7 'GLOCAL' INFRASTRUCTURE AND THE SPLINTERING OF URBAN ECONOMIES

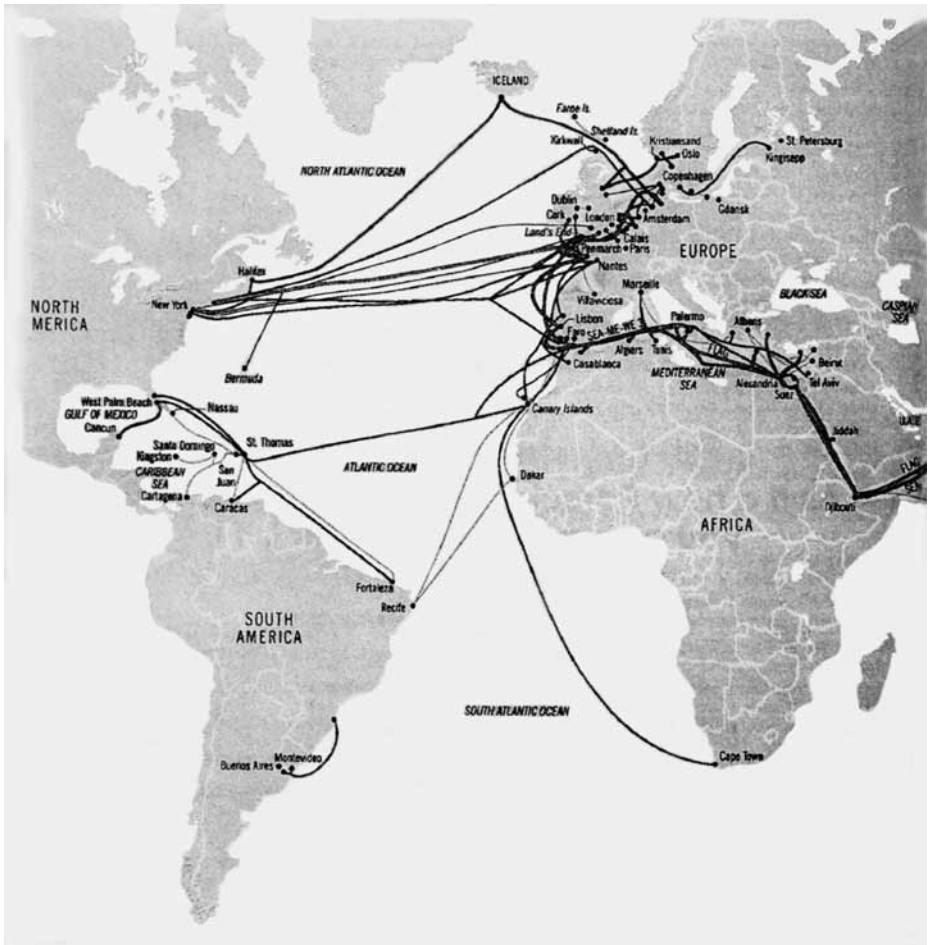

Plate 13 'Glocal' transoceanic optic fibre networks connecting the major metropolitan regions of Europe, the east coast of the Americas and Africa, 1997. *Source*: Vedel (1997), 34

> National borders have ceased being continuous lines on the earth's surface and [have] become nonrelated sets of lines and points situated within each country.
> (Andreu, 1997, 58)

CITIES AND THE 'ARCHIPELAGO ECONOMY'

It has been widely argued that, as urban economies integrate internationally, they are, in a sense, 'disintegrating' (Lovering, 1988, 150). In the old industrial cities of the North, for example, the tight, local interdependence between production units that characterised the earliest phase of industrialisation has, in many cases, largely unravelled. It has been replaced by an often largely disconnected series of economic and corporate spaces and spheres, many of which are increasingly oriented towards powerful connections elsewhere. Accelerated concentrations of growing industries in dynamic metropolitan zones contrast increasingly starkly with bypassed intervening spaces. As Pierre Veltz suggests, 'one increasingly has the impression of an "archipelago economy" in which horizontal, frequently transnational, relations increasingly outmatch traditional vertical relations with the [city's] hinterland' (2000, 33). Speaking about Northern industrial cities, particularly those in the United Kingdom, John Lovering uses a rather different metaphor. To him:

> If the local economy of the 'Old Model' was a skeleton in which each part was connected to all the others, under the new post-Fordist model it is more like a pile of bones. The bigger cities and towns are now centres of administration rather than production. The smaller ones are centres for a whole set of unrelated production activities . . . The 'local economy' is now a thing of fragments.
>
> (1988, 150)

Such fragmentation, according to Manuel Castells, is a tendency in virtually all contemporary city economies as they become enmeshed in what he calls the 'variable geometry' of the internationalising 'network society' (1996, 145–7). Within this logic – which tends to transcend traditional notions of scale and separation, 'core' and 'periphery', 'North' or 'South' – technological and economic integration is taking place in virtually all cities, but in extremely partial, uneven and diverse ways (see Sassen, 1991, 2000a, b). A logic of intense geographical differentiation is under way, within which people and places are enrolled in very different ways into the broadening circuits of economic and technological exchange (see Veltz, 1996).

The clear worry here, as the French communications scholar Armand Mattelart has written, is that 'the dynamic of the economic model of globalization now unfolding risks leading to a "ghettoized" world organized around a few megacities in the North, but occasionally in the South, called on to serve as the nerve centres of worldwide markets and flow' (1996, 304). Ricardo Petrella (1993), an ex-EU commissioner, is even more pessimistic. To him, current logics, based on the centralisation of wealth and power on key cities in the technological cores of the global economy, risk little less than a 'new Hanseatic phase in the world economy' riddled with a 'stark techno-apartheid'.

THE 'STICKY' PLACES OF GLOBAL CAPITALISM; GLOBAL AND SECOND-TIER CITIES

Very broadly, those global and second-tier cities, parts of cities, and the socioeconomic groups involved in producing high value-added goods, services and knowledge outputs, are tending

to become intensively interconnected internationally (and sometimes even globally) (Sassen, 2000a, b; Markusen *et al.*, 1999). Using the capabilities of high quality information, transport, power and water infrastructures, zones of intense international articulation – business spaces, new industrial spaces, corporate zones, airports, new cultural or entertainment zones, logistics areas – are emerging in such cities, albeit to highly varying degrees.

Within some such 'sticky' spaces (Markusen, 1999; Markusen *et al.*, 1999) – global financial capitals like Manhattan or the City of London, 'high-tech' industrial districts like Silicon Valley, Cambridge, Seattle or Bangalore, government complexes like Washington DC, cultural production centres like Hollywood (Scott, 1997) or the emerging digital innovation clusters like New York's Silicon Alley – a tight degree of interaction on the 'industrial district' model may survive and prosper. In such places, flexible, continuous and high value-added innovation continues to require intense face-to-face learning and co-location in (the right) place, over extended periods of time (see Storper, 1997; Veltz, 1996; Markusen, 1999).

Ash Amin and Nigel Thrift (1992) have termed this the logic of 'neo-Marshallian nodes on global networks'. In their view, highly valued local production systems like the City of London or the 'Third Italy' manage to maintain their competitive advantage within the broader shift to pervasive, dominant, corporate networks. They argue, however, that it is extremely difficult, if not impossible, to generate 'artificially' such self-sustaining international economic nodes if the basic structures, production conditions and institutional cultures that make them grow organically are not already in place. To them it follows that 'the majority of localities may need to abandon the illusion of the possibility of self-sustaining growth and accept the constraints laid down by the process of increasingly globally integrated industrial development and growth' (ibid., 585).

ROUTINE PRODUCTION, SERVICE AND EXTRACTION CENTRES AND THE COMPETITIVE SCRAMBLE FOR INVESTMENT

A second layer of spaces in developed, developing or newly industrialising countries is also able to attain some sort of economic position within circuits of internationally integrated industrial and economic development. These spaces may be global nodes for the production of high-volume manufacturing goods and services; places that can deliver routine services on-line or via telephone links to the core city regions; or sources for the extraction and production of various types of raw materials. Here we see the familiar scramble of entrepreneurial and increasingly internationally oriented localities for foreign direct investment (FDI) in routine manufacturing, mobile services and resource extraction.

Because of their overwhelming external orientation, economic and technological connections elsewhere in many of these spaces – for example, the burgeoning clusters of call centres and back offices in North American, Caribbean and European cities – now tend to far outweigh connections with the local 'host' space.

The economic development of such urban spaces, and the splintering of infrastructure networks that reflects and supports their development, therefore bring new tensions between

favoured parts of cities and their wider metropolitan areas. Customised spaces, linked into splintered infrastructure networks, increasingly tie global production chains and *filières* together, in telecommunications, transport and logistics, and even energy and water. New patterns of 'hubs', 'spokes' and 'tunnel effects' are emerging as infrastructure networks link up 'cherry-picked', favoured spaces across widening territories, whilst excluding and bypassing intervening spaces deemed to be less profitable. In fact, it could be argued that, in the context of regional trading blocs, global capital freedom and the growing dominance of transnational corporations (TNCs), such infrastructural chains, tying together corporate *filières*, made up of customised urban spaces, effectively *constitute* the dominant spaces and practices of the global economy.

SUBORDINATE AND BYPASSED TERRITORIES

Manuel Castells argues that the 'territories surrounding these nodes play an increasingly subordinate function' (1996, 380). Indeed, in some extreme cases, what he calls the 'redundant producers, reduced to devalued labour' (ibid., 147) that inhabit such spaces may become little more than 'irrelevant or even dysfunctional' as the labour or assets they possess are ignored or bypassed by the logics of the 'network society'. Neil Brenner has observed, for example, that 'world cities like London can become "delinked" from declining cities and regions' (1998a, 444; see Deas and Ward, 2000).

Complex patterns of relations emerge here. As the global financial networks linking London, Paris and New York, or the *train à grand vitesse* (TGV) rail networks connecting Paris and the French provincial capitals demonstrate, the infrastructure networks that support distant linkages, whilst always local and always embedded in space and place, may actually provide 'tunnel effects' which bring valued spaces and places closer 'together' whilst simultaneously pushing physically adjacent areas further 'apart' (Graham and Marvin, 1996). The global divisions of labour and telecommunications networks of transnational corporations provide another perfect example. For, as Paul Adam states, 'in this milieu of globalization, the buildings housing the various functions of a transnational corporation, although dispersed around the globe, are intimately connected, yet they may have little or no connection with offices or housing that are directly adjacent' (Adams, 1995, 277).

INTENSIFYING UNEVEN DEVELOPMENT: WHY INTRAREGIONAL DIFFERENCES ARE STARTING TO MATCH OR EXCEED INTERREGIONAL ONES

The key result of these trends is that all cities, whether they be 'global' cities like London and New York, 'mega' cities facing 'structural adjustment' policies in the Developing World, cities in post-communist Eastern Europe that are 'opening up' to foreign capital, or others, seem to be facing variations of the same broad logics of development. Everywhere,

it seems, '*intra*-regional differentiations are often bigger than *inter*-regional ones' (Keil and Ronnenberg, 1994, 143).

Patterns of intensely developed and interconnected nodes are thus emerging which are increasingly attempting to secure themselves off from surrounding spaces of marginalisation and bypassed exclusion. This is not to deny, of course, the stark differences which exist between the situations faced by different cities. Each is embedded within a different economic, cultural, social and geopolitical context and history. The marginal spaces in cities like Tokyo tend to be much less extreme than those of, say, Johannesburg.

Of course, patterns of intense disconnection between internationally networked urban spaces and surrounding neighbourhoods are not new, either. As we saw in Chapter 2, they have, in particular, long been characteristic of developing and colonial cities, and the highly segregated cities of the United States. So it is very important to re-emphasise that we are not claiming complete convergence between contemporary cities. Nor do we claim some clean break in a binary transition model between more integrated and less integrated cities everywhere in the world. Rather, we suggest that the intersections between globalisation, liberalisation, new technologies and infrastructural practices have crucial implications for the development of urban economies in developed, developing, newly industrialising and post-communist cities alike. As a result, whilst major variations continue to differentiate individual cases, virtually all cities are starting to display intensifying unevenness based on the partial integration of their most valued elements towards global circuits of economic exchange, whilst their more peripheral and informal economic spheres face increased marginalisation at the very same time (see Hoogvelt, 1997).

THE AIMS OF THIS CHAPTER

In this chapter we seek to demonstrate how the construction of unbundled, 'glocal' infrastructures is intimately bound up with the splintering of urban economies in a wide variety of contexts. We analyse this question by undertaking an analytical journey across the most privileged and valued spaces and times of the splintering metropolitan economic landscapes of a wide range of cities.

The chapter has three parts. First, we explore the ways in which nation states, entrepreneurial urban agencies, infrastructural capital and corporate firms are all working to support the construction of 'glocal' urban infrastructures.

Second, we take a selective tour of those places that are emerging as highly valued and intensively connected 'glocally' within the splintering city. These are the spaces that are benefiting most from the erosion of the modern infrastructural ideal around the world, as they are being equipped with highly capable infrastructures on an increasingly private and self-contained basis.

We encounter seven such types of place on this journey: the enclaves in dominant 'global' financial service cities like London and New York; development enclaves in 'megacities' in the Developing World; emerging urban enclaves of innovation in multimedia; new industrial spaces for 'high-tech' innovation and production; spaces configured for inward investment

in manufacturing; 'back office' enclaves for data processing and call centres; and, finally, spaces customised as logistics zones (airports, ports, export processing zones and e-commerce spaces). In each category we explore a range of current examples to analyse precisely how the production of dedicated spaces for these valued economic activities is bound up with the customisation of infrastructure networks that allow them to extend their influence internationally whilst carefully filtering the degree to which they connect with their host city.

We round off the chapter by looking once again beyond the favoured worlds of glocal infrastructure at those space–times of the urban economy which seem to be facing marginalisation from infrastructural connection and investment. Here we explore the economic fortunes of the urban 'peripheries' that are facing infrastructural and sociotechnical disconnection from the favoured 'glocal' spaces of the metropolis. In developed cities such spaces were the main beneficiaries of the cross-subsidies and universal service obligations that were inherent in the modern infrastructural ideal. In developing cities they are often the burgeoning unserviced, informally constructed economic spaces on the fringe of the metropolitan core. Here, too, we argue, networks are splintering, but for different reasons. In such spaces, micro-level entrepreneurship is emerging to try and address the failings of the infrastructural legacy of the modern ideal. In other words, rather than wait to be equipped with modern 'glocal' infrastructure, people and firms are trying to secure essential infrastructure themselves.

ECONOMIC PLAYERS IN THE CONSTRUCTION OF 'GLOCAL' URBAN INFRASTRUCTURE

A central argument of this book is that the broad logics of 'unbundling' urban infrastructure are working to provide the crucial material and sociotechnical underpinnings to these wider processes of urban splintering. Four key supports for this in the economic arena warrant further analysis here: the changing roles of nation states, urban municipalities, infrastructure capital and corporate capital.

NATION STATES

First, nation states in the developed, developing and post-communist worlds have largely abandoned the project of the modern infrastructural ideal with its ostensible goal of 'equalising life conditions on a national scale' (Brenner, 1998a, 445). Instead, they have tended to shift to 'the promotion of urban regions as the most essential level of policy implementation' (ibid.). Nation states have thus 'substantially rescaled their internal institutional hierarchies in order to play increasingly entrepreneurial roles in producing geographic infrastructures for a new round of capitalist accumulation' (Brenner, 1998, 476).

As we have seen earlier in the book, this process has meant a widespread shift to privatisation, liberalisation, opening up public infrastructure monopolies to private investment and allowing private capital the freedom to develop limited, customised infrastructures

in specific spaces, without worrying about the need to cross-subsidise networks in less favoured zones.

URBAN DEVELOPMENT AND PLANNING AGENCIES

Second, and relatedly, entrepreneurial urban economic development planning is everywhere emerging as the key imperative of urban governance (Clarke and Gaile, 1998). City authorities are struggling to project their cities, or at least favoured parts of them, into internationalising circuits of exchange. The latest innovations in urban economic development strategies are concentrating on 'integrating local economies into global markets' through the provision of infrastructure, the development of customised spaces for global capital, place marketing and the assistance of training and human capital development (Clarke and Gaile, 1998, 181). Within the context of the collapse of meaningful notions of comprehensive urban planning in many contexts, ambitious real estate packages and project-oriented infrastructure improvements form essential elements within the wider packaging of sites and places to be enrolled into the uneven logics of the 'network society' (along with the customary place marketing and financial inducements). Neil Brenner suggests that:

> Today municipal governments . . . are directly embracing this goal [of mobilising territory] through a wide range of supply-side strategies that entail the demarcation, construction and promotion of strategic urban places for industrial development – for example, office centres, industrial parks, telematic networks, transport and shipping terminals, and various types of retail, entertainment and cultural facilities.
>
> (1998a, 446)

Thus urban agencies, too, are helping to support the practice of building 'glocal scalar fixes' by configuring infrastructural and urban spaces to the precise needs of valued spaces within the metropolis. This is what Shearer calls the apparently pervasive 'edifice complex' within contemporary urban politics, which tends to 'equate progress with the construction of high-rise office towers, sports stadiums, convention centres, and cultural megapalaces, but often ignores the basic needs of most residents' (1989, 289). Such 'glocal' urban economic strategies entail configuring spaces and infrastructures to connect seamlessly with dominant international circuits of exchange. Special-purpose private or quasi-private infrastructure development bodies are an increasingly popular policy option here, as they can be tasked with equipping strategic economic spaces with high-quality infrastructure without facing onerous political challenges or the imperatives of cross-subsidies and territorial equalisation (Foster, 1996; Mallett, 1993a, Nunn, 1996).

At the same time, however, 'there appears to be a paradoxical tendency towards the enforcement of local boundaries' (Ezechieli, 1998, 3). Fine-grained economic segregation within virtually all cities is increasing (Hack, 1997). Roger Keil asks if 'the only counterforce to the convergence of global capital interests [is] the tribalist fragmentation of diverging communities: guarded and fenced off from one another, crammed in between the barriers of high-speed traffic and humming to the deafening sound of electronic highways?' (1994, 132).

INFRASTRUCTURE AND REAL ESTATE CAPITAL

Third, in response to global moves towards liberalisation and/or privatisation, infrastructure and real estate capital is itself increasingly withdrawing from rolling out general networks across cities and regions to focus on 'glocal' infrastructural articulations for strategically favoured places and users, largely within metropolitan areas (Crilley, 1993; Logan, 1993). This is a reaction to the growing demand for, and profitability of, seamless glocal links that transcend national and municipal boundaries, to tie in with the wider development logics of interconnecting valued spaces at the expense of less valued ones. It also reflects a shift away from notions of universal service and towards a greater proactivity among utilities and infrastructure operators in ensuring the most profitable economic development of the spaces they serve (Graham and Marvin, 1995).

It is more and more common, then, for infrastructure operators to act as 'growth statesmen' for the valued spaces that they serve (Logan and Molotch, 1987, 74). They are increasingly eager to become involved in the growth politics and policies of their host cities or localities (Guy *et al.*, 1996). As Cox and Mair put it, 'public infrastructure networks are highly capital-intensive, and realizing the values locked up in fixed gas lines, power stations etc. requires the reproduction of a particular spatial pattern of customers who will provide the infrastructure's value inputs' (1988, 2).

At the same time, though, operators are developing international portfolios of mergers, alliances and strategic acquisitions, and aspiring to become 'global network firms' in transport, telecommunications, power, water or, increasingly, combinations thereof (Rimmer, 1998). Such firms are able to offer international corporate clients a 'one-stop shop' service, for example with global logistics solutions, 'flat rate' telecoms tariffs to anywhere on earth or CCTV surveillance or a single energy package for multiple sites. Figure 7.1 provides Peter Rimmer's analysis of the 'glocal' infrastructural configurations that such global network firms are aspiring to provide.

To infrastructure capital, serving a range of valued locations across a wider area helps to 'reconstitute local dependence at some broader geographical scale' (Cox and Mair, 1988, 3). But the most important point for our purpose here is that the geographically *embedded* nature of infrastructure networks is inevitable and impossible to avoid. Ways thus have to be found to minimise the risks it entails, either through careful targeting of the most profitable markets within a territory, extending it to serve an international portfolio of profitable spaces or diversifying into less vulnerable markets and sectors.

CORPORATE CAPITAL

Finally, it is clear that corporate capital is increasingly intervening directly to encourage the production of the infrastructural network spaces that most suit its internationalising and 'glocal' needs (Schiller, 1999a). Lobbying of states and providers perceived to be inadequate in opening up restrictions on the provision of customised corporate infrastructure, or of those who are deemed to offer inadequate infrastructural price, quality or reliability, is increasingly

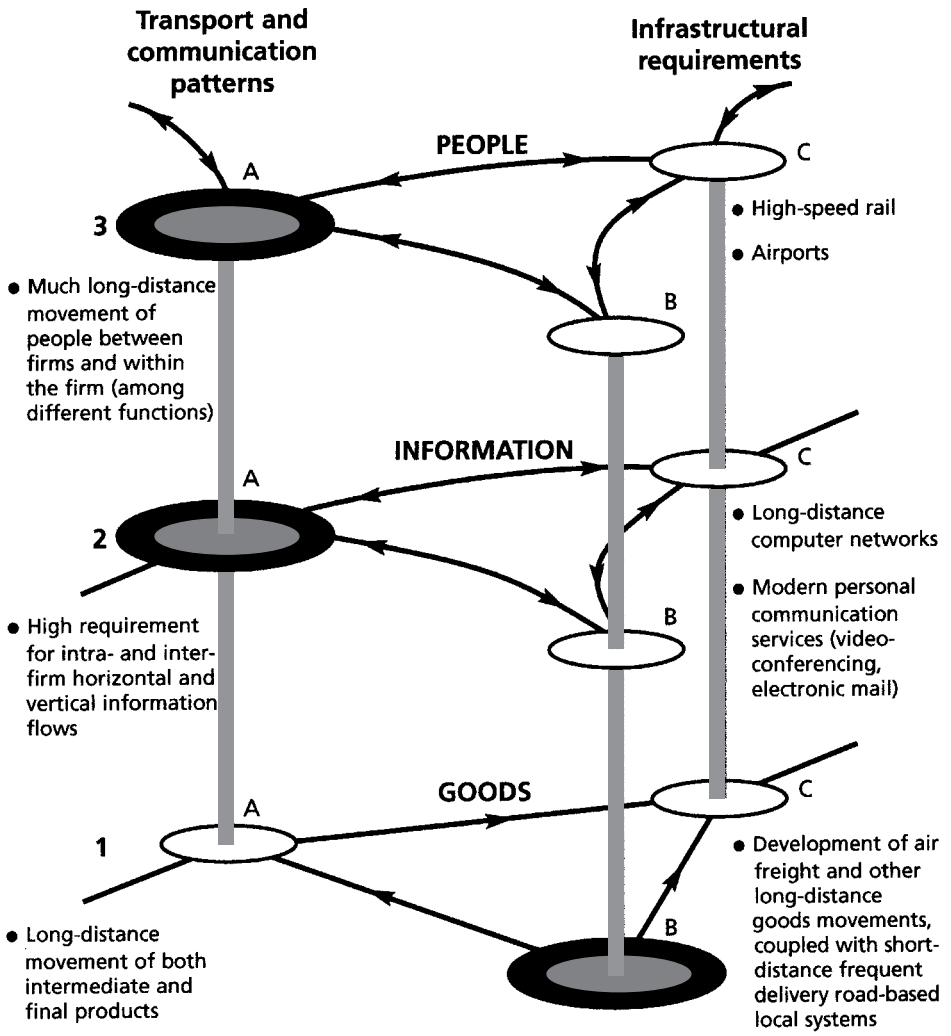

Figure 7.1 Glocal infrastructure requirements of global network firms, focusing on transport and communications. *Source*: Rimmer (1998), 85

intense. Mobile corporations are also not slow to exploit the leverage they command to coerce entrepreneurial and ambitious municipalities and nation states to customise and configure infrastructural arrangements to their precise needs at little or no cost to them (Peck, 1996).

With this context in mind, we are in a position to explore the ways in which our seven chosen examples of premium infrastructural spaces are being 'globally' constructed in a range of cities across the world. The first example comes from the world's dominant 'global cities' (see Sassen, 1991, 2000b).

GLOBAL CONNECTIONS, LOCAL DISCONNECTIONS: CUSTOMISING INFRASTRUCTURE FOR GLOBAL FINANCIAL ENCLAVES

Any cursory examination of the dominant 'hub' positions of London, New York, Tokyo or Paris within their respective countries will quickly reveal that 'global' cities have long been central articulation points for all manner of networked infrastructures: rail, metro, water, power, airline, freight and telecommunications. But the combined processes of liberalisation, globalisation, technological change and the application of new urban design techniques are not only reinforcing the centrality of global city cores in global infrastructure networks. They are also, paradoxically, working carefully to secure the highly valued segments of global cities from their surrounding cityscapes. As Manuel Castells suggests:

> the few nodal functions still located in central cities, around Central Business Districts (CBDs) and high quality urban spaces, can be bridged to national and global hinterlands via telecommunications, fast transportation and information systems, without needing to renovate their surrounding urban areas. Thus the central city's islands of prosperity and innovation can further isolate themselves from the city, whilst integrating into the space of flows and delinking themselves from their social and territorial environments.
>
> (1999b, 31–2)

COMBINING GLOBAL CONNECTIONS AND LOCAL DISCONNECTIONS IN GLOBAL CITY CORES: THE CASE OF TELECOMMUNICATIONS

It is increasingly clear that the most highly valued spaces in global city cores are being provided with their own dedicated, high-quality infrastructural connections. These are configured to maximise the ease of connecting to other global city cores around the world. At the same time they are increasingly organised carefully to filter out unwanted connections with the surrounding metropolis – those that are judged to be 'threatening' or deemed to be irrelevant to the direct needs of the glocal enclave.

As we see in Box 7.1, the case of telecommunications presents perhaps the most potent illustration of how seamless connections can link powerful spaces and users 'glocally' with other powerful spaces and users, whilst helping them simultaneously to disconnect from the wider social and economic worlds of the surrounding metropolis. These processes, as Barney Warf suggests, show how telecommunications are being used to allow space to be 'stretched, deformed, or compressed according to changing economic and political imperatives' (1998, 225).

In global cities the most sophisticated, diverse and capable electronic infrastructures ever seen are being mobilised to compress space and time barriers in a veritable frenzy of network construction. Global city regions are heavily dominating investment in, and the use of, such

BOX 7.1 DEDICATED URBAN OPTIC FIBRE GRIDS AND THE COMPETITIVE STRUGGLE BETWEEN 'GLOBAL' CITIES

In the telecommunications field, the result of the combination of concentrated demand and customised infrastructure provision is the superimposition of many high-capacity optic fibre grids within the valued cores of global cities right across the world. The presence, or absence, of these networks, and the services which run on them, strongly defines the communications 'competitiveness' of global cities, an important consideration as they struggle to establish themselves as hubs of telecommunications traffic.

A survey by the Yankee Group, a US telecommunications consultancy, and *Communications Week International*, attempted to rank the competitiveness of telecommunications provision in early 1998 in twenty-five global cities encompassing 5 per cent of the world's population (see Finnie, 1998). Their scored rankings, shown in Table 7.1, were based on technical definitions of the pricing of services, the choice of physical infrastructure connections available, and the availability of the most advanced and sophisticated connections (for example, 'dark fibre', which is uncommitted to other users) and very broadband services.

Their results give a revealing portrait of the degree to which intense competition is focusing on the small number of global cities. Such cities concentrate particularly high demand, are located within the core geo-economic regions of the world, and are placed within nations that have enthusiastically embraced telecommunications liberalisation. The researchers concluded that 'cities large and small around the globe are integral to the fortunes of the world's economy, yet the [telecommunication] infrastructure in each can vary greatly. . . . Although the gap between the best and worst of infrastructure is narrowing, particularly in the middle ground, it is still very wide' (Finnie, 1998, 20).

The five US cities included in the sample ranked highest and most competitive. New York led the way, with nine separate optic fibre infrastructures. London was the most 'competitive' city outside the United States, with six separate optic fibre grids. Cities that are experiencing a proliferation of urban fibre infrastructures, following liberalisation, came next (Stockholm, Paris, Sydney, Hong Kong, Frankfurt and Amsterdam – which has constructed its own municipally supported urban fibre ring called CityRing® in partnership with the Dutch PTT – see Figure 7.2).

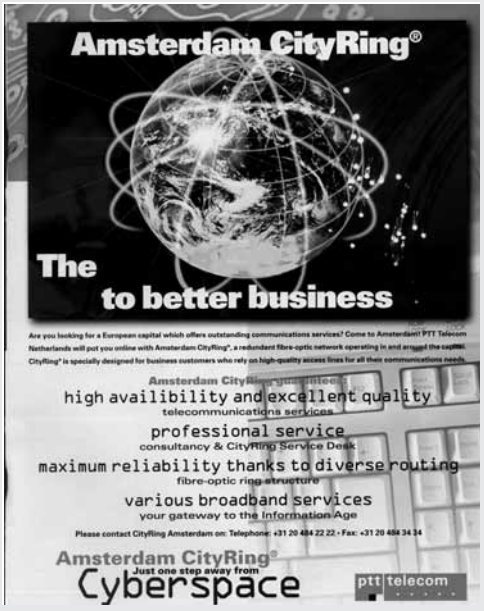

Figure 7.2 The Amsterdam CityRing® initiative. *Source*: PTT Telecom Netherlands promotional brochure

Table 7.1 Ranked scores of global cities by the competitiveness of their telecommunications infrastructure, 1998

Rank city	*Total score*	*Tariffs*	*Choice*	*Availability*
1 New York	438	148	182	108
2 Chicago	428	154	166	108
3 Los Angeles	428	152	168	108
4 San Francisco/San Jose	425	149	168	108
5 Atlanta	409	141	160	108
6 London	391	131	161	99
7 Stockholm	386	129	149	108
8 Toronto	361	123	148	90
9 Paris	337	118	129	90
10 Sydney	331	123	118	90
11 Hong Kong	328	107	149	72
12 Frankfurt	321	78	135	108
13 Amsterdam	308	100	118	90
14 Tokyo	300	77	133	90
15 Brussels	294	97	107	90
16 Mexico City	283	93	118	72
17 Zurich	276	100	86	90
18 Milan	267	101	94	72
19 Kuala Lumpur	256	90	94	72
20 Tel Aviv	230	110	66	54
21 Singapore	206	108	44	54
22 Johannesburg	161	76	50	36
23 São Paulo	135	44	55	36
24 Moscow	134	26	72	36
25 Beijing	105	48	39	18
Maximum possible score	500	171	221	108

Source: Adapted from Finnie (1998), 21.

Note: Scores are based on a technical assessment of tariffs, choice of networks and availability of services.

The rest trailed further behind because of insufficient network competition, relatively high tariffs and lack of access to the most sophisticated services. Eleven of the twenty-five cities only had one optic fibre network, tying firms into sole, monopoly suppliers. Interestingly, though, the researchers believed that, such was the rate of the shift towards global archipelagoes of competitive global city optic fibre grids, all global cities would have 'at least five' optic fibre grids 'in the near future' (Fillion, 1996, 22).

Global cities in the 'Developing' World tended to be at the bottom of the table because of their nation states' general reluctance to privatise and/or liberalise their telecommunications regimes. The authors portrayed foreign-owned telecom infrastructures as the 'silver bullet' to such cities' lack of 'competitiveness', arguing that:

> the 'poorer' cities in our survey – defined as such in terms of GDP *per capita* – trail far behind, victims by and large of local reluctance to allow competition. Of these five 'poorer' cities – Mexico City, Johannesburg, Beijing, São Paulo and Kuala Lumpur – only Mexico City makes a reasonable showing, mainly because it has been efficiently colonized by foreign-owned telecoms operators taking advantage of Mexico's liberal regulatory structure. The others still have a long way to go before they can join the global elite.
>
> (Finnie, 1998, 22)

technologies (Graham and Marvin, 1996). A survey by the Yankee Group and *Communications Week International*, for example, found that around 55 per cent of all international private telecommunication circuits that terminate in the United Kingdom do so in London. About three-quarters of all advanced data traffic generated in France comes from within the Paris region (see Finnie, 1998).

But the 'wiring' of cities with the latest optic fibre networks is extremely uneven. It is characterised by a dynamic of stark dualisation. On the one hand, seamless and powerful global–local connections are being constructed by private communications operators within and between highly valued spaces of global cities – the downtown cores and newly constructed 'intelligent' corporate plazas and data processing areas (see Sassen, 2000b).

On the other hand, intervening spaces populated by poorer communities – even those which may geographically be cheek-by-jowl with the favoured zones within the same city – are often largely ignored by telecommunications investment plans. Such spaces threaten to emerge as 'network ghettoes' – places of low telecommunications access and social disadvantage. As with many contemporary urban trends, uneven global interconnection via advanced telecommunications becomes subtly combined with local disconnection in the production of urban space (see Amin and Graham, 1998). Moreover, such a situation seems likely to characterise developed countries (which are now fully liberalising telecommunications), developing and newly industrialised countries (which are increasingly liberalising telecommunications under structural adjustment pressures) and post-communist countries (where dedicated city networks are being built to bypass the obsolescent telecoms infrastructure left behind by communist regimes – see Berlage, 1997).

Last mile connectivity: the 'messy' material basis of the 'death of distance'

It is paradoxical, then, that an industry which endlessly proclaims the 'death of distance' actually remains driven by the old-fashioned geographical imperative of putting physical networks in trenches and conduits in the ground to promote market access. The greatest challenge of the multiplying telecommunications firms in global cities is what is termed the problem of the 'last mile': getting satellite installations, optic fibre 'drops' and whole networks through the expensive 'local loop'. In other words, the challenge is to thread fibre under the congested roads and pavements of the urban fabric, to the 'smart' buildings, dealer floors, headquarters, media complexes and stock exchanges that are the most lucrative target users.

Without the expensive laying of hardware in the financial and business districts of global city cores it is not possible to enter the market seriously and win lucrative contracts. Fully 80 per cent of the cost of a network is associated with this traditional, 'messy' business of getting it into the ground in congested, and contested, urban areas. There is a strong connection between the internal information infrastructures of the 'smart' buildings of global city cores – with their security, energy and communications management systems – and the global grids of fibre, satellite and transport infrastructure that link the buildings up across the planet.

Massive investment is planned to try and overcome the problem of the 'last mile' through the construction of fleets of 'flying base stations' which hover over major metropolitan cores twenty-four hours a day. Specially designed low-speed planes flying ten miles above the city, high-altitude airships and balloons, even dedicated geostationary satellites for major cities are all being planned to offer broadband connectivity over wireless links to the lucrative corporate markets in major city cores.

Connecting global city cores: integrating global archipelagoes of metropolitan fibre networks

Such is the pull of global city cores that they are strongly shaping the global geography of telecommunications investment. One of the world's fastest growing firms, for example, WorldCom (which incorporates MCI) is emerging as a global player by constructing dedicated fibre networks for 'global' city cores and few other places. This completely 'unbundled' solution avoids the costs of building networks to serve all but the most lucrative spaces. WorldCom have built over sixty fibre optic infrastructures in major city centres across the world, in carefully targeted, financially strong city centres (forty-five of them in the United States). A hundred and thirty WorldCom city grids are eventually planned – eighty-five in the United States, forty in Europe and the rest in Asia, Latin America and the Pacific. Each is carefully targeted on 'information-rich' global cities and parts of global cities which have a sufficient concentration of large corporate or government offices to ensure high levels of international revenue relative to miles of network constructed.

But WorldCom is also building the transoceanic and transcontinental fibre networks to tie the urban grids together into global archipelagoes – a global market which absorbed US$22 billion between 1988 and 1998 and which is expected to attract a further US$27 billion between 1998 and 2003 – largely on direct city-to-city global links (*Communications International*, July 1999, 47). As well as constructing a transatlantic fibre network known as Gemini between the centres of New York and London, WorldCom are building their own pan-European Ulysses network linking their city grids in Paris, London, Amsterdam, Brussels and major UK business cities beyond London. The strengthened importance of direct city-to-city connection is not lost on telecommunications commentators. As Finnie (1998) argues:

> it should be no surprise . . . that when London-based Cable & Wireless PLC and WorldCom laid the Gemini transatlantic cable – which came into service in March 1998 – they ran the cable directly into London and New York, implicitly taking into account the fact that a high proportion of international traffic originates in cities. All previous cables terminated at the shoreline.
>
> (Finnie, 1998, 20)

The increased 'filtering' of local connectivity: road pricing and 'rings of steel'

Thus the operations of global cities simultaneously 'reach out', extending their influence further across the globe via dedicated global fibre optic networks, whilst withdrawing into

their ever larger, mixed-use corporate plazas. These 'electronic superbanks' are not skyscrapers but 'groundscrapers': 'huge nine-to-eleven-storey buildings with immense floor plates' to accommodate the remarkable IT needs of global financial institutions today (Pawley, 1997, 59).

Such processes are also supported by the growing shift towards filtering out 'unwanted' road traffic in the heart of global cities, either through police cordons and the electronic surveillance of car number plates (as in London – see Box 7.2), or electronic road pricing (as in Singapore). The Singapore scheme, which started in 1998, levies electronic tolls on car drivers commuting at peak periods into the core of the central business district (Soo, 1998; Seik, 2000). Obstensibly, this initiative is aimed at reducing traffic congestion. But the scheme, and others like it, also works as another form of local disconnection, as the toll mechanism filters out relatively 'cash-poor/time-rich' commuters, releasing space and improving the speed for wealthy 'cash-rich/time-poor' business commuters. Beneath the rhetoric that such road pricing is aimed at achieving environmental sustainability, the real objective is often therefore to create fast-flowing premium downtown road spaces as a boost to interurban competitiveness. Hong Kong, for example, is implementing a similar scheme to Singapore's, based on the fear that corporate head offices will select the uncluttered roads of central Singapore over Hong Kong's regular gridlock. High-profile cases of CEOs having to leave their air-conditioned limousines to walk the 'last mile' to meetings in searing heat and humidity are being explicitly used to justify the initiative (Khan, 2000).

BOX 7.2 GLOBAL CONNECTIONS AND LOCAL DISCONNECTIONS IN GLOBAL CITY CORES: THE CASE OF THE CITY OF LONDON

Few places exemplify how unparalleled global connectivity can be combined with highly selective local connectivity as well as the City of London. This space has the most powerful global telecommunications connectivity outside North America. Access to the world's airline networks is also exceptionally good, especially since the dedicated Heathrow Express rail link opened in 1998 connecting central London with Heathrow – the world's best connected international airport – non-stop in fifteen minutes. This link is due to be extended direct to the heart of the City early in the new century, further supporting the 'glocal' connectivity between the City and global airline networks.

GLOBAL CONNECTION: TELECOMMUNICATIONS

The overall telecommunications market for London was estimated in 1999 to be over £1,300 million, around the same as that for Paris and over four times that of Frankfurt (£253 million) (COLT communications, Web site, http://www.colttelecom.com/english/ corporate). As a result of global telecom firms scrambling to access this highly concentrated market, the City of London now has at least six overlaid fibre optic grids rolled out beneath the Square Mile and the rest of the main business areas of the City. They are operated by BT,

Mercury, City of London Telecommunications (COLT), WorldCom, Energis and Sohonet. Roads, canal pathways, old hydraulic power ducts, Underground railway tunnels, sewers and other utility pipes provide the conduits for this massive concentration of electronic infrastructure.

Increasingly, such urban networks link directly into transatlantic and international optic fibre grids, maximising the quality and reliability of transglobal connectivity. Detailed information on the urban geographies of these competing infrastructures is not easy to come by (Kellerman, 1993). But details are available of one of the networks – that operated by COLT (Figure 7.3). The geographies of the other five are unlikely to vary considerably. Figure 7.3 thus shows how dedicated fibre networks tend to be tightly focused, at least at first, on the central areas with the greatest concentration of communications-intensive activities. In the COLT network fibre is laid especially thickly in the City of London financial district. A broader grain of network coverage exists in the West End. An extension runs out to the new international business spaces in the Docklands.

Another of London's six optic fibre infrastructures has been developed since 1994 by WorldCom/MCI. This network has been particularly successful, providing a potent reminder of how powerful but geographically highly focused infrastructures in global cities can be at articulating large portions of the electronic flows of whole nations, even continents. With only 180 km of fibre constructed within the City, the London WorldCom network has already secured fully 20 per cent of the whole of the United Kingdom's international telecommunications traffic, which is, in turn, a good proportion of Europe's (Finnie 1998). WorldCom has been especially successful at building its own fibre networks across oceans and interurban corridors to link up its archipelago of global city networks. Direct and seamless glocal connections emerge which support the global interoperable operations of transnational finance and corporate capital whilst totally bypassing the old public phone systems laid out during the modern ideal. 'Bypassing incumbent carriers on both sides of the Atlantic, WorldCom's newly established transatlantic submarine cable facilities and

Figure 7.3 The optic fibre network in central London run by City of London Telecommunications. *Source*: COLT Web site at http://www.colttelecom.com/english/corporate/mn_corp13.html

urban business networks will allow it to link directly some 4,000 business buildings in Europe with 27,000 such buildings in the United States' (Schiller, 1999a, 63).

LOCAL DISCONNECTION: THE 'RING OF STEEL'

At the same time as the City of London is being equipped to connect with ever greater power to (highly valued parts of) the world, however, it is also withdrawing from free-flowing and public local connections with the rest of London. This strategy 'guards the City [of London] so that it might continue to negotiate its path towards the increasingly cosmopolitan requirements of being a "global city"' (Jacobs, 1996). It is designed specifically so that the global financial core of the City of London can 'delineate its space and signal its exclusivity' as a centre of global, immaterial power (Power, 2000, 12).

This strategy applies especially to road connections and vehicular traffic. Since the two major IRA bombings in the early 1990s, the City Corporation has developed a strategic plan to protect what it calls 'the world's leading financial capital' by, effectively, erecting 'a modern version of the medieval Wall with security gates' (*The Times*, 27 April 1993, quoted in Jacobs, 1996). This is the so-called 'ring of steel' which carefully manages and scrutinises all incoming and outgoing vehicular traffic (Jacobs, 1996; Power, 2000). Electronic road blocks and armed guards now scrutinise every vehicle entering or leaving the City of London, as part of the corporation's efforts to 'make the City less vulnerable as an economic target' (Jacobs, 1996) (see Plate 14). As part of the process, entry points for vehicles have been reduced from thirty to eight (Power, 2000). Car number plates are automatically recorded and a database has been created of all vehicles entering the area. Any vehicle not leaving the area after a specified time causes an alarm to ring, leading the suspect vehicle to be investigated.

Plate 14 The 'ring of steel' in the City of London. *Photograph*: Stephen Graham

ATTEMPTS TO DISCIPLINE URBAN BOUNDARIES ALGORITHMICALLY

More recently this computerised CCTV system has been upgraded so it can proactively search for any stolen vehicle reported in the United Kingdom. This takes four seconds

between the car passing the CCTV camera and the computerised database being checked. In 1997–98 over 114,000 daily checks were made and 26 million checks were made against the national police computer for stolen vehicles (Power, 2000). Facial-recognition software has even been tested on the system. As Norris *et al.* argue, 'technology perfected during the Gulf War in 1991 has been utilised to track vehicles coming into the City of London and trigger an alarm when a car travels in the wrong direction on the one-way system' (1998, 8). By 1998 340 arrests and 359 stolen vehicles had been triggered by this proactive computerised scanning system.

In addition, an initiative called Camerawatch has been pursued, encouraging all private businesses in the City to install their own CCTV systems to monitor public areas of the City on a continuous basis. Over 90 per cent of the Square Mile is covered, involving 385 schemes and 1,280 cameras. A record of all the images captured by the cameras allows police to trace the movements of any suspected persons (Norris and Armstrong, 1999).

'Bundled' complexes and superblock development

Finally, there is an architectural dimension to the selective local disconnection of global city cores from their immediate urban contexts. For, with the growing integration into enormous mixed-use urban redevelopment schemes like London's Broadgate and New York's Battery Park City (shown on p. 217), global cities are increasingly providing all the uses business executives need within single, bundled complexes or 'superblock' developments: state-of-the-art work space, upscale housing, retailing, schools, fitness centres, skating rinks, car parks, dedicated links to rail networks, etc. As Robert Reich observes in the US context:

> Public funds have been applied in earnest to downtown 'revitalization' projects, entailing the construction of clusters of postmodern office buildings (replete with fibre optic cables, private branch exchanges, satellite dishes, and other state-of-the-art transmission and receiving equipment), multilevel parking garages, hotels with glass-enclosed atriums rising twenty storeys and higher, up-scale shopping plazas and gallerias, theaters, convention centers, and luxury condominiums. Ideally, these projects are entirely self-contained, with air-conditioned walkways linking residential, business, and recreation functions. The fortunate symbolic analyst is thankfully able to shop, work, and attend the theater without risking direct contact with the outside world – in particular, the other city.
>
> (1992, 271)

Colonising the peripheries of global cities: configuring global connections and local disconnections for new financial enclaves

But the customisation of international links for highly valued parts of global financial capitals now extends far beyond the traditional central business district in the urban core. Increasingly,

spaces are being redeveloped and configured for global financial services industries elsewhere in the metropolis (Crilley, 1993). In New York, for example, Longcore and Rees (1996) observe a 'doughnut' shape, with a restructured core remaining for headquarter functions and routine back offices and dealer floors moving to cheaper, more spacious locations further towards the urban periphery. 'As highly competitive major financial firms retreat to secretive, security-conscious structures and a building technology that stresses large horizontal over vertical spaces,' they write, 'the traditional tightly focused financial district and market has finally demonstrated geographical flexibility' (ibid., 368).

The development of new 'packaged' landscapes for decentralising financial services is particularly intense in the triumvirate of truly global financial centres: New York, London and Tokyo.

New York

In New York major new complexes have been constructed on the lower western tip of Manhattan (the World Financial Center at Battery Park City), and away from Manhattan, at Jersey City and Brooklyn, to accommodate the changing needs of financial services companies – especially for high-quality, lower-cost, relatively low-density space for headquarters and data processing functions. Each such 'smart building' is configured with new suites of infrastructure and high-security design and surveillance features, to secure them from the perceived risks of adjacent lower-income districts. Automated heating, cooling and humidity controls are tailored for the electronic equipment; back-up water tanks and air conditioning are provided. Three or four separate electricity grids are bundled together with emergency generators with at least three days of fuel. Building footplates are at least 40,000 m^2, to accommodate the needs of global financial institutions. And extremely generous conduits and spaces are provided for IT infrastructure – again with redundancy and several connections to the fibre networks of competing local providers (Longcore and Rees, 1996).

Across the Hudson river from Manhattan, in Jersey City, for example, public authorities have underwritten a major 6 million ft^2 complex of offices, elite condominiums, hotels, shops and a marina, to tempt major finance companies across the river from Wall Street. New rail, road, power and information infrastructures have been explicitly packaged to the needs of the complex. Merrill Lynch have moved a major back office facility there, as the site is only three and a half minutes from their Manhattan headquarters by commuter train (Longcore and Rees, 1996, 364). On the other side of Manhattan, in Brooklyn, meanwhile, at the new ten-block MetroTech development for corporate migrants from Manhattan, the utility Con Edison offer high-quality and individual utility connections to incoming companies.

On the one hand, all these developments exhibit a combination of highly regulated, policed and internalised 'public space' for corporate workers (with winter gardens, a marina and 'European' design features for the 30,000 people who work at the World Financial Center) (see p. 217). On the other, they are carefully removed from surrounding traditional streets. Instead, they articulate with integrated parking garages, skywalks linking them with other valued nodes, direct tunnels to transit systems, and malls (Crilley, 1993).

Tokyo

In Tokyo, a 1,100 acre artificial island known as Tokyo Teleport Town is the most obvious glocally connected reclaimed space (Obitsu and Nagase, 1998). The initiative is an attempt to construct an 'intelligent business centre', to 'prepare Tokyo to become a twenty-first century international metropolis for the future's advanced information oriented society' (Web site http://www.tokyo-teleport.co.jp/english/ttc/0-b.html). Centred around a massive twenty-four-storey dedicated satellite ground station complex, the site has its own highway network, light rail system, centrally controlled power and water infrastructures and, of course, a sophisticated suite of cable and telecommunications networks. 'The whole complex is a "smart building" with a fully integrated electronic facility management system relating energy supply, security systems and computer networks' (Riewoldt, 1997, 44). Over 70,000 workers are expected to be employed in the area; 'the land is gradually filling with exhibition centres, hotels, and office buildings for broadcasters and communications-intensive businesses' (World Teleport Association, 1999).

The urban nexus between state-of-the-art telecommunications and real estate speculation is increasingly forging similar 'teleport town' style urban enclaves, fuelled by a roving band of teleport consultants, real estate speculators and the World Teleport Association (WTA). Such spaces are designed to 'attract transnational corporations, international financing, trade and other international business activities' (Kim and Cha, 1996, 541), and are being developed in such diverse locations as Seoul, Korea (ibid.), Osaka (the 'technoport' project), and Rio, Brazil (Amborski and Keare, 1998).

Even more grandiose than the Teleport Town island are the 'artificial platform cities' that are planned in Tokyo by the Obayashi real estate firm. These are 1 km^2 platforms raised 31m above the existing cityscape, supporting all necessary modern infrastructures and super-high-rise mixed-use buildings (see Figure 7.4). Taking the logic of the 'packaged city' to its logical extreme, an 800 m tall 'millennium tower', a 1 million m^2 'building city' 'with enough space to accommodate the entire central area of a large city' (ibid., 328) has also been suggested on a reclaimed space in Tokyo Bay.

London

In London, finally, the development of new packaged landscapes for the global financial services industries has been just as dramatic. As the Thatcher government in the United Kingdom sought to establish a wholly new space for global finance capital in the London Docklands in the 1980s it adopted what Shane calls a 'free-market, deregulated, hyper-developmental enclave' model of urban development (1995, 63). This fuelled intense speculative development, supported by major public subsidies and tax breaks. Later, following the bankruptcy of the main developers, the government realised that only an immense amount of both private and state-backed infrastructure (to the tune of $2.7 billion) could make the project work (Crilley, 1993; Foster, 1999).

Docklands has now emerged with a carefully customised light rail system, a short take-off and landing (STOL) airport, two teleports, six competing fibre optic grids and dedicated

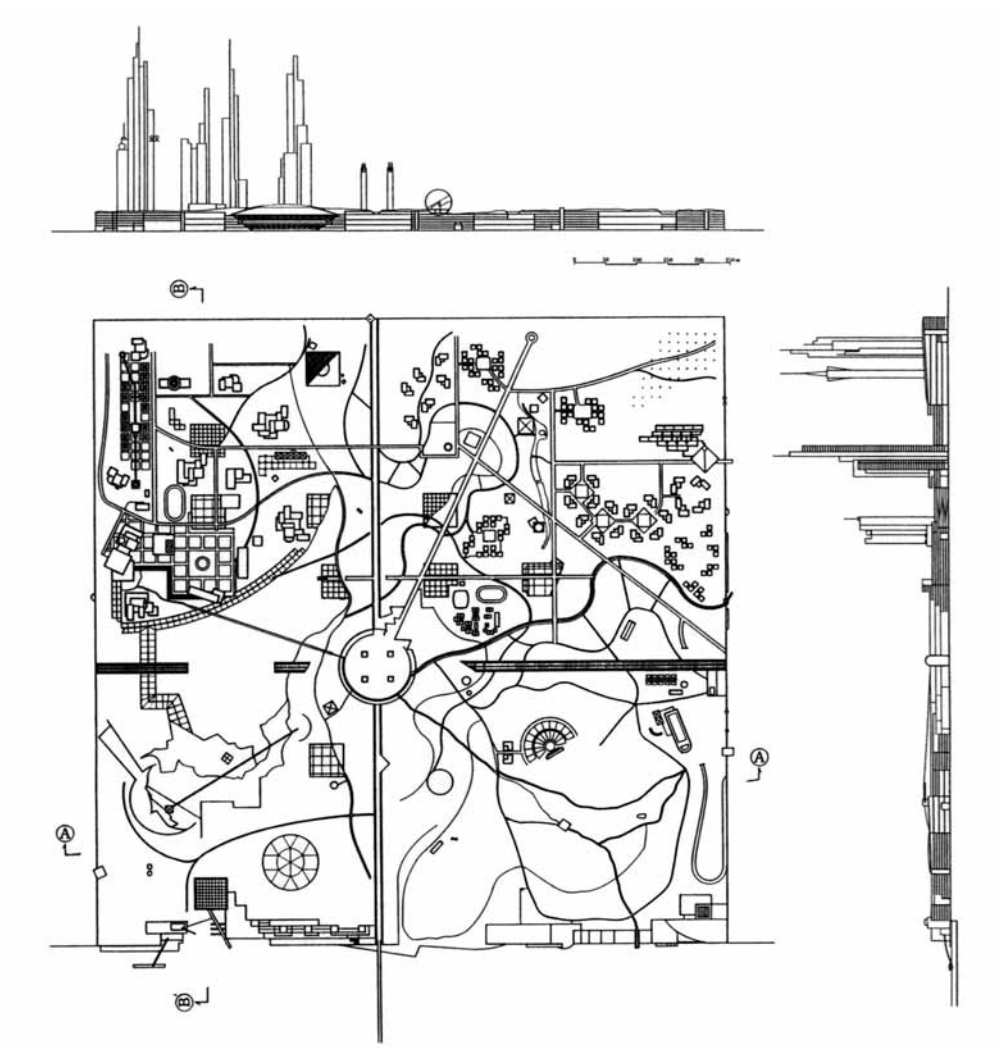

Figure 7.4 Artificial platform cities as envisaged for Tokyo: 1 km² urban platforms imposed on the cityscape to support new infrastructure and super-high-rise development. *Source*: Obitsu and Nagase (1998), 327

power, water, logistics and highway links. These allow high-income Docklands inhabitants and investors to connect with value spaces elsewhere whilst allowing them at the same time to secede relationally from the poor communities that geographically surround them (a strategy reinforced by the use of the old docks literally as moats (Avendano *et al.*, 1997)). (See Figure 7.5.)

Very notably, the Docklands light railway initially connected Docklands with the financial spaces of the City of London whilst avoiding most of the lower-income communities in the surrounding districts of Newham and Tower Hamlets. The United Kingdom's liberalised energy market allowed competing companies – for example, London Underground – to build

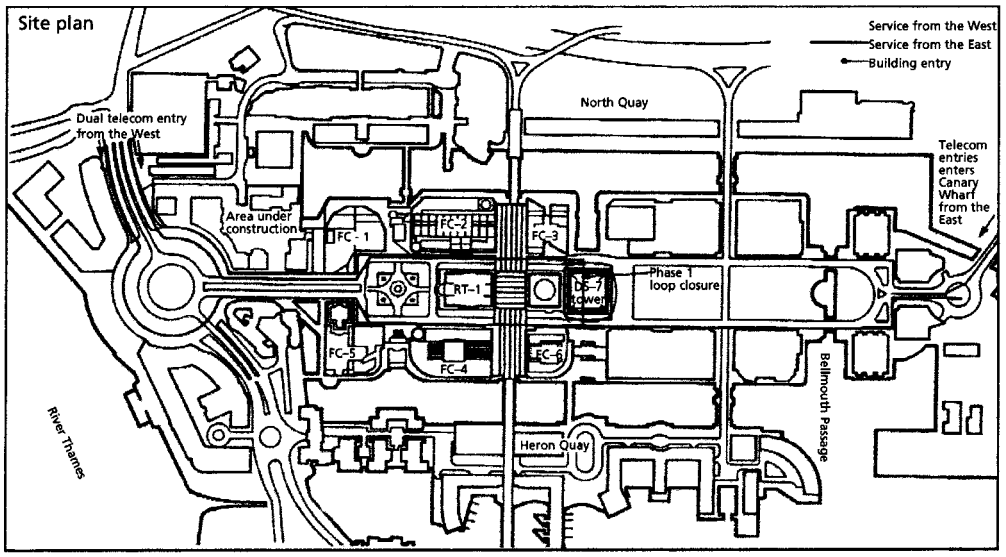

Figure 7.5 The carefully configured 'glocal' infrastructure connections of the London Docklands development. *Source*: adapted from Chevin (1991), 47

new electricity networks for Docklands, offering cheaper tariffs to the major companies located there. The highway link allowed commuter motorists to access Docklands seamlessly from professional housing spaces in the rest of the City. The newly built STOL airport provided direct connections with other European business capitals on the doorstep without having to access London's other airports. And a brand-new £1.3 billion Jubilee Tube line, completed in the year 2000, further improves the public transport to the West End of London and Westminster.

Particularly after the IRA bombing campaign of the early 1990s, access by road to the heart of Docklands, Canary Wharf, was carefully controlled by a so-called 'mini ring of steel' comprising CCTV cameras, a police cordon, a worker identity card scheme and a dedicated, patrolled tunnel road for approved goods deliveries (see Plate 15). All in all, Docklands was a paradigm example of how urban design approaches can be combined with security practices and highly selective infrastructural connections to configure a built space for certain users (global finance capital, allied industries and elite professional residents and workers) at the direct expense of others (adjacent multi-ethnic and low-income communities) (see Brownhill, 1990).

In Docklands customised infrastructural configurations are backed by intense electronic surveillance, 'fortress' architecture and private policing strategies in the new corporate enclaves. 'The rejection of a design framework for the area led to islands of development insulated from each other by security fences, stretches of open water, and the remnants of a derelict Docklands landscape' (Edwards, 1999, 23). Resulting commercial developments are 'inward looking and insular with "public" spaces on the inside. Externally they are forbidding' (ibid.). The emphasis is on securitisation and boundary control, to maintain and police the

Plate 15 London Docklands: a classic defensive glocal enclave with police cordons, digital CCTV surveillance, dedicated roads for goods access, defensive elite housing spaces and customised rail, air, energy, water and satellite connections. *Photographs*: Stephen Graham

stark social divides between wealthy and powerful and the marginalised and displaced. 'The landscapes of advantage and disadvantage are often only a security wall apart' (ibid.). The 'telehouse' development in Docklands, for example, boasts a 'sound-sensitive external fence which can detect a sparrow landing on it, infrared and videophone surveillance and cameras everywhere. Inside, customers [need] PIN numbers to head from chamber to chamber' (Quillinan, 1993, 14).

The 'mini ring of steel' around Docklands was, in fact, a direct echo of the strategy built up after the IRA's 1993 Bishopsgate bomb in the central financial core of London to partition carefully the core financial spaces of central London from the wider metropolis (Pawley, 1997, 153). In fact, as we show in Box 7.2, the global financial landscape of the City of London also represents something of a paradigm example of splintering urbanism. Whilst it is as electronically connected with far-off parts of the globe as any place on the planet, the City of London Corporation is simultaneously attempting to manage and remodel local connections by remodelling the 'public' streets inherited as part of the legacy of the modern infrastructural ideal.

INFRASTRUCTURE AND ECONOMIC ENCLAVES IN DEVELOPING CITIES

The linked construction of business and consumption enclaves and the networked infrastructures to sustain them are also a prevailing model of development in our second range of examples: aspiring 'global' cities in the Developing World. Many factors have combined to support this process: infrastructural liberalisation; the shift towards the construction of large, mixed-use 'superblock' enclaves in urban design; the shift towards extended, polycentric urban structures; a general process of social polarisation; and the predilection of local policy makers for large development projects to symbolise their modernising ambitions (so-called 'teleport' advanced telecommunications and satellite complexes, World Trade Centres, retail and commercial centres, new university precincts and the like).

In the largest 'megacity' in Latin America, São Paulo, for example, newly modernised and gentrified spaces of the city centre have been heavily supported by intense infrastructural investment by the state and private firms. As a result, there has been:

> a remarkable increase in the gap between the areas where the advanced 'global' activities are located and the peripheral areas. Internally, the implementation of sophisticated systems of infrastructure [like optic fibre, cable television and mobile telephony] have been concentrated either on existing business districts or on new business developments, generating new centralities for the whole urban complex.
>
> (Schiffer, 1997, 15)

In Bangkok, meanwhile, as we show in Box 7.3, this logic of interconnecting urban enclaves, at the expense of the wider city, is also taken to extremes.

BOX 7.3 INTERCONNECTING ENCLAVES OF NEW DEVELOPMENT IN AN EXTENDING MEGACITY: THE CASE OF BANGKOK

As the city of Bangkok explodes in a carpet of urbanisation stretching over 50 km from the original centre, all efforts to use infrastructure to integrate the city in a comprehensive manner have been abandoned. Instead, concessions are being offered for private developers to put in highways, metros and telecommunication lines connecting the places they most want to serve without real efforts to coordinate or integrate the resulting networks. Massive new private toll roads and expressways complement those operated by the state. These are oriented to the business enclaves and affluent residential spaces of growth corridors like those stretching out to the second Bangkok International and Don Muang airports at Chonburi. Until the Asian financial crash in 1998 separate, competing commuter and metro rail systems were being constructed, again by private firms seeking to cover the most lucrative spaces. Such networks will be 'uncoordinated in terms of fare structure and physical connection' (Kaothien *et al.*, 1997, 5).

Property companies are already taking 'advantage of high accessibility where the lines intersect to develop thematically oriented mixed-use "new towns in town"' comprising office, retail, leisure and housing spaces geared to the needs of affluent commuters – see Figure 7.6 (Kaothien *et al.*, 1997, 5). Over 50,000 low-income residents have been displaced over the past few years from shanty towns to clear the way for such 'mega-development' projects. Such people are expelled to the periphery, where they are poorly served by transit and infrastructure (Hack, 1997, 8). 'This process is being further fuelled by private redevelopment of inner city areas for high income residents and offices' (ibid., 8). The partial liberalisation of telecommunications – formerly the city's greatest infrastructural deficiency – has allowed new entrants to meet the unsatisfied demand for wiring up and servicing the new middle-class spaces of the expanding city.

Outside the core area, the installation of fibre optics along the so-called 'intelligent corridor' round the major outer ring roads is reinforcing the linear expansion of the city into exurban areas (Hack, 1997, 11). A 'leapfrog' strategy is being encouraged, 'providing households and firms with fibre optic services

Figure 7.6 The four 'new towns in town' development: enclaves built on key infrastructure nodes in Bangkok. *Source*: Kaothien *et al.* (1997), 6

in high-income, educational, knowledge and high value industrial areas' at the expense of the wider city (Kaothien *et al.*, 1997, 14). Overall, the pattern of infrastructure in Bangkok, as in many other 'megacities' in the Developing World, shows a notable lack of horizontal coordination either within or between networks. The result, combined with the pattern of large-scale packaged development and market-oriented infrastructure providers, is 'oversupply in some areas and lack of services in others' (ibid., 14).

CONSTRUCTING 'HOME' DISTRICTS FOR CYBERSPACE: NEW MEDIA ENCLAVES IN GLOBAL CITIES

Our third type of emerging economic enclave, like the global financial cores, tends to be located in the 'global' cities of North America and Europe: the gentrifying 'cyber' district. Such spaces are now driving the production of Internet services, Web sites and the whole digitisation of design, architecture, gaming, CD-ROMs and music. The cities that are developing such enclaves tend to be those with very great strengths in the arts, cultural industries, fashion, publishing and computing: New York, San Francisco and London, to name but three (see Braczyk *et al.*, 1999; Zook, 2000).

THE 'INTERNETTING' OF MANHATTAN AND SAN FRANCISCO: CONSTRUCTING 'SILICON ALLEY' AND 'MULTIMEDIA GULCH'

Manhattan, for example, now provides one of the highest concentrations of Internet activity anywhere on earth, as the Internet and digital multimedia technologies weave in to support every aspect of the functioning of the city. According to Moss and Townsend (1997), Manhattan now has twice the 'domain density' (i.e. concentration of Internet hosts) of the next most 'Internet-rich' US city – San Francisco – and six times the US average.

In fact, the metropolitan dominance of the Internet in the United States is actually *growing* rather than declining, despite its association with rural 'electronic cottages' (Graham and Marvin, 1996). The top fifteen metropolitan core regions in the United States in Internet domains accounted for just 4.3 per cent of the national population in 1996. But they contained 12.6 per cent of the US total in April 1994; by 1996 the figure had risen to almost 20 per cent as the Internet was becoming a massly diffused and corporately rich system. As Moss and Townsend (1997) suggest, 'the highly disproportionate share of Internet growth in these cities demonstrates that Internet growth is not weakening the role of information-intensive cities. In fact, the activities of information-producing cities have been *driving the growth of the Internet* in the last three years' (emphasis added).

Manhattan is home to a booming set of interactive media industries. In particular, Manhattan's so-called 'Silicon Alley' – roughly the area south of Forty-first Street – is emerging

as a dominant global provider of Internet and multimedia skills, design and high value-added content of all sorts. As in San Francisco's so-called 'Multimedia Gulch' district, several downtown urban neighbourhoods have been refurbished and gentrified to sustain the clustering demands of interlocking micro, small and medium-size firms in digital design, advertising, gaming, publishing, fashion, music, multimedia, computing and communications. In Manhattan, over 2,200 firms now provide over 56,000 jobs in these sectors, up 105 per cent between 1996 and 1998 (Rothstein, 1998).

Here, as with global financial service sectors, the need for on-going face-to-face contact to sustain continuous innovation is closely combined with exceptionally high use of advanced telecommunications to link relationally and continuously with the rest of the planet. Increasingly, too, certain downtown spaces are being constructed as the 'in' spaces of Internet innovation, places with a 'creative' urban ambience and 'milieu' that contrasts starkly with the sanitised campus landscapes of technopoles.

CYBERDISTRICTS, GENTRIFICATION AND URBAN SOCIAL CONFLICT

Such processes have set off spirals of gentrification, attracting considerable investment from restaurants, corporate retailers, property firms, 'loft' developers and infrastructure companies, and leading to the exclusion of lower-income groups from the newly 'high end' space (see Zukin, 1982). Rents have exploded and, somewhat ironically for an industry whose products can be sent on-line anywhere on earth, parking shortages have become critical.

In both New York and San Francisco major urban social and political conflicts have emerged as 'dot-commers', with their extraordinary wealth, along with real estate speculators and service providers, have colonised selected districts. This has, not surprisingly, dramatically driven up rents, leading to the eviction or exclusion of many poorer residents and to growing efforts at disciplining those who are not tapped into the high-tech, consumerist gentrification (in this case the poor and the black). As Dolgon (1999) suggests, the reconstruction of urban neighbourhoods as chic districts for young professional 'digerati' is often portrayed on the surface as the 'celebrating [of] a diverse and plural community' manifest in diverse ethnic restaurants, art spaces and shops. In reality, however, it tends to 'reinforce a class hierarchy that includes only those with access to new markets'. Furthermore the 'new landscapes of power' created in the process tend to 'further marginalize those whose downward mobility places them outside the marketplace of democracy, diversity, and identity except in their invocations as the hungry, the homeless, panhandlers, and the other "rude rabble"' (ibid.).

In San Francisco's 'Multimedia Gulch' district, centred on the SOMA area of the city, political coalitions such as the 'Yuppie Eradication Project' are already fighting back against the 'dot-com invasion' from Silicon Valley to the south (Solnit, 2000). Their campaign operates under the banner 'The Internet killed San Francisco' (see Figure 7.7). Paul Borsook (1999) outlines the symptoms of what he calls the 'Internetting' of the city: commercial real estate rates rose 42 per cent between 1997 and 1999; the median-price apartment was $410,000 by August 1999; the median rental for an apartment was over $2,000 per month;

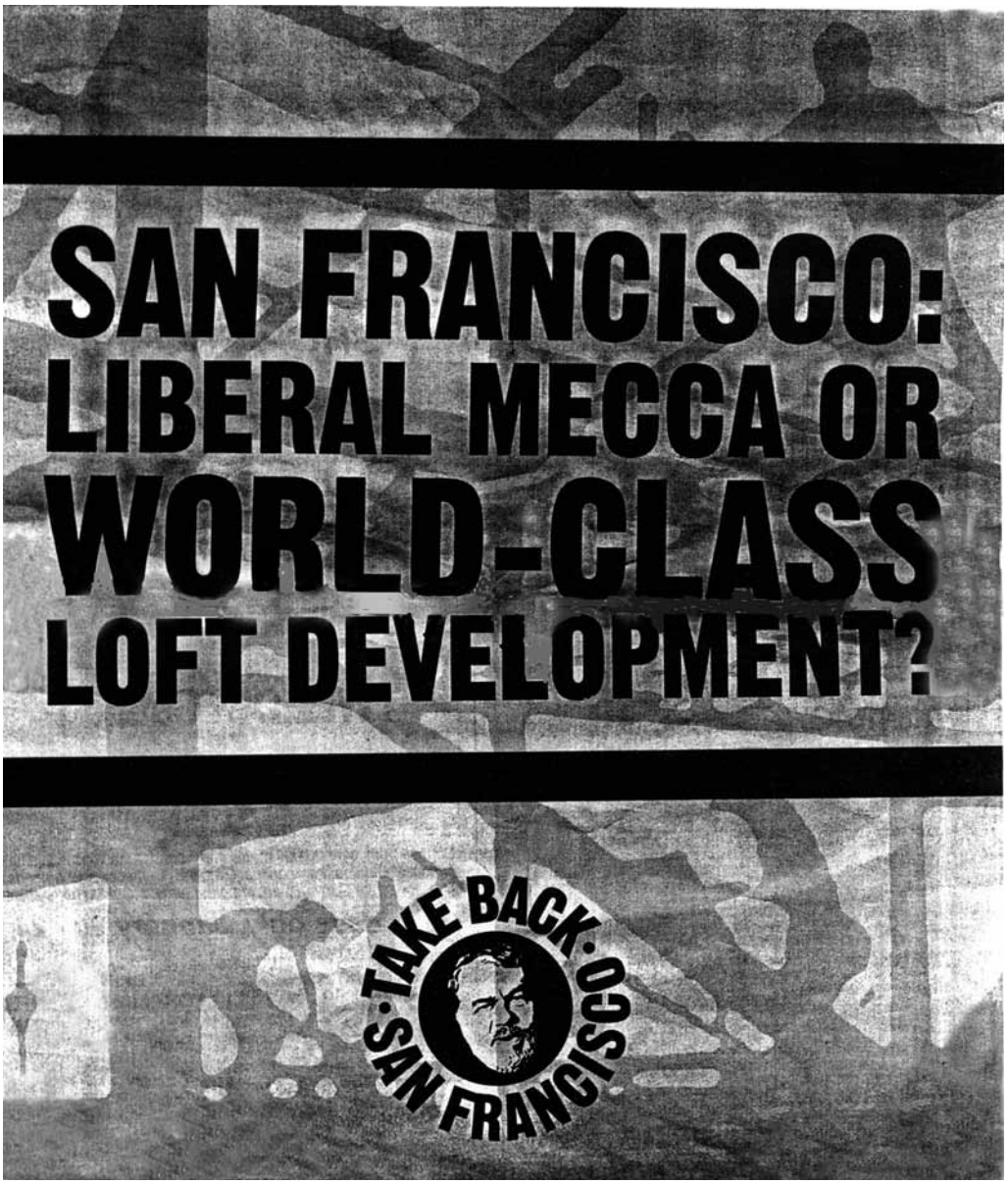

Figure 7.7 Backlash against the colonisation of San Francisco neighbourhoods by affluent Internet and multimedia companies and their employees: lobbying by the *San Francisco Bay Guardian*

homelessness rates were rising fast. Landlords, backed by the relaxation of rent controls and tenant protection laws by the City Council in the 1990s, have instigated a huge rise in evictions. The rising stress levels which have resulted for older residents of gentrifying neighbourhoods have been linked with rapid rises in the death rates of elderly seniors (Nieves, 2000, 12). The result is a severe housing crisis, the expulsion of poorer people from the city

(as many cannot afford to remain) and accentuating landscapes of social and geographical polarisation as pockets of the city are repackaged as places of work, leisure or living for Internet-based businesses and entrepreneurs.

'ULTIMATE GLOBAL CONNECTORS': CONSTRUCTING INTERNET-READY REAL ESTATE

Within such so-called 'digital districts', new types of work spaces, often with integrated living quarters, are also being configured. Within these, new infrastructural connections are closely combined with highly flexible and carefully configured office suites. Labelled 'Internet-ready' real estate by its inventors, a series of new complexes for interactive media firms is now emerging at the heart of the 'cyber districts'. The New York Information Technology Center, for example, a thirty-storey, 400,000 ft^2 building, sells itself as 'Manhattan's hottest wired building' and 'the ultimate global connector'. To its tenants of CD-ROM developers, Web companies, digital design consultancies and virtual reality artists it offers a dazzling suite of global telecommunications connections, from seven competing companies, direct from the desk, at bandwidths that few other buildings in the world can handle. Emergency power back-up, twenty-four-hour security and training, all-important meeting space, secretarial services and advanced fire suppression systems are also provided. The full suite of high-power electrical systems is especially important, as 'most buildings today are equipped with only 10 per cent of the necessary requirements' of an e-commerce or Web company (Bernet, 2000).

The city of New York has supported the emergence of the new media enclaves with tax holidays, grants, loan funds and financial support for the 'Plug 'n' go' programme to convert properties into Internet-ready real estate (see Figure 7.8). By 2000 millions of square feet of older commercial property across mid town Manhattan were being converted and customised for the new media industry (*New York Times*, 21 March 2000). To match the imperative of twenty-four-hour-a-day, year-round electric and electronic connections, these spaces are being equipped with 'massive quantities of electric power, advanced back-up power and security systems, and generator farms that allow tenants to install and manage their own generators' (*New York Times*, 21 March 2000, 6).

DIGITAL MEDIA CLUSTERS AND 'BYPASS' ELECTRONIC INFRASTRUCTURES: THE CASE OF LONDON

London, too, is extending its cutting-edge, customised telecommunications networks into its booming digital cultural and media industries. In Soho, for example, a tightly constructed media enclave is benefiting from dedicated infrastructure allowing it to extend to global markets in 'real time'. Called 'Sohonet', this system links the tight concentration of film and media companies, television broadcasters, publishers, Internet providers, graphic designers and recording studio headquarters in the West End directly with Hollywood film studios via seamless transatlantic fibre connections (see http://www.sohonet.co.uk).

Figure 7.8 Advertisements for Internet-ready real estate in Manhattan, New York: the 'Plug 'n' go' workspace programme and the New York Telecom Exchange. *Sources*: New York City Economic Development Corporation; New York Telecom Exchange

Sohonet allows on-line film transmission, 'virtual studios' and editing over intercontinental scales via highly capable, digital, broadband connections (see Plate 16). The network is seen as a critical boost to the broader global ambitions of the UK film and cultural industries. Other connections are planned with other global cities, leading to the possibility of a dedicated, global, interurban system for digital film and media production in the near future. Thus, once again, it is clear that patterns of tight geographical clustering, relying on intense, on-going, face-to-face innovation and contact, linked globally and locally through sophisticated telemediated networks, are a feature of many of the industries which concentrate in global cities (not just financial services and corporate services).

TECHNOPOLES AND THE CONSTRUCTION OF HIGH-TECH INNOVATION CLUSTERS

> There is a great deal of interest in technopoles as economic growth engines, some interest in them as new forms of cultural representation, and practically no interest in their political governance, that is, addressing [them] as sites of political power, and their residents as citizens.
>
> (Mosco, 1999a, 40)

Plate 16 The Sohonet under construction in the Soho district of London, a centre of media activity. *Source*: Sohonet Web page www.sohonet.co.uk

Our fourth example of carefully networked emerging urban enclaves encompasses the new spaces of 'high-tech' production and innovation that are emerging in new or renewed spaces of production in the North (such as southern California, Baden-Württemberg, and the Rhône Alps region of France); in the campus-like technopoles surrounding reconfigured global cities (such as London, Paris, Berlin); and in the newly constructed high-tech production and innovation spaces of the South (in places like Bangalore in India and the Multimedia Super Corridor south of Kuala Lumpur).

Such is the litany of imitators of Silicon Valley that virtually every region of the world now boasts a 'Silicon'-prefixed space or district, an alleged home to clusters of new high-tech firms and corporate research and development complexes, working (supposedly) in complex interdependence. The Siliconia Web site, which tracks the global diffusion of silicon or cyber prefixes to place marketing and urban boosterist strategies, listed fifty-one such sites in June 1999 worldwide, ranging from Silicon Prairie (Kansas City), Silicon Glacier (Kalispel,

Montana) and Silicon Glen (central Scotland), to Silicon Island (Taiwan), Silicon Plateau (Bangalore, India), Silicon Wasi (Tel Aviv, Israel), Silicon Plain (Kempele, Finland) and Silicon Beach (Santa Barbara, California) (available at http://www.tbtf.com/siliconia.html). However, it must be stressed that a much smaller number of spaces can be genuinely classified as 'new industrial spaces', in the sense that self-sustaining high-tech clusters of innovation are emerging there. Countless others are merely attempts symbolically to turn round the fortunes of ailing or peripheral spaces through decidedly optimistic place marketing.

In all these 'technopole' spaces, which Castells and Hall (1994) label the 'mines and foundries of the informational economy', highly customised and packaged 'edge city'-style landscapes are emerging. Within these, produced space is carefully combined with customised infrastructure whilst design practices, 'filtering' local infrastructures, surveillance and simple geographical distance are often used to connect selectively with only more prosperous parts of the host city or region. In fact the produced spaces, the customised infrastructures, the secure withdrawal and the supporting institutional and financial infrastructure of local agencies are seen to be central in supporting or nurturing the appropriate 'innovative milieux' or 'clusters' to create self-sustaining growth and development (Castells and Hall, 1994, 8).

These are the spaces, often distributed around the polycentric metropolis, where flexible production techniques flourish, where biotechnologies and information technologies are at the cutting edge, and where continuous research and development are necessary for non-stop innovation (Storper, 1997). We do not intend here to explore the technological dynamics of new industrial spaces (for reviews see Castells and Hall, 1994; Storper, 1997). Rather, we maintain our analysis of the central theme of this chapter, namely: how the new packaged landscapes underpinning technopoles and new industrial spaces are being produced in tight relationship with carefully configured, highly selective infrastructure networks. Whilst the binary distinction is a massive oversimplification, in what follows we divide our discussion of technopoles broadly between those in the Developed World and those in the Developing World.

INFRASTRUCTURE AND THE GROWTH OF HIGH-TECH CLUSTERS IN THE CITIES OF THE NORTH

The burgeoning new industrial spaces surrounding dominant Northern cities – the quintessential Silicon Valley, Route 128 to the west of Boston, Massachusetts, the Cambridge growth area north-east of London, Baden-Württemberg in Germany – are born out of a potent fusion of intense, on-going innovation, supportive finance capital, world-class labour market skills and universities, a little bit of serendipity and sophisticated, but highly partial, infrastructural links: state-of-the-art digital telecommunications, dedicated highway networks, excellent links with global hub airports, uninterruptible power supplies and, inevitably, generous water systems, both to fuel the water-hungry production processes and to irrigate the corporate lawns and atria.

In the United States, for example, real estate developers now routinely customise spaces with 'global connectivity' to try and lure in computing, multimedia, biotechnology and new

materials companies, especially in the booming group of 'high-tech' cities like Boston, Austin, Silicon Valley, Seattle, Dallas, and Denver (Grogan, 1998). The 'Infomart' development in Dallas, for example, bundles unprecedented communications bandwidth into highly flexible office and production suites within a 1.6 million ft^2 complex catering to the needs of 120 small firms. Small, high-quality, flexible spaces with short leases are backed by many shared amenities, shared services and a high degree of infrastructural redundancy within such complexes. Such 'flex-tech' architecture is finding its expression in larger real estate strategies for whole innovation parks such as the Spectrum development in Irvine, California, which supports five major development clusters in computers, software, biomedical technology, medical devices and automotive engineering (ibid., 92). Custom-built high-tech office complexes have also emerged at major railway stations on the outskirts of major cities in Switzerland (Lehrer, 1994).

Strategies to generate new industrial spaces and clusters artificially on urban peripheries have long been supported in *dirigiste* countries such as France, Singapore and Japan, where vast new infrastructures have been combined with new urban complexes and universities in the 'technopole' and 'technopolis' programmes of national and regional governments. The Japanese technopolis concept, in particular, relies on a modular model encompassing a range of physical developments (R&D centres, higher education buildings, universities, etc.), tightly integrated with airport links, Bullet train connections, high bandwidth telecommunications, cable networks and dedicated water and power supplies (Rimmer, 1991; Markusen *et al.*, 1999).

Interiorised constructions and external delinking

Carefully configuring the infrastructure networks of new industrial spaces allows such places to extend their links to global markets and connections. But that also helps the innovation cluster itself to develop highly filtered links with its adjacent city. Whilst the 'clustering' of innovative firms encourages dense relations within new industrial spaces, they often have a semi-detached relationship with the wider urban landscape. The architecture of technopoles like Silicon Valley 'is shaped by land costs, parcel availability, road access, and business expansion and contraction rates' (Schwarzer, 1998b, 16). Resulting developments tend to be inward-looking. 'The real landscape of Silicon Valley,' writes Rebecca Solnitt, 'seems wholly interior, not only in the metaphor of the maze and the terrain of offices and suburbs, but in the much promoted ideal of the user never leaving the well-wired home or office and the goal of eliminating the world and reconstituting it as information' (1995, 231).

Typically, supporting infrastructures, services and labour are drawn in to such new industrial spaces, whilst connections with the poorer socioeconomic and sociotechnical spaces of the metropolis are neglected or undermined (often through the instrument of explosive rises in housing and living costs) (see Mosco, 1999a). 'Just across Highway 101' from the university–industrial complex of Silicon Valley, for example, 'is East Palo Alto, a ghetto in which chronic poverty and unemployment among its black residents seem beyond remedy.

. . . But for those in the white, self-actualizing utopia of Silicon Valley, the poor and black are of little concern' (Winner, 1992, 49). A whole network of hostels have emerged in the valley even to house the working poor – those who do crucial but relatively low-skill jobs but have no way of affording the rents or purchase prices for housing. (Median house costs in early 2000 were $410,000; median one-bed apartment rents were $1,700 per month.) Many caretakers and cleaners, unable to afford market rents, are squeezed into converted garages in overcrowded conditions. In addition, high-tech companies use the method of subcontracting to absolve themselves of responsibility for such workers' welfare. A spokesman for the IT firm KLA-Tencor, for example, when challenged to pay the company's janitors a living wage, stated that 'the janitors are not our employees, and we don't comment on other companies' employees' (Greenhouse, 2000, A12).

'ISLANDS WHERE EVERYTHING WORKS': CONSTRUCTING 'TECHNOPOLES' IN PERIPHERAL AND DEVELOPING WORLD CITIES

As microelectronics and software production plants are also gradually shifted 'offshore' to lower-cost locations in the newly industrialising and developing countries, technopoles and 'high-tech' spaces are increasingly a feature of cities in those countries – the products of increasingly elaborate development strategies by cities, regions and nations (see Van Grunsven and Van Egeraat, 1999).

Policy makers in Japan, for example, eager to secure the land, natural resources and cheap labour denied them at home, have even developed concepts of 'packaged' cities which are fully self-contained innovation and production spaces ready to be implanted in newly industrialising or developing nations (Rimmer, 1991). The Mitsubishi Electric Corporation developed a programme in the 1980s to export prepackaged technopolis cities to the main urban corridors of South East Asia (ibid., 253) (see Figure 7.9). In 1987 the Japanese Ministry of International Trade and Industry (MITI) also produced a grandiose vision of a 'multifunction *polis*', a 'high-tech' city of 100,000, with carefully customised infrastructure, which was proposed for a site to the north of Adelaide, South Australia.

Bangalore: a paradigmatic developing world technopole

In Developing World new industrial spaces, however, the precise configuration of infrastructure is even more important than in the North because the quality and reliability of the existing networks are often so poor. A good example is India's fifth largest city, Bangalore, an internationally important centre of software engineering and electronic commerce which sells itself to the world as 'India's Silicon Valley' (Wetzler, 2000). Here, extensive efforts have been made by real estate developers and local planning agencies to configure special software and technology campuses and enclaves to the needs of fast-growing inward investing

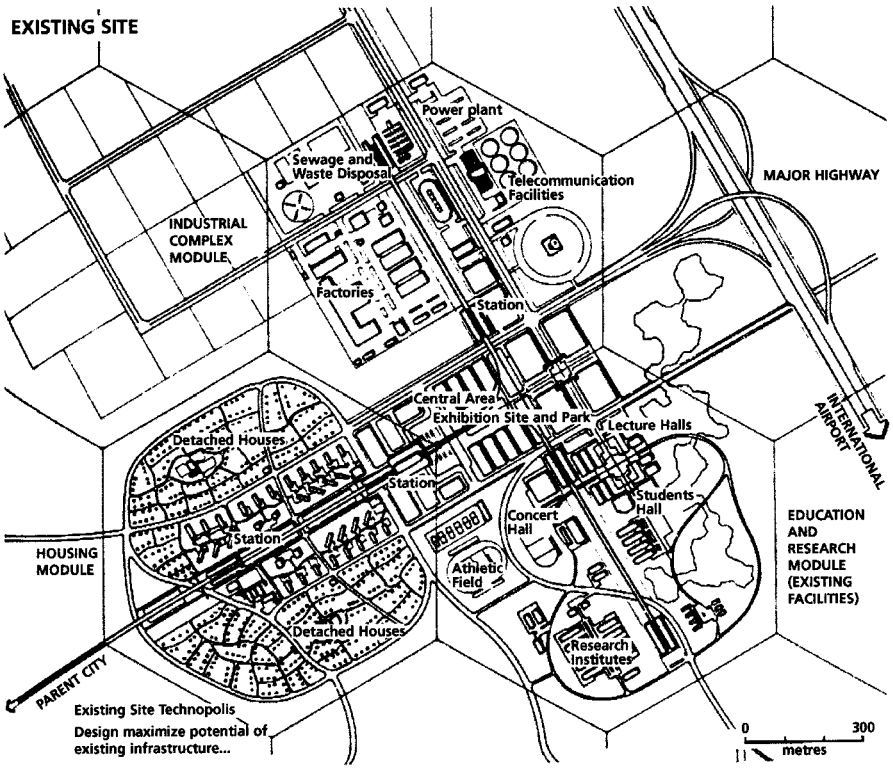

Figure 7.9 Mitsubishi Electric Corporation's concept of a modular technopolis, complete with customised infrastructural connections. *Source*: Rimmer (1991), 259

and indigenous software and IT firms that deliver services and products to global markets. The city's 300 high-tech companies employed over 40,000 people in early 2000 (ibid., 154).

The heightened wealth inequalities resulting from high-tech growth in Bangalore have created an extremely fragmented and polarised urban structure. It is based on 'participation in the information-intensive global economy by a core elite, and non-participation by the masses' (Madon, 1998, 232). At the Electronics City complex, for example, three-quarters of a mile from the centre, several hundred acres of 'offshore' technology campus have been configured to house companies like Texas Instruments (undertaking circuit design), IBM, 3-M and Motorola. The Indian firm Wipro, another major presence, exploits advanced communications to use India's cheap software programmers to service many of the world's computers remotely. All these firms 'are insulated from the world outside by power generators, by the leasing of special telephone lines, and by an international-style work environment' (ibid., 234). With their on-site ATMs, soaring postmodern buildings and multiple redundant infrastructures, such parks, in effect, are 'islands where everything works' within surrounding spaces where modern facilities and networked connections are both very limited and extremely unreliable (Dugger, 2000, 12).

Singaporean capital has also constructed an Information Technology Park on the outskirts of Bangalore, equipping it with dedicated satellite ground stations, broadband

telecommunications, uninterrupted power supplies, back-up generators and international-standard private water, sanitation and waste disposal services (Wetzler, 2000). Because of the poor quality of the regional telecoms infrastructure, the park also serves a regional role as a hub linking global markets: 'companies within 30 km of the park can simply point their microwave antennae and connect by satellite link to clients anywhere in the world' (Rapaport, 1996, 105). Celia Dugger argues that most businesses within the new technology parks 'don't need decent roads: they can deliver their products via satellite links of fibre optic cables' (2000, 12). The Information Technology Park is also integrated with luxurious residential and leisure facilities, separating them even further from the prevailing poverty in the shanty towns which house the bulk of the city's in-migrant population (over 50 per cent of whom are illiterate). 'You won't see many Horatio Algers leaping from the shanty towns to workstations in Bangalore's infotech forms' (Wetzler, 2000, 166).

Indeed, whilst the bulk of public and infrastructural investment centres on linking the new parks globally and securing them locally, the local municipality has actively worked to bulldoze 'illegal' self-built housing areas in the name of a civic modernisation 'clean-up' programme. Thus it is clear that 'the recent internationalization of Bangalore has had a negative impact on the poor' (Madon, 1998, 236). The condition of shanty town areas is deteriorating and many have very poor access to mains water, communications, energy or metalled roads and motorised transport – a sharp contrast to the glocally configured modern landscapes of the new technopolis parks that they surround. In fact, a broader infrastructure crisis is emerging for the poorer majority of the city: shortages and interruptions of power are common, a water shortage is looming and the city authorities are desperately trying to attract private sector investment into the poorer districts.

The technology parks in Bangalore, however, are tiny compared with the most ambitious attempt to customise an entire metropolitan corridor to the needs of the international IT and multimedia industries: Malaysia's Multimedia Super Corridor (MSC). We explore the case of the MSC in more detail in Box 7.4.

CUSTOMISING INFRASTRUCTURE FOR FOREIGN DIRECT INVESTMENT IN MANUFACTURING

In our fifth range of examples, strikingly similar processes of customising infrastructure to the precise needs of export-oriented foreign direct investors are also widely established in an area where the race between cities and regions to lure in new investment is even more intense – the struggle for mobile routinised manufacturing (Dunning and Narula, 1996; Chan, 1995). Across the emerging urban and regional development strategies of North America, Europe, Asia, South Africa, the Middle East, Australasia and Latin America, there is one broadly consistent feature: intensive efforts to configure built space and infrastructure needs in parallel to the detailed desires and wants of manufacturing inward investors. This reflects the global mushrooming of flows of foreign direct investment from $77 billion in 1983 to $644 billion in 1998 (Robinson and Harris, 2000, 33).