiple causes of the crisis and the associated impacts on governments, financial institutions, businesses, and individuals (Derudder et al. 2009; Lee et al. 2009). Studying these impacts at national, regional, and international scales would seem to be required, even though timely, quality, and accurate data for local or global investigations are often not available for in-depth analyses. This dilemma surfaces when scholars realize that there are no comparable international databases available at national or subnational levels tracking the flow of money and credit around the world, and also there are no comparable databases measuring the impacts of economic slowdowns or downturns. The result is that scholars seeking to understand the scale and impacts of the current global financial crisis must consider surrogate databases. Unemployment levels, business closures, suspended and abandoned construction projects (ghost developments and subdivisions), factory layoffs, and reduced spending on human goods and services are data that one might consider, but often these data are not available for

comparable local and regional analyses or are not reported at regular intervals (monthly or quarterly) to make meaningful timeline projections.

For the past year we have been trying to tackle the challenges facing social and policy scientists who seek to provide some understanding of the global dimensions of the current financial crisis or economic slowdown or recession (Devriendt et al. 2009, 2011; Brunn et al. 2010; Boulton et al. 2011). Although we are aware that there are a number of criteria one might use to measure the global and regional impacts of the financial crisis, one database that would be especially useful would be the global transfer of monies or credit from one city to another city. Such an intricate and international linkage analysis would be desirable, but, unfortunately, such data are not available on global, regional, and national scales. A second possibility would be to collect and analyze data on downturns in productivity (manufacturing, construction, and service economies) or reductions in labor force (unemployment figures in various sectors). A third desirable source would be the number of workers who have applied for unemployment benefits or those individuals or firms that have applied for bankruptcy or foreclosed on agreements. These data, however, as those just mentioned, are difficult to obtain, in large part because they are not available or because there are no centralized national or regional governmental organizations and offices that collect them. Even if such data were available on any of these financial transactions, economic sectors, or employment categories, there would likely not be comparable data that would permit meaningful and significant analyses.

In absence of any readily available international database on the global financial crises, we make use in this chapter of an alternative database that we think provides a useful perspective on the current conditions, that is, the *global* and *real-time* intercity links represented by the World Wide Web. A core characteristic of the current Information Age is the unprecedented volume of and access to information, with the Web being the most prominent and obvious example. These literally hundreds of billions of digital information "pages" represent a huge and thus far underutilized source of data on the characteristics of and relationships between places (Devriendt et al. 2009). The chapter is organized as follows. The first part is based on our previous work wherein we briefly introduce the arguments for using the World Wide Web as an alternative source of real-time urban rankings on the current financial crisis at global and regional scales. In the second part, we present an in-depth empirical analysis focused on the South and Southeast Asia region to better understand the impact of the *global* financial crisis at the *regional* scale. Third, we provide an overview and discussion of the results, and conclude by suggesting some avenues for further research.

8.2 Use of a Hyperlink Web Database in Global Urban Studies

With the increasing importance of the Web for an ever-broader spectrum of human activities, we can expect that the structure of and information in this space will reflect more and more the existing ("offline") relationships between people, cities,

institutions, and so forth (Hillis 1998; Barnett et al. 2001; Barnett and Park 2005; Zook and Graham 2007; Park and Thelwall 2008). Furthermore, what is desirable and urgently required in urban studies, particularly in times of global crises, are up-to-date and real-time measures of information *about* cities and informational flows *between* cities (Castells 1996, 2001; Crutcher and Zook 2009). The key point here is that currently we *have* access to unprecedented volumes of relevant information: the WWW being the most prominent and obvious example, which, with the rise of new ICTs (information and communication technologies), is a vast and valuable information source for monitoring changes in urban relationships as well as for a quantitative estimate of business salience (Brunn and Dodge 2001; Zook 2005, 2008; Devriendt 2010).

The potential for using Web information in looking at global and regional flows between places has been explored previously (Kellerman 2002; Dodge and Zook 2009). For instance, Heimeriks and Van den Besselaar (2006) draw on hyperlinks between research websites to study the international connections of scientific research. They analyze hyperlink networks on the scientific web to study the development of research fields, and the relationship between research organizations and the relevant institutions in their environments. We used the Google search engine—Google fast became and stands as the de facto standard search engine (Marketshare.hitslink.com 2009; GlobalStats 2009)—to develop a global hyperlink database for urban network analyses.

At the most basic level, entering the name of a city in the Google search engine provides the number of indexed web pages related to that city. The volumes of information links on the World Wide Web are a useful barometer for comparative urban linkages because they represent electronic pieces of information that are most useful in examining knowledge economies in a global perspective. In short, a hyperlink analysis has two advantages over other databases that might be used to consider global financial flows: first, they provide timely information *about* cities and regions and, second, they can be used to measure and map the relationships *between* and among cities and between and among regions.

To obtain data on the economic situation for each city, we entered not only the name of the city, as researchers have done in previous Web-based analyses (Brunn 2003; Devriendt et al. 2008), but combined with some key phrases (here, "economic slowdown" and "global financial crisis"). These key phrases are essential in producing economics-related search results but are also helpful in limiting the "unwanted"/irrelevant search results of intercity relationships. This result is what we previously called the "Paris Hilton" effect: searching for the word "Paris," without any additional keywords, returns (many) Paris Hilton-, rather than Paris, France-, related results.[1] Searching, for example, for the number of (Google) Web pages that jointly mention "London" and "economic slowdown" resulted in 364,000 entries about this word combination. We developed in this way an *international* database wherein we

[1] Other potential "problems" with the present hyperlink analysis such as word order, temporality, and language are largely discussed by Devriendt et al. (2009).

ranked 100 major cities globally through this quantitative hyperlink analysis (this list is based on the top 100 cities in population as provided by Demographia 2009).

We began our inquiry not knowing what we would uncover or discover about the geographies of information related to the current financial situation. What we learned from these qualitative and quantitative analyses (see also Devriendt et al. 2009, 2011; Boulton et al. 2011) are several significant findings: (1) the extent of the current financial crisis is indeed global and international, in that it impacts major cities in all major world regions; (2) global interdependency is well illustrated in the volume and flow data that emerge; (3) the financial picture is much more complex than one might imagine, in that the financial crisis is not limited to only the largest financial markets (New York, London, and Tokyo), but also large regional centers in South America, South Asia, Southeast Asia, and elsewhere; and (4) the linkages of the 100 largest cities with all others is not what one might predict or suspect, in that those linkages reveal a much more complex set of urban and financial networks than might be predicted. It is in this fourth observation that we began to observe that the largest cities in North Africa and Southwest Asia are not all linked to Europe and North America or that those in Latin America are mostly linked to large US and Canadian cities. Our graphical and cartographical analyses depict this complex network of global, regional, and subregional financial networks.

8.3 Empirical Regional Analyses of the Financial Crises

A useful, productive, and logical next step in any examination (descriptive or quantitative or cartographic) analysis of the urban financial linkages by geographers, economists and other to date is to extend hyperlink analyses of the financial crisis to consider the situation of developing world regions. One would expect that the impacts would be different in North American and European cities than those in Latin America, Sub-Saharan Africa, or South Asia. This empirical analysis is an attempt to fill this gap in our knowledge base. We focus on the networks and impacts of the financial crisis on major cities, capital cities, and major regional centers in South and Southeast Asia. Because we are interested in the South(east) Asian region, we examined web data for all the 19 cities in South and Southeast Asia from the Demographia list: the selected cities are Jakarta (ranked 2nd), Manila (5th), Mumbai (9th), Delhi (11th), Kolkata (15th), Karachi (24th), Bangkok (28th), Chennai (38th), Lahore (39th), Ho Chi Minh City (40th), Dhaka (41st), Hyderabad (43rd), Bangalore (44th), Kuala Lumpur (50th), Ahmadabad (56th), Singapore (63rd), Yangon (69th), Pune (71st), and Bandung (94th).[2]

Using the same search requests (cities and phrases, as already mentioned), we further calculated (a) the number of linkages each city in our database had to all

[2] Although other South and Southeast Asian cities such as Kathmandu, Thimpu, Vientienne, Phnom Penh, and Bandar Seri Bagawan are worthy to examine, we based our selection of cities on the top 100 Demographia list (in terms of population). In further research, we will enlarge this list.

other world cities in the top 100 in the world (that is, the number of web pages jointly referencing pairs of cities); (b) the number of linkages each had to all the other cities in South and Southeast Asia; and (c) the volume of linkages to cities in their respective regions compared to those outside the region. Because the number of hyperlinks for the "economic slowdown" and "global financial crisis"—our two financial crisis search terms—were similar for most cities (Pearson's r is 0.96 for the top 100 cities), we divided the total number by 2 to obtain a Global Financial Score (GFS). The GFS measure is used in the following analyses. We also considered it important to examine the GFS per capita, so we calculated the GFS per capita (per 100,000 inhabitants). These Google searches were conducted on 23 February 2010. Among the major questions we seek to answer are the following:

1. Which cities have the most and fewest total references to the current financial crisis?
2. How do the leading cities in these regions compare to other major world population centers?
3. Are there one or two or three cities in South and Southeast Asia that dominate? If so, what is the degree of their domination?
4. Is there any clear hierarchy of connected cities in these regions, that is, those that are strongly connected and those with only few linkages?
5. Do capital cities emerge as major centers of regional and global connection or are some capitals more connected than others?
6. Which cities are most connected to all others and are there any differences between most linked cities in South and Southeast Asia?
7. Are there cities that are more regionally oriented (that is, South Asian cities to other South Asian cities) and others that are more extraregional or international in orientation?

Answers to these questions will help us place the global and regional financial crises of South and Southeast Asian cities in a better perspective. Without such analyses we will not be sure of the scale and dimensions of financial problems in these regions nor of their regional and international linkages.

8.4 South and Southeast Asian Cities in Global Perspective

In terms of the GFS (Global Financial Score) for the 19 cities, there were major differences (Table 8.1, Fig. 8.2). Singapore's hyperlink total was 287,000, which was more than twice the totals for the second (Delhi, 124,000), third (Mumbai, 115,000), and fourth (Kuala Lumpur, 100,000). Farther down the list from these three were Bangkok, Manila, Bangalore, and Jakarta. And much farther down the list, with few references to the categories of economic slowdown and global financial crises, were Karachi, Ho Chi Minh City, Lahore, Yangon, and Bandung. A ranking of the GFS per capita entries was somewhat similar to the total GFS with Singapore, Kuala Lumpur, Bangalore, and Bangkok having the highest figures and Karachi, Kolkata, Lahore,

Table 8.1 GFS (per capita) for 19 largest South and Southeast Asian cities

City	Country	Region	GFS	GFS per capita (per 100,000 inhabitants)
Singapore	Singapore	Southeast Asia	287,000	7,175
Kuala Lumpur	Malaysia	Southeast Asia	100,200	1,965
Bangalore	India	South Asia	61,200	1,073
Bangkok	Thailand	Southeast Asia	84,600	1,058
Delhi	India	South Asia	124,000	813
Pune	India	South Asia	29,400	783
Hyderabad	India	South Asia	42,600	744
Chennai	India	South Asia	46,900	730
Mumbai	India	South Asia	115,500	679
Manila	Philippines	Southeast Asia	81,750	427
Ahmadabad	India	South Asia	15,600	345
Jakarta	Indonesia	Southeast Asia	59,850	291
Dhaka	Bangladesh	South Asia	15,315	255
Ho Chi Minh City	Viet Nam	Southeast Asia	14,750	236
Yangon	Myanmar	Southeast Asia	8,895	228
Karachi	Pakistan	South Asia	18,750	216
Kolkata	India	South Asia	26,900	204
Lahore	Pakistan	South Asia	11,595	184
Bandung	Indonesia	Southeast Asia	3,775	126

GFS stands for Global Financial Score

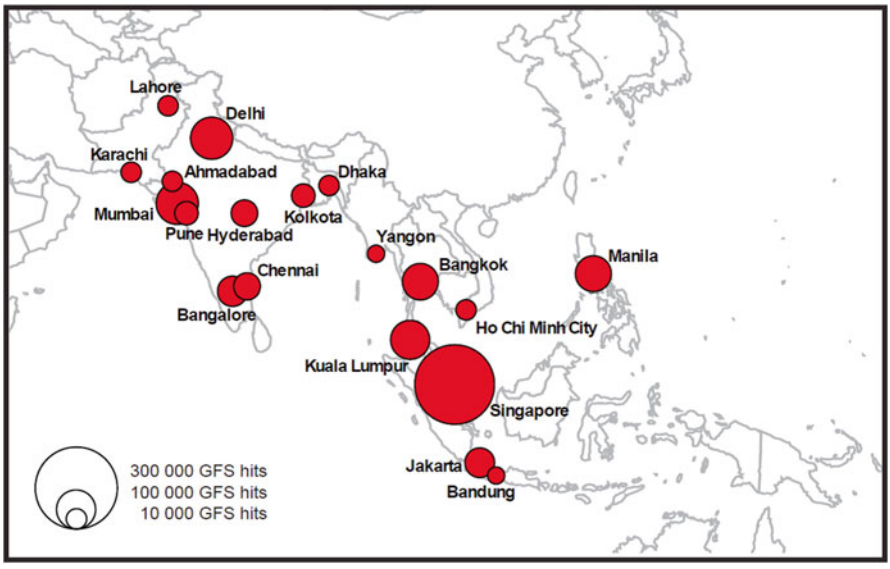

Fig. 8.2 Global Financial Score (GFS) for 19 largest South and Southeast Asian cities

Table 8.2 Global GFS relationships

City	Country	Region	Global GFS relationship
Singapore	Singapore	Southeast Asia	3,856,104
Jakarta	Indonesia	Southeast Asia	2,713,236
Bangkok	Thailand	Southeast Asia	2,119,465
Manila	Philippines	Southeast Asia	1,911,618
Bangalore	India	South Asia	1,717,622
Chennai	India	South Asia	1,481,876
Hyderabad	India	South Asia	1,386,191
Delhi	India	South Asia	1,195,462
Mumbai	India	South Asia	1,107,050
Kuala Lumpur	Malaysia	Southeast Asia	632,939
Ho Chi Minh City	Viet Nam	Southeast Asia	589,097
Yangon	Myanmar	Southeast Asia	573,584
Karachi	Pakistan	South Asia	549,470
Dhaka	Bangladesh	South Asia	433,076
Pune	India	South Asia	351,874
Lahore	Pakistan	South Asia	337,257
Bandung	Indonesia	Southeast Asia	237,821
Ahmadabad	India	South Asia	207,649
Kolkata	India	South Asia	189,051

and Bandung the lowest. What becomes apparent in even a cursory examination of Table 8.1 is that there are cities in both South and Southeast Asian regions that are clearly at the top or bottom of this ranking. It is also worth noting at this juncture that there is no straightforward relationship between the amount of information on the web about a given city (such as its GFS) and Internet access in that city. The hyperlinked data that we are using represents the information available about the global financial crisis in each city and not necessarily the amount of information on the web produced or consumed within each city. This subtle, but important, point is worth keeping in mind in our following discussions of city hyperlinks.

Another perspective on the international linkages is obtained by looking at the number of linkages (hyperlinks) between each of the 19 cities and all others within the top 100 major world cities. That is, how many web pages reference the South or Southeast Asian city under consideration jointly with another major city and the global financial crisis? A high number would indicate a degree of similarity or connection between the economic situations of two cities, whereas a low number might indicate there are fewer such connections. We can treat the ensuing number as describing a global GFS relationship (see Table 8.2). In terms of this measure, again Singapore emerged as the clear leader with 3.8 million total hyperlinks referencing it jointly with major world cities and nearly 50 % more than Jakarta, the second leading city with 2.7 million hyperlinks. Bangkok and Manila had more than 1.9 million each, and Bangalore, Chennai, Hyderabad, Delhi, and Mumbai had more than 1 million each. At the other end of the continuum are some surprises: Lahore

Table 8.3 Number of hyperlinks in own regions in comparison to global (regional + global) number of hyperlinks

City	Country	Region	RH	GH	RH/GH (%)
Kolkata	India	South Asia	134,480	323,531	42
Ahmadabad	India	South Asia	94,484	302,133	31
Pune	India	South Asia	148,684	500,558	30
Kuala Lumpur	Malaysia	Southeast Asia	188,508	821,446	23
Mumbai	India	South Asia	320,714	1,427,763	22
Delhi	India	South Asia	282,596	1,478,058	19
Lahore	Pakistan	South Asia	66,582	403,839	16
Dhaka	Bangladesh	South Asia	82,130	515,206	16
Hyderabad	India	South Asia	242,227	1,628,417	15
Chennai	India	South Asia	246,362	1,728,238	14
Karachi	Pakistan	South Asia	87,872	637,341	14
Bangalore	India	South Asia	252,359	1,969,981	13
Singapore	Singapore	Southeast Asia	491,210	4,347,314	11
Yangon	Myanmar	Southeast Asia	68,729	642,313	11
Bangkok	Thailand	Southeast Asia	250,623	2,370,087	11
Manila	Philippines	Southeast Asia	206,517	2,118,135	10
Jakarta	Indonesia	Southeast Asia	251,858	2,965,094	8
Ho Chi Minh City	Viet Nam	Southeast Asia	40,820	629,917	6
Bandung	Indonesia	Southeast Asia	14,257	252,078	6

(16th) and Kolkata (19th). Southeast Asian cities were more connected to the world's largest cities than those in South Asia. Three of the four South Asian cities with the fewest hyperlinks were in India. The Indian cities with the most connections were Bangalore, an "Indian Silicon Valley" city, followed by Chennai, Hyderabad, and Delhi, the Indian capital. Kolkata, as just noted, was in last place among Indian cities in connections to other world cities; it had fewer than half of Dhaka's total.

8.5 Regional and Extraregional Linkages

A different perspective on regional and global linkages is obtained by comparing the Global Hyperlink (GH) value with Regional Hyperlink (RH) value (Table 8.3). GH is defined as the number of relational hyperlinks to all (global and South and Southeast Asian cities), where RH is the number of hyperlinks between a city and others in its own region. The ratio RH/GH is a comparison of a city's regional total to its global number. A high value would indicate strong regional connections, and a low percentage a city with relatively few regional ties (hyperlinks).

The cities with the highest GH, not surprisingly from what we have already discussed, are Singapore (4.3 million), Jakarta (2.9 million), Bangkok (2.4 million),

and Manila (2.1 million). The lowest GH cities are Lahore (403,000), Kolkata (323,000), Ahmadabad (302,000), and Bandung (252,000). A ranking of the cities with the highest RH would be similar for both the top and bottom cities.

The calculated ratios illustrate striking differences among the 19 cities in these ten countries. First, Indian cities are those with the highest RH/GH ratios: Kolkata (42 %), Ahmadabad (30 %), and Pune (31 %). These percentages indicate the strong regional connection of Indian cities; Bangalore's RH/GH was 13 %, which indicated a lower regional connection and more international linkages. Second, the cities with the lowest RH/GH ratio (and thus the most international ties as a proportion of total hyperlinks) were Jakarta (8 %), Ho Chi Minh City (6 %), and Bandung (6 %). Third, Southeast Asian cities tended to be more "international" than those in South Asia. Fourth, Indian cities were less international than those in Southeast Asia, and fifth, most capital cities in Southeast Asia had RH/GH ratios in the 6–11 % range (Bangkok, Manila, Singapore, and Yangon).

8.6 Global Linkages for Selected Cities

Five cities illustrate the volume and extent of the GFS linkages. These data derive from the data collected on the number of linkages of each of the 19 cities to the world's other 100 largest cities. In this analysis it should not be surprising that many of the largest population cities in the world are identified and ranked as those they are most connected; they also are the most connected cities when we control for population or use hyperlinks per capita. For this part of the analysis we selected only five cities (Singapore, Jakarta, Bangkok, Manila, and Bangalore). These five are among the major cities connected to other world cities, and the five are also important economic centers in South and Southeast Asia (see Table 8.4).

The city most linked to these five cities is Hong Kong, with nearly 562,000 hyperlinks. This financial and economic center in East Asia, not surprisingly, has major financial linkages for investments and loans, throughout Southeast Asia especially. Hong Kong was the world city with the most links to Singapore; it was Jakarta's second, Bangkok's third, Manila's fourth, and Bangalore's fifth most-linked city of all 100 cities. London was the world city with the second most connections to these five cities (552,000). For Jakarta and Bangkok it was their second leading city; for Bangalore and Singapore, it was the third. This European financial capital retains strong linkages to major banks and investment houses in South and Southeast Asia. The third leading city with the most connections to these five cities was New York (551,000); it was the leading city with connections to Bangkok and the second most connected city with Singapore and Manila.

Following Hong Kong, London, and Paris was New York, which ranked in the top five in connections with all five cities. Next were Beijing and Shanghai, with Beijing having more connections to these five cities than with Shanghai. Tokyo's linkages were seventh with Singapore, Jakarta, and Manila, ninth with Bangkok, and twelfth with Bangalore. The only other cities in the top 100 in population that

Table 8.4 'Global' GFS relationships of Singapore, Jakarta, Bangkok, Manila, and Bangalore

Singapore		Jakarta		Bangkok		Manila		Bangalore	
Hong Kong	269,000	Hong Kong	117,000	New York	80,900	Kinshasa	79,800	Paris	76,800
New York	232,000	London	113,550	London	78,250	New York	68,350	Shanghai	72,390
London	231,000	New York	110,500	Hong Kong	73,500	Sydney	65,200	London	69,400
Beijing	145,400	Kinshasa	106,720	Beijing	66,150	London	60,150	New York	59,800
Paris	138,900	Sydney	87,650	Paris	62,200	Hong Kong	56,650	Beijing	46,550
Shanghai	126,200	Beijing	85,450	Berlin	60,950	Beijing	52,150	Hong Kong	46,000
Tokyo	124,600	Tokyo	84,200	Tokyo	58,000	Berlin	50,950	Chicago	43,070
Chicago	107,800	Paris	78,350	Shanghai	53,250	Paris	491,100	Boston	40,520
Sydney	100,800	Shanghai	73,600	Chicago	52,300	Tokyo	47,200	Guangzhou	39,700
Boston	87,800	Montreal	69,155	Sydney	50,600	Shanghai	44,200	San Francisco	38,710
Los Angeles	86,000	Chicago	61,700	Seoul	49,500	Seoul	43,450	Los Angeles	38,700
Washington, DC	80,600	Moscow	58,350	Boston	48,250	Moscow	40,150	Tokyo	38,520
San Francisco	80,500	San Francisco	56,700	Moscow	47,750	Chicago	40,050	Berlin	37,830
Berlin	74,800	Berlin	55,850	Los Angeles	47,350	San Francisco	39,150	Atlanta	36,460
Moscow	74,600	Sepoul	55,250	San Francisco	46,650	Los Angeles	38,900	Toronto	36,060
Toronto	70,900	Los Angeles	54,950	Kinshasa	42,290	Boston	37,650	Sydney	35,980
Seoul	70,200	Boston	53,200	Toronto	42,205	Toronto	37,295	Detroit	35,360
Houston	62,800	Toronto	461,140	Atlanta	41,800	Houston	36,905	Philadelphia	35,170
Atlanta	61,200	Mexico City	45,180	Houston	4,113	Hanoi	36,600	Moscow	35,075
Philadelphia	60,700	Houston	44,770	Cairo	40,330	Taipei	35,200	Houston	34,990

were ranked in the top 20 for all five cities were Sydney, Chicago, Berlin, Boston, Los Angeles, San Francisco, Moscow, Toronto, and Houston; each of these, except for Sydney and Chicago, had a total number of hyperlinks fewer than half those for Hong Kong, London, Paris, and New York.

There were some cities that had strong linkages with other individual cities for which the possible reasons were difficult to discern. Examples of these linkages include Houston as Singapore's 18th most linked city, Mexico City as Jakarta's 16th, Kinshasa as Bangkok's 16th, Hanoi as Manila's 19th, Milan as Jakarta's 16th, and Kinshasa as Bangkok's 15th. Kinshasa was 1st for Manila, Hanoi was 19th for Manila, and Guangzhou was 9th for Bangalore.

Of these five South and Southeast Asian cities, the most linkages with other large cities are with those in North America especially; East Asian cities were second in terms of links, and European cities were a distant third.

8.7 Regional Linkages for Selected Cities

We explored the linkages that another five cities have with the other cities in South and Southeast Asia considered in this study. These cities were Singapore, Mumbai, Delhi, Bangalore, and Chennai (see Table 8.5). We have already noted the strong regional networks of Indian cities, and we wanted to observe the extent of their financial ties to other cities in both South Asian and Southeast Asian regions. Of these five Indian cities, the city that had the most linkages with the other 18 cities was Mumbai; it had nearly 321,000 hyperlinks or 20 % of the total for all cities' linkages. Next were Delhi with 8.8 % (282,000 hyperlinks) or 18 %, followed by Bangalore (252,000) (8.5 %). Manila, Kuala Lumpur, and Bangkok had between 8 % and 10 %; all others were less than 4 % each. The South and Southeast Asian cities with the fewest hyperlinks related to global financial crises were Lahore and Ho Chi Minh City with less than 2 %; Bandung, the city with fewest linkages, had only 5,700 or 0.3 % of the regional total.

The city pair with the most hyperlinks (nearly 108,000) is Singapore and Kuala Lumpur; second is Singapore and Manila (nearly 76,000); and next are Delhi and Mumbai with 66,000 hyperlinks. These cities are the most linked in the region in regard to issues about the global financial crisis. Many of the capital cities in South and Southeast Asia have fewer than 10,000 hyperlinks to one or more of the five cities. Some cities have fewer than 5,000 links to one or more of the cities; examples of these include Dhaka and Ho Chi Minh City. Bandung has the fewest linkages of any city in this study, fewer than 1,000 with Mumbai and Bangalore.

We illustrate the extent and geographic networking of these 5 cities through a series of "clockograms" (Fig. 8.3a–e for the 5 cities)., which can be read by comparing the names of the leading cities and the ranking of the 18 cities in the volume of linkages. For example, Singapore's clockogram clearly shows the dominance of nearby Kuala Lumpur, followed by Bangkok, Delhi, Mumbai, Manila, and Jakarta as cities with which it has the most links in regard to the global financial crisis. Few

Table 8.5 Regional GFS relationships of Singapore, Mumbai, Delhi, Bangalore and Chennai

Singapore		Mumbai		Delhi		Bangalore		Chennai	
Kuala Lumpur	100,700	Delhi	66,200	Singapore	49,650	Delhi	45,400	Bangalore	46,800
Manila	76,150	Singapore	45,200	Bangkok	27,000	Singapore	31,550	Mumbai	35,000
Delhi	49,600	Chennai	34,950	Jakarta	24,900	Hyderabad	29,350	Bangkok	25,215
Mumbai	45,100	Bangkok	23,000	Mumbai	22,850	Bangkok	19,015	Singapore	23,520
Bangkok	45,000	Jakarta	21,300	Pune	22,600	Pune	18,850	Jakarta	18,255
Jakarta	35,300	Kolkata	20,450	Manila	21,250	Jakarta	16,700	Ahmadabad	17,150
Bangalore	31,500	Manila	18,650	Kolkata	21,000	Chennai	16,050	Kolkata	15,400
Chennai	23,445	Pune	14,800	Bangalore	14,850	Kolkata	15,200	Manila	13,830
Hyderabad	22,600	Bangalore	14,500	Ahmadabad	13,150	Manila	14,765	Pune	13,600
Pune	11,925	Ahmadabad	12,900	Chennai	12,500	Mumbai	14,150	Delhi	12,450
Kolkata	8,410	Hyderabad	9,315	Hyderabad	9,700	Ahmadabad	11,075	Hyderabad	8,375
Ho Chi Minh City	8,010	Karachi	8,845	Kuala Lumpur	9,250	Kuala Lumpur	5,020	Kuala Lumpur	4,255
Karachi	7,160	Kuala Lumpur	8,725	Karachi	7,990	Karachi	3,535	Karachi	3,355
Dhaka	7,150	Lahore	6,540	Dhaka	7,835	Yangon	3,145	Dhaka	2,775
Yangon	6,915	Dhaka	6,450	Yangon	7,365	Lahore	3,135	Yangon	2,485
Ahmadabad	5,410	Yangon	5,530	Lahore	5,845	Dhaka	2,955	Lahore	2,220
Lahore	4,870	Ho Chi Minh City	2,800	Ho Chi Minh City	3,790	Ho Chi minh City	1,850	Ho Chi Minh City	1,073
Bandung	2,010	Bandung	559	Bandung	1,071	Bandung	614	Bandung	604

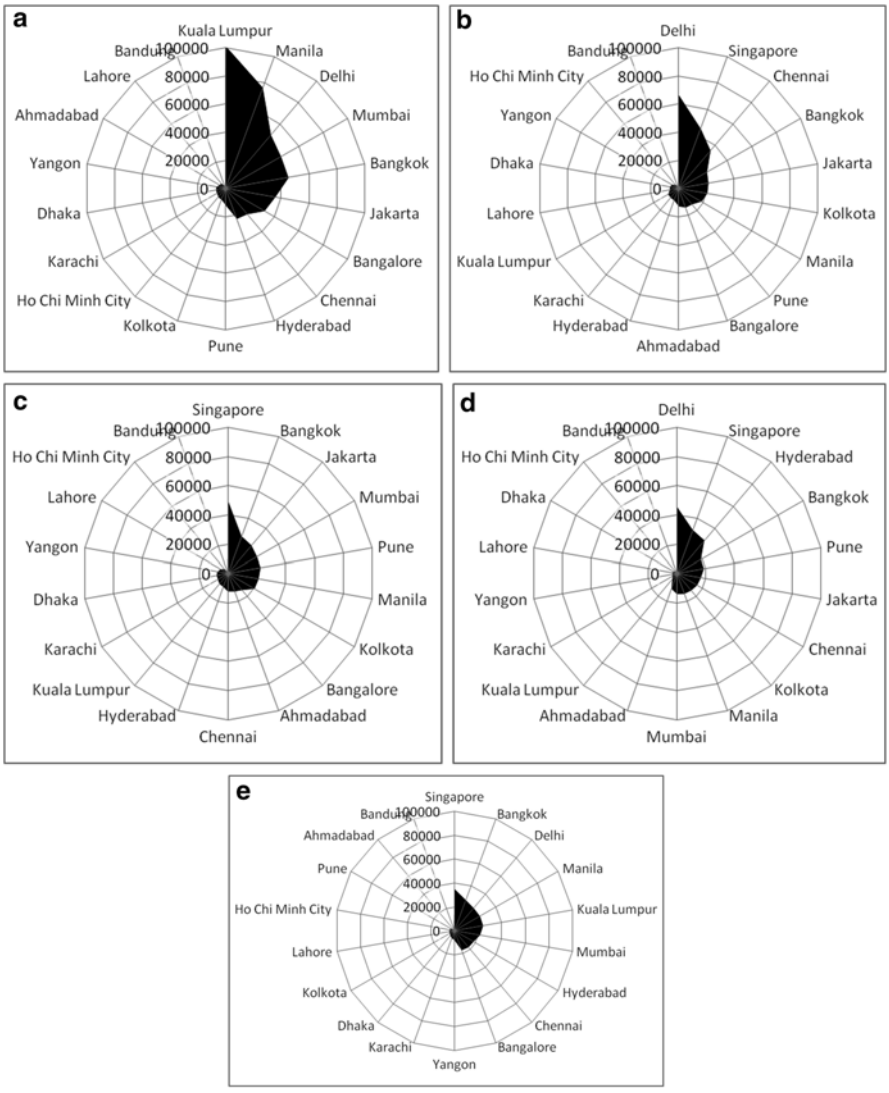

Fig. 8.3 (**a–e**) Regional clockogram of Singapore, Mumbai, Delhi, Bangalore, and Chennai

are the links with Ho Chi Minh City, Dhaka, Lahore, Yangon, and Bandung. The Singapore clockogram contrasts somewhat with Mumbai's, which has links mainly with other Indian cities. Mumbai is most connected with Chennai, followed by Delhi, Singapore, Hyderabad, and Pune. The cities least connected to Mumbai are the same as for Singapore. Delhi's pattern is somewhat similar to Mumbai in that it is most connected to other Indian cities; Singapore ranks as the secondmost net-

worked city. The final 2 cities we consider here are Bangalore and Chennai; their totals are far less than those of Mumbai or Delhi, but their linkages with other Indian cities are similar. In all 5 cities, there are few connections with cities in Pakistan and the capitals of Vietnam, Myanmar, and Bangladesh.

8.8 Discussion

Mapping and analyzing the role of South and Southeast Asia cities in the current global economy reveals how complex the linkages are between large financial centers, regional economic and financial centers, capital cities, and other large population centers. The complexity defies easy attempts to try and understand the global and regional variations that exist. Here, we identify ten major observations are noted from the foregoing descriptions of the city and regional data. We discuss first the global and international dimensions, proceed then to regional, and then to the results for large cities in individual countries.

First, and this observation should come as no surprise, the largest cities are not those with the most hyperlinks. Although 3 South Asian cities (Mumbai, Delhi, and Kolkata) and two in Southeast Asia (Jakarta and Manila) are included in the 15 largest world cities, they have much lower rankings in the number of hyperlinks (for the top 25, see Table 8.6). Kolkata, Jakarta, and Manila are not among the top 25 major world cities in GFS hyperlinks; however, Kuala Lumpur, Hanoi, and Bangkok are. What these results illustrate is the disparity between population size and K economy data about cities. That the cities with the most hyperlinks are in North America and Europe comes as no surprise, as these are among the cities with the largest, longest, and strongest K economies.

Second, there are also significant differences between the ranking of the largest cities on total hyperlinks, total population, and GFS scores. The highest GFS rankings are for Singapore, Delhi, Mumbai, and Kuala Lumpur, followed by Bangkok, Manila, Bangalore, Chennai, Pune, and Hyderabad. Another group of cities with very low scores includes Lahore, Yangon, Bandung, Koklata, Karachi, and Dhaka. Third, based on these results, we observe that most cities in South and Southeast Asia are not among the cities or regions that are strongly connected to the 100 largest cities when considering the current economic slowdown: the most connected are the largest cities in the richest countries and most urbanized countries. The low rankings for South and Southeast Asian cities reflects their semi-peripheral, peripheral, or deeply peripheral (for some) positions within the global economy. This point was illustrated in our GAWC report (Devriendt et al. 2009).

Fourth, when we considered the international linkages of five major cities in South and Southeast Asia (Singapore, Jakarta, Bangkok, Mumbai, Bangalore), we discovered they are most linked with the world's major financial markets and cities. Hong Kong and London were those with the strongest connections, followed closely by Paris, New York, Beijing, Shanghai, and Tokyo. The next group of cities with the

Table 8.6 GFS of top 25 major cities

Rank	City	Country	Region	GFS
1	New York	United States	North America	563,500
2	London	United Kingdom	Europe	480,500
3	**Singapore**	**Singapore**	**Southeast Asia**	**287,000**
4	Hong Kong	China	East Asia	246,500
5	Beijing	China	East Asia	223,500
6	Washington, DC	United States	North America	207,500
7	Pairs	France	Europe	200,500
8	Sydney	Australia	Australia	188,550
9	Chicago	United States	North America	181,000
10	Shanghai	China	East Asia	150,000
11	Boston	United States	North America	139,500
12	Tokyo	Japan	East Asia	138,500
13	Los Angeles	United States	North America	136,000
14	**Delhi**	**India**	**South Asia**	**124,000**
15	**Mumbai**	**India**	**South Asia**	**115,500**
16	San Francisco	United States	North America	112,000
17	Toronto	Canada	North America	109,900
18	Melbourne	Australia	Australia	109,700
19	Berlin	Germany	Europe	102,300
20	Moscow	Russia	Russia	101,600
21	**Kuala Lumpur**	**Malaysia**	**Southeast Asia**	**100,200**
22	**Hanoi**	**Viet Nam**	**Southeast Asia**	**95,000**
23	Atlanta	United States	North America	91,100
24	**Bangkok**	**Thailand**	**Southeast Asia**	**84,600**
25	Houston	United States	North America	82,950

most connections to these five were Sydney, Chicago, Los Angeles, Seoul, Boston, Moscow, Berlin, and San Francisco. North American and East Asian cities were clearly the leaders compared to major financial centers in Europe.

Fifth, although most of South and Southeast Asian cities can be considered to occupy a semi-peripheral or peripheral status, one city emerges as the most connected to the largest global centers: that is Singapore. As we have observed, in several measures considering the Global Financial Score and GFS Per Capita, this Southeast Asian city dominates all others, including those with much larger populations in India, Philippines, Pakistan, and Indonesia. It also has the most linkages with all other cities in South and Southeast Asia, far surpassing Jakarta, Bangkok, Manila, Delhi, and Mumbai. It truly is *the* key economic lynchpin in urban South and Southeast Asia. The relationship between GFS and GFS per capita is $r = 0.76$ for the top 100 cities and $r = 0.90$ for South and Southeast Asian cities.

Sixth, regionality in urban economic networking is particularly evident among cities in India. Five of the six cities with the highest regional hyperlink/global hyperlink (RH/GH) ratios were in India (a high ranking illustrates more regional

connections than global connections). Regardless of population size or number of hyperlinks related to the economic slowdown, Kolkata, Ahmadabad, Pune, Mumbai, and Delhi had more linkages with each other than with Singapore, Bangkok, Manila, Karachi, and Jakarta.

Seventh, the strong Indian regionality was further apparent in an examination of the linkages of selected Indian cities with cities in nearby Pakistan and Bangladesh. In the case of Mumbai: Karachi ranked 12th in linkages with this large city on the Arabian Sea; Lahore was ranked 14th and Dhaka 15th. Mumbai had more linkages with Singapore, Manila, Bangkok, and Jakarta than with the aforementioned cities in Pakistan and Bangladesh. The low rankings observed for Mumbai also were identical for Delhi, Bangalore, and Chennai. These three cities also had more linkages with Singapore, Bangkok, Manila, and Bangkok than with Karachi, Lahore, or Dhaka.

Eighth, there are several patterns evident in the linkages of other Southeast Asian capitals (Table 8.7). Kuala Lumpur, not surprisingly, is most strongly linked to Singapore and Bangkok. Jakarta is most strongly linked with Bangkok, Singapore, Delhi, Manila, and other Indian cities; it has few links with other capital cities in Southeast Asia. Both Yangon and Ho Chi Minh City, two important capitals in the region, have many more linkages with the large cities in the region, especially Singapore, Bangkok, Delhi, Manila, and Mumbai, than with other capitals nearby. Kolkata, Lahore, and Dhaka are among the capital least connected to other capitals in South and Southeast Asia.

Ninth, the linkages of most cities in South and Southeast Asia are with one or two dominant cities, either, as we have seen, within the same country, as in the case of Indian cities, or with nearby large cities in one of the two regions. The "clockograms" we constructed illustrated this point well. Rather than these linkages being somewhat equally distributed among several key cities, one or two cities dominate, usually the largest populated cities in South and Southeast Asia and largest capital cities. The cities with small populations and even small regional capitals are much less connected.

Tenth, and finally, our regional analyses strongly illustrate not only those cities that are most connected, but also a number that are not connected to regional and global centers in terms of information about the current economic crises. This peripherality concept is evident in some of the large-population cities in India, such as Pune, Ahmadabad, and even Kolkata, as well as the capital cities of Dhaka, Yangon. and Ho Chi Minh City. The Southeast Asian cities are clearly in the shadows of Singapore, but also of Bangkok and Manila.

8.9 Conclusions

This chapter represents a first attempt to examine the international dimensions of the current economic crises in two developing world regions, viz., South and Southeast Asia. We sought to measure those dimensions by looking at an electronic

Table 8.7 Number of hyperlinks for Manila, Jakarta, Bangkok, Kuala Lumpur, Yangon, Ho Chi Minh City: capital cities to others in the region

Jakarta		Bangkok		Manila		Kuala Lumpur		Yangon		Ho Chi Minh City	
Singapore	35,300	Singapore	44,700	Singapore	31,300	Singapore	100,650	Jakarta	7,860	Singapore	8,030
Bangkok	27,600	Jakarta	27,600	Bangkok	26,100	Bangkok	12,400	Delhi	7,340	Bangkok	4,355
Delhi	24,900	Delhi	27,050	Jakarta	24,500	Jakarta	9,785	Bangkok	7,240	Delhi	3,775
Manila	24,500	Manila	26,050	Delhi	20,850	Delhi	9,245	Singapore	6,795	Kuala Lumpur	3,575
Kuala Lumpur	24,235	Mumbai	22,900	Mumbai	18,350	Mumbai	8,735	Manila	6,715	Jakarta	3,480
Mumbai	21,600	Bangalore	19,070	Bangalore	14,395	Manila	7,795	Mumbai	5,540	Manila	3,385
Hyderabad	18,385	Chennai	18,080	Hyderabad	14,070	Dhaka	6,860	Karachi	4,200	Mumbai	2,790
Chennai	18,250	Hyderabad	18,050	Chennai	13,790	Bangalore	5,015	Kuala Lumpur	4,045	Yangon	2,375
Bangalore	17,565	Kuala Lumpur	12,400	Dhaka	7,860	Chennai	4,260	Kuala Lumpur	3,150	Bangalore	1,855
Yangon	7,865	Yangon	7,235	Kuala Lumpur	7,795	Yangon	4,030	Chennai	2,490	Karachi	1,397
Karachi	6,665	Karachi	4,665	Yangon	6,715	Ho Chi Minh City	3,575	Lahore	3,280	Chennai	1,074
Dhaka	5,325	Dhaka	4,620	Karachi	5,190	Karachi	3,455	Ho Chi minh City	2,370	Lahore	1,059
Kolkata	4,405	Ho Chi Minh City	4,365	KolKata	3,650	Hyderabad	2,915	Dhaka	2,310	Dhaka	873
Lahore	4,330	Kolkata	4,005	Ho Chi Minh City	3,390	Kolkata	2,535	Kolkata	1,860	Kolkata	787
Ho Chi Minh City	3,900	Lahore	3,190	Lahore	3,060	Lahore	2,505	Hyderabad	1,860	Hyderabad	786
Pune	3,880	Pune	3,150	Pune	2,575	Pune	2,045	Pune	1,800	Pune	632
Ahmadabad	1,665	Ahmadabad	2,240	Ahmadabad	1,720	Ahmadabad	1,495	Ahmadabad	391	Ahmadabad	388
Bandung	1,488	Bandung	1,253	Bandung	1,207	Bandung	1,208	Bandung	383	Bandung	206

database about the current economic conditions in large cities. We utilized the Google search engine to identify the volume and geography of hyperlinks related to the global financial crises and global economic slowdown for 19 major cities in South and Southeast Asia. We compared these volumes with the population sizes of these cities and also the linkages each of these cities had with all others in these regions and with the largest world cities. These data provided us an opportunity to measure, map, and analyze the results for individual cities as well as cities in India specifically, and for major cities in South and Southeast Asia.

The major finding of this descriptive, analytical, and cartographic effort is that the linkages of cities in these two developing world regions are much more difficult to understand than might be initially expected. Whereas one might expect that these 19 are all linked to the same global financial centers, viz., New York, London, and Tokyo, the results showed the linkages patterns were much more complex. Furthermore, there were sharp differences among cities in these regions, with some having strong national linkages, as in the case of Indian cities, and others more extraregional, as in the case of many capital cities in Southeast Asia. The dominant city in this region in regard to linkages or information networks about the global financial crisis was not Mumbai, nor was it Delhi; rather, it was Singapore. This Southeast Asian city emerged as not only the most-linked city for most cities in Southeast Asia, but also one of the leading cities in linkages for Indian cities. And this city's major international connections were with Hong Kong, New York, London, Beijing, Paris, Shanghai, and Tokyo, not with Mumbai, Jakarta, Manila, or Bangkok. Kuala Lumpur is, however, strongly linked to Singapore. The Singapore picture illustrates well the intricate and often unpredictable nature of trying to make facile generalizations about the current economic crises.

This study has clearly identified a number of additional possible studies that merit investigation by economic geographers and others interested in considering regional dimensions of the current financial crises. We mention only three that we consider especially meaningful. The first is to examine the extent of the economic problems in selected key cities based on web content: these may be unemployment, bank failures, foreclosures, stimulus packages, and disinvestment. A similar content analysis of web pages was conducted by Williams and Brunn (2004) and also Devriendt et al. in their Globalization and World Cities (GaWC) report (Devriendt et al. 2009). Second, it would be worth examining in greater detail the linkages of the global financial centers with the largest cities in this region. Specifically, we consider the role of Hong Kong, Beijing, and Shanghai along with Tokyo, as these are cities with already strong investment histories, especially in Southeast Asia. Third, the peripherality concept begs for more attention, as these are not only cities (many with large populations) in these regions, but many of these are also capital cities. The peripherality is already apparent in Fig. 8.4 showing the GFS scores per capita. In addition to Yangon and Ho Chi Minh City, Colombo, Vientienne, Phnom Penh, Bandar Seri Begawan, Kathmandu, and Thimpu need to be considered along with the second, third, and fourth largest cities in Indonesia, Philippines, Thailand, and Malaysia. These cities, as have the mega-cities, in both South and Southeast Asia, have been negatively affected by the global and regional financial crises.

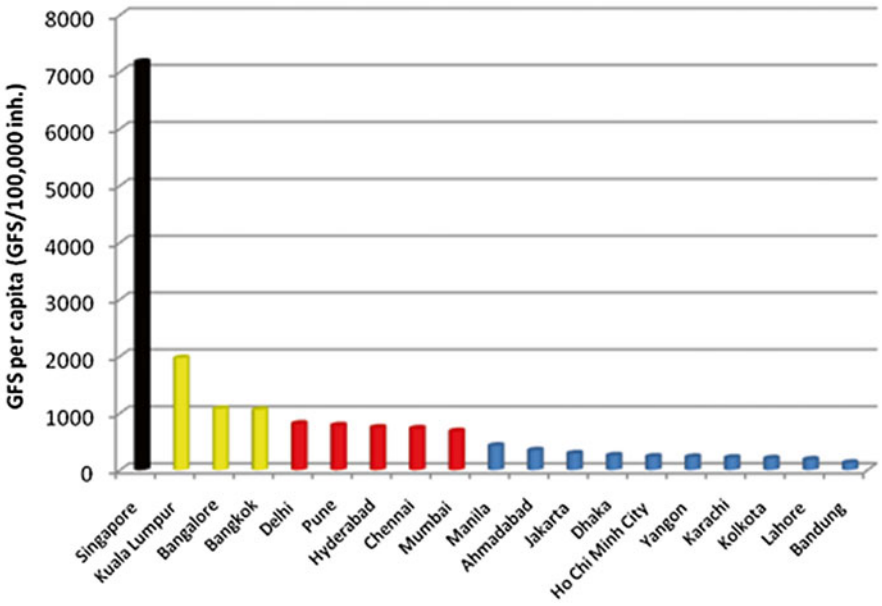

Fig. 8.4 GFS per capita for the 19 South and Southeast Asian cities

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