CHAPTER III

TNCs IN INFRASTRUCTURE INDUSTRIES

The provision of good quality infrastructure services is a prerequisite for economic and social development. In terms of both the quantity and quality of key infrastructure services and utilities, such as electricity, telecommunications, transport and water supply, there are significant gaps between developing and developed countries and among developing countries at different stages of development. Indeed, in developing countries, insufficient provision of infrastructure and related services is one of the main obstacles to accelerating or maintaining the pace of development and to achieving the Millennium Development Goals (MDGs) set by the United Nations in 2000. One way of addressing the shortfalls in infrastructure and related services in developing countries is to mobilize FDI and other forms of TNC participation to supplement and complement the activities of domestic public and private infrastructure enterprises.

This chapter examines the involvement of TNCs in the establishment and operation of infrastructure facilities and related services, especially in developing countries. It begins with a review of developments in infrastructure industries, examining their distinctive features and the scale and scope of infrastructure investment and operations worldwide. Section A analyses various factors that influence FDI and TNC activity, including the impact of globalization and technological changes, the changing role of the State, the prevalence of investment gaps and the rise of new players to help bridge these gaps. Section B identifies trends in FDI and other types of TNC involvement in infrastructure industries, especially in developing countries. Section C reviews the main TNC players involved, and section D discusses the determinants of TNC investment and activities.

A. Main features of infrastructure industries and emerging issues

1. Characteristics of infrastructure industries

There is no commonly agreed usage of the term infrastructure, but the concept, in its broadest sense, comprises the physical facilities, institutions and organizational structures, or the social and economic foundations, for the operation of a society. Within this broad concept, social infrastructure (e.g. health and education) can be distinguished from economic infrastructure. The latter directly supports production activities of enterprises at various points of the value chain, and is thus directly relevant to the competitiveness of firms and to economic development. *WIR08* focuses on *economic infrastructure*,[1] which is a homogeneous group in the sense that it underpins the functioning of other economic activities, and is hence directly relevant to the competitiveness of firms and to economic development. Infrastructure[2] consists of a group of industries, including electricity, gas, telecommunications, water and sewage, airports, roads, railways and

seaports (the last four collectively referred to as transport infrastructure).[3] Nevertheless, the definition is fluid, especially with the advent of advanced information and communication technologies (ICT) that have affected the nature of telecommunications facilities and services.

The activities of the infrastructure industries can be considered as including the establishment, operation and maintenance of fixed infrastructure. This report focuses on the infrastructure industries themselves, as presented in table III.1 (listing different categories based on Standard Industrial Classification (SIC) codes), which include both "infrastructure facility operation and maintenance" (e.g. power stations) and "infrastructure services" (e.g. electricity distribution services). It distinguishes between the infrastructure industries per se ("infrastructure") and broader, related activities, which include services directly relying on the provision of infrastructure (table III.1). For example, airports and seaports – and the services they provide to vehicle and aircraft operators – are included as infrastructure, but not the actual air transport or shipping activities that utilize these infrastructure facilities and services.

There is a close relationship between infrastructure industries and supplier industries and activities, such as the construction industry (backward linkages), and user industries such as air, road or sea transportation services (forward linkages). Both supplier and user industries fall outside the boundaries of infrastructure as used in this report (table III.1), even though they are closely related as providers of inputs or as direct users of services. In addition, the analysis of TNCs in this chapter also makes a distinction between those firms whose primary operations are in an infrastructure industry (infrastructure TNCs or firms "rooted" in infrastructure) and those, such as manufacturing or financial firms, that have ancillary operations in infrastructure (other TNCs in infrastructure).

Infrastructure activities are often regarded by many investors and operators as high-risk undertakings, especially when conducted in developing or transition economies (Ramamurti and Doh, 2004). Some of these risks are common to all kinds of infrastructure projects, while others pertain to a specific industry. These risks may be accentuated when investors operate in foreign countries and investments are undertaken in low-income countries. Risks from the corporate perspective include uncertainty of returns on investment in infrastructure, political risk (e.g. governments reneging on contracts, popular protests against private or foreign firms) and the ability of users to pay. Moreover, not all political and other non-commercial risks can be covered through the private insurance market (Berne Union, 2008). Governments also need to consider the risks they face from investors, including TNCs reneging on contracts. The high-risk nature of infrastructure activities, as well as other aspects of infrastructure industries that influence investment, derive from some of the distinctive features of these industries:

- Infrastructure industries include very capital-intensive and complex activities (boxes III.1–4). Typically, infrastructure assets last a long time, involve huge sunk costs and are location-specific. This makes them formidable undertakings, especially for developing countries, which often depend on technology, expertise and financial resources from overseas.
- Since infrastructure industries often involve (physical) networks, they are frequently oligopolistic (or monopolistic) in nature. Thus control or access to the network can be a key competitive advantage, and requires strict regulation.
- Many societies regard access to infrastructure services as a social and political issue. Such services may be considered public goods, in the sense that they should be available to all users, and some (e.g. water supply) are considered a human right.[4] Other infrastructure industries or services, such as ports, are considered by many governments to be of strategic importance.
- Infrastructure industries are a major determinant of the competitiveness of an economy as a whole. Their role as inputs for all other industries means that the entry and performance of private companies (including TNCs) in infrastructure activities have to be evaluated not just in terms of the efficiency and competitiveness of the services concerned (based on cost, price and quality, for example) but also in terms of their impact on industrial users.
- Infrastructure is key to economic development and integration into the world economy (ESCAP, 2006; OECD, 2006a; World Bank, 2005).[5] Good transportation and telecommunications infrastructure can contribute to an economy's national and subnational competitiveness[6] and to poverty alleviation.[7] The provision of efficient and adequate electricity is vital for industrial development and economic growth, but also for helping countries attain the MDGs, including poverty alleviation (IEA, 2003). The provision of good infrastructure in turn is a major determinant of inward FDI (Bellak, Leibrecht and Damijan, 2007; Kirkpatrick, Parker and Zhang 2006; Asiedu, 2002).

Because infrastructure is essential for development, increasing investment in this area of activities should be a priority for developing countries. It is not a question of "if" but rather "what", "when", "how much", "by whom" and "for whom" (section

Table III.1. Infrastructure industries and related activities

<table>
<tr><th colspan="2" rowspan="3">Infrastructure</th><th rowspan="3">Supplier industries and activities</th><th colspan="3">Infrastructure sectors</th></tr>
<tr><th colspan="2">Infrastructure industries</th><th rowspan="2">Services relying directly on infrastructure</th></tr>
<tr><th>Facility operation and maintenance</th><th>Infrastructure services</th></tr>
<tr><td rowspan="5">Transport</td><td>Seaports</td><td>...</td><td>Marine cargo handling (4491)</td><td>Towing and tugboat services (4492)</td><td>Deep sea transportation of freight (441–442)</td></tr>
<tr><td>Railroads</td><td>Railway track equipment (part of 3531)</td><td>Railroads, line-haul operating (4011)</td><td>Railroad switching and terminal establishments (4013)</td><td>Local and suburban transit (4111)</td></tr>
<tr><td>Roads and highways</td><td rowspan="2">Heavy construction other than building (16, exc. 1623)</td><td>Terminal and joint terminal maintenance (423)</td><td>Terminal and service facilities for motor vehicle (417)</td><td>Motor freight transportation and warehousing (421–422)</td></tr>
<tr><td>Airports</td><td colspan="2">Airports, flying fields, and airport terminals (458)</td><td rowspan="2">Air transportation (451–452)</td></tr>
<tr><td>Other</td><td>Parts of heavy construction, not elsewhere classified (1629)</td><td>...</td><td>Parts of miscellaneous services incidental to transportation (4785)</td></tr>
<tr><td colspan="2" rowspan="2">Telecommunications</td><td>Telephone and telegraph apparatus (3661)</td><td colspan="2">Telephone communications (481)</td><td rowspan="2">Radio broadcasting stations (4832), Television broadcasting stations (4833)</td></tr>
<tr><td>Telephone interconnect systems (7385)</td><td colspan="2">Telegraph and other message communications (482)</td></tr>
<tr><td colspan="2" rowspan="2">Water</td><td rowspan="5">Water, sewer, pipeline, and communications and power line construction (1623)</td><td colspan="2">Water supply (494)</td><td rowspan="2">Irrigation systems (497)</td></tr>
<tr><td colspan="2">Sanitary services (495)</td></tr>
<tr><td colspan="2" rowspan="3">Power</td><td>Electric services (491) (generation and transmission)</td><td>Electric services (491) (distribution)</td><td rowspan="3">…</td></tr>
<tr><td>Natural gas transmission and distribution (4922), gas production (4955)</td><td>Natural gas transmission and distribution (4923) and distribution (4924)</td></tr>
<tr><td colspan="2">Combination electric and gas, and other utility (493)</td></tr>
<tr><td colspan="3"></td><td colspan="2">Steam and air-conditioning supply (496)</td></tr>
</table>

Source: UNCTAD.

Note: The classification used here is based on the SIC codes indicated in brackets.

A.2). At the same time, the questions surrounding investment by private companies (including TNCs) in infrastructure activities are more far-reaching than in most other industries, and touch on the economic, social and political spheres (chapter IV).

Each infrastructure industry has its own individual characteristics. Therefore, while the above-mentioned features generally apply to all of them, it is important to note the distinctive characteristics of electricity generation, transmission and distribution (box III.1), fixed-line telephony, mobile telephony and Internet telecommunications (box III.2), seaports, airports, roads and railways (box III.3) and water and sewage (box III.4) in the analysis.

Infrastructure, by its very nature, and due to social and political preferences is frequently subject to public intervention. Such intervention adds to the risky nature of infrastructure from a corporate perspective. Nevertheless, private sector involvement in infrastructure has increased in recent years. Indeed, its potential for high returns in the long term is often sufficiently enticing to companies. Consequently, in recent years a number of players other than infrastructure firms have expanded their presence in infrastructure industries, including private equity funds.

Defined by technology and regulation, each infrastructure industry includes potentially competitive and non-competitive segments (table III.2). Non-competitive areas include transmission and distribution networks, such as transmission lines in electricity; cables and switching centres in fixed line telecommunications; tracks, signals and stations in railways; landing strips at airports; and pipes and sewers in water supply. Such networks, positioned between upstream production and downstream supply, are very capital-intensive and involve large sunk costs and assets that are of minimal use for other purposes. Once built, they are location bound and cannot be moved to other sites. These features mean that such activities retain the characteristics of natural monopolies. Other upstream and downstream segments, on the other hand, offer greater potential for competition. In electricity, telecommunications

Box III.1. Main features of electricity infrastructure

There are three segments to the electricity industry: generation, transmission and distribution. Together, they form an important part of the backbone of a modern economy. Without adequate investment and a reliable supply of electricity, an economy is unable to function efficiently, economic growth targets are difficult to achieve, outages and blackouts are common, and it is difficult to attract FDI to help create employment and advance industrial development. The provision of electricity has a public good element in that it helps reduce poverty, and improves quality of life.

The electricity industry is technology- and innovation-intensive. Technological change, especially in electricity generation, is affected by social considerations, such as national and international concerns over climate change and environmental conservation. The use of environmentally friendly and clean technology, (e.g. hydropower plants) and renewable energy (e.g. wind and wave power) are expected to see continued growth.

In some segments of the electricity industry, economic and technical characteristics make it possible to introduce competition; in other segments they do not. For example, *electricity generation*, if separated (unbundled) from transmission and distribution, can involve a number of independent and competing providers, and hence can be structured as a competitive business. *Transmission networks,* in contrast, are a classic natural monopoly, as it is not economical to build parallel networks to transmit the same energy, which is why most countries have only a single entity owning and operating them.[a] At the end of the supply chain, *electricity distribution* can also be made competitive, although that may be constrained by the fact that distribution requires a physical network, which is a natural monopoly. Therefore, while wholesale distribution can usually be a competitive business, retail services can be made so only if regulations allow companies not affiliated with the transmission company access to a network's "final mile", which connects electrical substations with businesses and residences.

Source: UNCTAD.

[a] An especially large country might have multiple transmission operators, but even in this case each operator will have a monopoly within its own (typically large) geographic region.

Box III.2. Main features of telecommunications infrastructure

Telecommunications are carried out by transmitting signals over a distance through electromagnetic waves. Within telecommunications infrastructure, fixed-line telephony, mobile telephony, and transmission of digital data are the most important segments. They differ from each other in terms of their technology, how services are delivered, and in some of the specific services they offer to consumers. Investment in telecommunications infrastructure can enhance economic growth directly − through its demand for inputs − and indirectly, as better communication networks help firms in other industries improve and expand their production capacities (Madden, 2008). Given the growing role of telecommunications in development, access for all persons and societies to good telecommunication infrastructures is increasingly regarded as important. Telecommunications can be considered a public good in the sense that every member of society can benefit from them, and they can be used by additional consumers without generally risking depletion, although they are not provided free and users contribute to their cost.

Since all telecommunications are based on networks, it is important that different modes and technologies of communication are able to connect to each other. In this respect, there has been significant progress, although newer segments such as mobile telephony are less dependent on physical infrastructure than traditional fixed-line telephony, which requires greater investment for wired installations.

Technological change has led to increased competition and contestability in the industry, especially because of the rise of mobile telephony. Technological progress has reduced the cost of physical infrastructure, allowed the establishment of parallel mobile telecommunications networks and eliminated dependence on monopolies that control fixed lines. As a result, a large number of new, competing enterprises have emerged. Established firms have had to respond to this challenge by innovating quickly, and by moving into new segments. Introducing competition has been easier in mobile and Internet telecommunications than in traditional fixed-line telephony (ITU, 2007b).

The sector continues to innovate rapidly, with implications for services. For example, digitization allows any type of information to be transmitted over one network: voice, data and video. This is pushing the transition to so-called next generation networks, which are essentially built around Internet protocol (IP) technology and are accelerating the convergence between fixed-line and mobile telephony.

Source: UNCTAD.

Box III.3. Main features of transport infrastructure

Transport infrastructure comprises a heterogeneous group of industries, including roads, railways, airports and seaports. An integrated transport infrastructure that includes all these modes makes it possible to link underdeveloped parts of a country and regions into the global economy. For manufacturing and trading activities, the quality and coverage of transport networks significantly influences the costs of production and distribution (Aoki and Roberts, 2006). In this context, the role played by seaports is critical, because around 80% of global trade is estimated to be carried by sea (UNCTAD, 2008e). Thus efficient seaports can directly and indirectly contribute to the development of an economy by facilitating trade and providing a hub for industry clusters, which may also provide backward linkages in skills, technology and investment.

Technological innovation in transport has occurred mainly through the introduction of sophisticated computerized handling systems in response to the need to manage the global increase in containerized trade. In general, an integrated transport infrastructure offers a wider choice of transport options for users, which in turn encourages greater competition and efficiency, resulting in lower transport costs to the consumer.

For a country to spread development throughout its economy, an integrated, multimodal transport network is necessary. Landlocked countries, some of which are least developed countries (LDCs), have the additional burden of relying on their neighbours to have such an integrated multimodal transport network to link them to the world economy. Consequently, regional transport networks are a significant feature of investment in infrastructure across Africa, Asia and Latin America.

Source: UNCTAD.

Box III.4. Main features of the water industry

All activities along the water industry supply chain – extraction, transmission, distribution and supply – involve economies of scale. For this reason, the provision of water services typically involves high sunk and fixed costs incurred by large-scale centralized projects, and requires significant energy inputs. At the same time, the expansion of services, the replacement or maintenance of existing facilities, and their adaptation to security and environmental norms require large capital investments and considerable planning (OECD, 2007a).

Water supply has failed to keep pace with rising world population, leading to chronic shortages in several regions of the world. This is however due mostly to problems with water management and investment problem, and less to the lack of available sources of water. The gravity of the situation is reflected in the MDG declarations that recognize water availability and access as a priority goal. Even in developed countries, affordability of safe water among the poorer segment of society has become a critical issue. Moreover, it must be borne in mind that water is used not only for direct human consumption, but also for economic purposes in agriculture and manufacturing. In 2000, only 10% of world water withdrawal took place for households. Industry accounted for 20% and agriculture for 70%.[a]

The scope of governments for introducing competition in the water industry is limited, although in principle the extraction and retail supply segments could be made competitive. Water distribution remains a natural monopoly because its main costs come from laying a network of pipes to deliver water, and it is economically not interesting to introduce competition by duplicating the network. Moreover, unbundling is not always attractive due to the high costs and problems associated with connectivity, and due to the fact that most of the costs of water still arise in distribution, which is a natural monopoly. Considerations of water as a basic need can further add to the limits of unbundling.

Source: UNCTAD.

[a] In developing and transition economies, these shares were 9% (households), 12% (industry) and 79% (agriculture). The calculation is based on data from the Food and Agriculture Organization of the United Nations' Aquastat database (http://www.fao.org/nr/water/aquastat/). Data were used for 141 economies of the world for year 2000, and for 17 economies for the latest year available (between 2001 and 2006).

and transportation, technological progress has helped to reduce scale requirements and costs, and enabled the introduction of new sources of competition to some extent.

Private and foreign investors can enter formerly publicly provided infrastructure services if a given segment is unbundled from the rest of the industry. Unbundling refers to a separation of segments of an industry from each other.[8] Unbundled segments of infrastructure can be owned and/or operated by different enterprises competing with one another. However, network segments retaining the characteristics of a natural monopoly – regardless of whether they are publicly or privately owned – as well as interactions between more competitive and less competitive segments require special attention (Kessides, 2004; Newbery, 2006; Ure, 2008). If potentially competitive segments are not unbundled,

Table III.2. Non-competitive and competitive segments of modern infrastructure industries

Industry	Usually non-competitive segments	Potentially competitive segments
Electricity	High-voltage transmission and wholesale electricity distribution	Generation and supply to final consumers
Telecommunications	Local residential telephony or local loop	Long-distance, mobile and value-added services
Water and sewage	Local distribution and local wastewater collection	Production, long-distance transportation, purification and sewage treatment
Transport		
Railways	Track, stations and signalling infrastructure	Train operations and maintenance facilities
Air transportation	Airport facilities such as take-off and landing slots	Aircraft operations, maintenance facilities and catering services

Source: UNCTAD, based on Gönenc, Maher and Nicoletti, 2000; and Kessides, 2004.

or if the service provider is protected from competitive pressures, it is difficult to create the necessary incentives for cost control, pricing and enhanced performance and, ultimately, investments (Joskow, 1996; Berg, 2001).

2. The infrastructure investment gap in developing countries

The future investment needs of developing countries for infrastructure development far exceed the amounts currently planned by governments, the private sector and other stakeholders. This has created a significant gap in financing investment in infrastructure industries. Indeed, such investment needs are growing with increasing population, rapid economic growth and urbanization, among others, and finding the necessary funds remains a major challenge for most developing countries. However, accurate estimates of infrastructure investment needs and financing gaps are difficult to obtain (box III.5). The World Bank has estimated that, on average, developing countries *actually* invest about 3–4% of their GDP on infrastructure annually, whereas that they *should* be spending about 7–9% on new investment projects and maintenance of existing infrastructure, if broader economic growth and poverty reduction goals are to be achieved (World Bank, 2008b; Fay and Morrison, 2007). Of the amount actually invested in developing countries, public funding accounts for about 70% of the total, private financing represents a further 20% and ODA makes up the remainder.[9] In order to meet the shortfall, governments need to tap into all sources of investment funds, including TNCs.

There is a significant though varying gap between actual and needed finance for infrastructure investment across all developing regions and infrastructure industries. In *sub-Saharan Africa*, this gap may exceed 50%. An estimated annual investment of $40 billion in new infrastructure facilities and maintenance is needed until 2015 to meet the subregion's MDG poverty reduction targets. This assumes an average annual economic growth rate of 7% and annual investment in infrastructure of 9% of GDP (Estache, 2005a; Taylor, 2007), with roads and electricity requiring the largest investments (table III.3). Yet only, $16.5 billion is likely to be

Box III.5. Estimating investment needs and financing gaps

It is difficult to obtain comparable, consistent and accurate estimates of infrastructure investment needs and financing gaps. Differences in terms of methodologies and assumptions, data coverage and reliability, sectoral variations, price movements and other factors mean that different estimates for even the same region often differ significantly. For example, recent estimates by the Asian Development Bank (ADB) and the Economic and Social Commission for Asia and the Pacific (ESCAP) of infrastructure financing needs in the Asia and Oceania region for the period 2006–2010 differ for both the total investment needed and the financing gap (box table III.5.1).

Box table III.5.1. Asia and Oceania: Varying estimates of infrastructure financing needs for 2006–2010
(Billions of dollars)

Source	Investment required	Financing gap	Remarks
Asian Development Bank, Japan Bank for International Cooperation and World Bank (2000 prices)	228	180	Estimates are based on aggregate demand
Estimates derived from sectoral studies by ESCAP (2004 prices)	608	220	Estimates are based on sectoral demand

Sources: ADB, JBIC and World Bank, 2005; and ESCAP, 2006.

Most estimates are based on a "top-down" approach, in which investment needs are usually estimated on the basis of infrastructure requirements to support a certain economic growth rate or MDG target, including poverty reduction. Fewer studies use a "bottom-up" approach, which identifies investment needs for each infrastructure sector separately. In addition, some studies only assess investment needs in new infrastructure (e.g. the electricity study by the International Energy Agency), while other studies also cover investment needs for operation and maintenance.

Source: UNCTAD.

forthcoming annually from identifiable internal, external and ODA sources, leaving an estimated annual financing shortfall of $23.5 billion (Taylor, 2007).[10]

The investment needs and financing gap of the *Asia and Oceania* region is also large, especially when considering the significant investment requirements of China and India (ADB, JBIC and World Bank, 2005). ESCAP calculated that over the period 2006–2010, the region would need to invest some $608 billion annually in infrastructure development, while the actual annual investment in recent years has been only $388 billion – generating an estimated investment shortfall of $220 billion (box III.5; Heyzer, 2007). The case of India illustrates some of the financing challenges facing the Asia and Oceania region (box III.6).

In Latin America and the Caribbean, the financing gap is equally large. The region currently spends on average less than 2% of GDP on infrastructure annually, while some 3–6% of GDP is required (Omura, 2006; Fay and Morrison 2007). Public sector investment in infrastructure in the region has fallen considerably. This is partly due to fiscal adjustments to macroeconomic crises and a tendency by some governments to reduce public investment because of privatization initiatives, and a shift towards giving the private sector responsibility for infrastructure financing and management (Fay and Morrison, 2007). Private investment in infrastructure in the region has increased, but not enough to fill the gap in financing; and it has been unequally distributed across industries as well as by countries.[11]

Regional integration in Asia and Oceania, Africa and Latin America and the Caribbean is also accentuating regional infrastructure development and cooperation in transport, energy grids, ports and airports. Physical infrastructure connectivity is important to support regional integration, which in turn is crucial for facilitating intraregional trade, production and investment. This form of South- South regional cooperation is helping to boost economic development in the respective regions. The investment needs of these projects are also significant, although in some cases intraregional infrastructure activity can help bridge overall financing gaps in countries

Table III.3. Sub-Saharan Africa: estimated annual infrastructure investment needs in selected industries, 2006–2015[a]

(Annual average, in billions of dollars)

Item	Electricity	Telecoms	Roads	Rail	Water[b]	Sewage	Total	Financing gap[c]
New investment	5.5	3.2	9.8	-	1.8	2.7	22.8	23.5
Operation and maintenance	3.3	2.0	7.4	0.8	1.4	2.1	17.2	
Total	8.8	5.2	17.2	0.8	3.2	4.8	40.0	23.5

Source: UNCTAD, based on Taylor, 2007; and Estache, 2005a.

[a] Based on the estimated annual investment needs of $40 billion to achieve the subregion's MDG poverty reduction targets by 2015.

[b] Excluding investment needs for irrigation.

[c] Identifiable financing sources total $16.5 billion altogether, $8 billion from internally generated funds, $5 billion from external funding and $3.5 billion from international financial institutions, loans and ODA.

Box III.6. India: Financing infrastructure

Over the period 2007–2012, India will need investment averaging $99 billion per annum in 10 major infrastructure segments, to support a planned annual GDP growth of 9% (box table III.6.1). The public sector is expected to provide 70% of this investment, and the private sector the rest. Moreover, the private sector is expected to take the lead in financing some infrastructure such as telecommunications, ports and airports. However, these ambitious plans could face the same financing gaps as those of the preceding periods: over the period 2001–2010, for instance, the annual financing gap is estimated at close to $14 billion (box table III.6.1). So far, FDI has played only a very small role in the overall financing of infrastructure. Between April 2000 and February 2008, India attracted an average of only $1.3 billion of FDI per annum in electricity, roads, telecommunications, ports, railways and airports.

Source: UNCTAD.

Box table III.6.1. India: estimated annual infrastructure investment needs, financing gaps and FDI flows, various years
(Billions of dollars)

	World Bank estimates Fiscal years 2001–2010		Government of India estimates Fiscal years 2002–2007	Government of India estimates Fiscal years 2007–2012	April 2000 – February 2008
Industries	Investment needs	Financing gap	Investment needs	Projected investment needs[a]	Actual FDI inflows
Energy	26.5	8.7	14.2	30.0	0.2
Roads[b]	11.6	2.8	7.0	15.2	0.4
Telecom	5.4	1.2	6.0	13.0	0.5
Ports	0.8	0.6	0.2	3.6	0.1
Railways	3.1	0.4	5.8	12.6	0.1
Airports[c]	0.5	0.2	0.4	1.6	0.0
Total	47.9	13.9	43[d]	98.8[d]	1.3

Sources: World Bank, 2006; and India, Planning Commission, 2007.

[a] In constant 2006–2007 prices.

[b] Including construction activities.

[c] Including airfreight.

[d] Total for 10 infrastructure sectors identified.

through a sharing of development costs or exploiting economies of scale and scope.

The national and regional infrastructure investment gaps in developing countries are resulting in funding shortfalls across all infrastructure activities. A leading example of this gap is in electricity, given the scale of power blackouts in rapidly growing developing economies such as Brazil and South Africa. It has been estimated that during this decade, to 2010, developing countries will need to invest $160 billion annually in electricity generation, transmission and distribution, but so far, only about half of this amount has been forthcoming. Consequently, blackouts and limited access to electricity will hamper future economic growth and achievement of the MDGs unless further investment is found, a situation made more difficult by the fact that annual investment needs in the industry will rise further to $250 billion in the period up to 2030 (Krishnaswamy and Stuggins, 2007; IEA, 2007). The investment gap is also large in other infrastructure industries, with the possible exception of telecommunications, in which costs are falling because of rapid technological progress (Minges, 2008).

The magnitudes of the infrastructure investment needs of developing countries are huge, and even with identifiable sources of finance the gaps remain enormous. Unless the current level of infrastructure spending in all infrastructure industries is increased to match projected investment needs, developing countries will face a serious challenge in meeting their targets for growth and development. This is particularly true for those countries and regions where public sector budgets are limited, private investment has fallen short of needs, and where ODA support is declining. Governments will have to seek investments from a variety of sources to help fill the financing gap, including official flows – in particular ODA – and private investors, both domestic and foreign.

3. The role of the State and other players in infrastructure industries

From the period following the Second World War until the 1980s, infrastructure industries were by and large the purview of the State, sometimes run through State-owned enterprises (SOEs). Since then, governments have opened up these industries, resulting in significantly increased involvement of the private sector – including TNCs and other players – in their financing, investment, ownership and management.

The reasons for involving the private sector, and the pace of reforms, have varied by country and industry.[12] They include the need for reducing the fiscal burden on the public sector and for greater investment in order to rehabilitate deteriorating facilities and services or build new ones, enhancing management performance and encouraging the transfer of technology and expertise (Kessides, 2004; Sharan et al., 2007; Ure, 2008; box III.7). The process of changing the role of the State and increasing private sector participation involved a series of reforms, such as enterprise restructuring, market liberalization and regulatory changes.[13] Today, the private sector is a significant participant in many infrastructure industries globally, in countries of all political hues, and its role is likely to increase further because of the huge investment, technology, skills and management needs in developed and developing countries alike.

The earliest moves towards liberalization in infrastructure industries, during the late 1970s and 1980s, stressed different aspects of the reform process. For example, in the United States, the emphasis was on regulatory reform and unbundling,[14] in the United Kingdom it was on privatization along with regulatory reform; and in some European countries on different types of reform (including the creation of infrastructure SOEs) depending on the member country (Clifton, Comín and Díaz-Fuentes, 2007).

A variety of experiences also marked the second wave of liberalizations in the 1990s, as countries in Africa, Asia, Latin America and the Caribbean, and South-East Europe and CIS reformed their infrastructure industries. Many of these countries opted for market liberalization through divestitures of State assets and other forms of private participation,[15] including the involvement of TNCs. Indeed, many of these TNCs had been established in the first wave of liberalizations (section C).[16] Other developing countries took different approaches, for instance by choosing a strategy based on the corporatization SOEs (box III.8) as the central or major plank of their infrastructure reforms. However, such an approach is generally feasible only in countries that have (a) relatively good State-owned infrastructure facilities that can be restructured and are able to absorb new technologies and skills; (b) the funds necessary for restructuring; and (c) effective planning processes able to formulate and realize a long-term vision. Because of this, only a limited number of countries have taken this approach, such as China, Singapore and South Africa (Sharan et al., 2007; Heracleous, 2001; Kessides, 2004; section IV.A).

New players have emerged in infrastructure industries in many countries, both as operators and financiers, following the reduced or altered role of the State in infrastructure investment and operations. Some of these new operators – both SOEs and private firms – established mainly since the 1980s, have evolved into TNCs in their own right (section C). In addition, there are also a number of mostly private

Box III.7. Private sector participation in water infrastructure in developing countries

Over the past 20 years, developing-country governments have explored the possibility of opening up elements of water infrastructure to the private sector: 64 developing countries had introduced some form of private participation in the industry by December 2007.

There are several reasons why governments have recently turned to the private sector, the most common being the extreme degradation of water networks in some countries. For example, in water-scarce countries in the southern Mediterranean, such as Algeria, Egypt and Jordan, unaccounted for water exceeds 40%, and average water supply is available for less than 12 hours a day. Therefore their governments introduced private sector participation mainly in order to gain access to more funding and to knowledge on how to manage water infrastructure. In addition, private participation is sometimes used to engage in and accelerate water sector reforms.

However, not all aspects of the water sector have been opened to private businesses. Most of the activities delegated to private firms concern potable water supply and water treatment. The types of contracts range from a simple service contract to full privatization. Experience with full divestiture of municipal water networks has been limited to five developing countries (Brazil, Chile, China, Malaysia and Thailand), with only Chile opting for a fully private system nationwide. Concessions have been by far the most prevalent type of contract since 1990 worldwide but recent data suggest that most new contracts awarded are related to the construction of potable water treatment plants under build, operate, transfer (BOT) arrangements.

A detailed review of case studies and econometric tests shows that the performance of the private sector has not necessarily been better than the public sector, and the choice of one or the other depends on a range of factors. Moreover, the experiences of countries in the southern Mediterranean indicate that TNCs, similarly to other private sector participants,[a] possess three specific advantages over domestic private water companies and SOEs: global knowledge, financing capacity and economies of scale. In addition, their large portfolio of activities permits the pooling of risks and reduces the capital cost of each project. TNCs' competitive advantages over domestic private firms (where a domestic private water sector exists) partly explain why most private water contracts are awarded to international players.

Source: UNCTAD, based on Pérard, 2008 and supplementary information supplied by Edouard Pérard.

[a] Naturally not all TNCs are private companies and some are partly or wholly State-owned, including in water.

companies in infrastructure-related industries, such as machinery suppliers or construction companies. Of course, there were some significant private sector enterprises in infrastructure before the reforms of the 1980s and they continue to operate.[17]

The function of integrating complex projects is becoming increasingly important because of their number, scale and scope, and because developing countries are trying to leapfrog stages of infrastructural development (box III.9). Newer infrastructure TNCs are joining existing ones as leaders of consortiums and similar integrative activities.[18] Since other firms and organizations possess the skills to manage large and complex projects, some of them, such as private equity funds, sensing profitable opportunities, are

Box III.8. City Power Johannesburg – a successful SOE in infrastructure

City Power is a corporatized public company distributing electricity to Johannesburg, where demand for power grows at an annual rate of 20–25%. Established in 2001 as a successor to a municipal department supplying electricity, it is wholly owned by the city of Johannesburg. It purchases electricity from the two power generation sources present in the Johannesburg Metropolitan Area: Eskom (which supplies to 80% of the market) and Kelvin Power Station (20%).[a] Because of the growing demand for power, there is a need for massive investment in new capacities and maintenance. Supply is expected to be tight in the near future as the Government of South Africa would like to accelerate economic growth, and the country and the city have to prepare for the 2010 Soccer World Cup.

City Power is currently profitable because of efficient management and tariff collection, with practically 100% collected from business customers and over 90% from residential customers (up from 70–75% in 2001). The company's tariff system is pro-poor: it allows a quota of free basic electricity for all residents, with fees charged only on consumption that exceeds a specified minimum. Rates are set by City Power's board, on the basis of a formula of cost of electricity, plus mark-up to include profits, and they are approved by the national regulator. City Power believes that the previously low tariffs were mainly responsible for a low investment rate, which in turn led to frequent outages.

Source: UNCTAD, based on information provided by City Power.

[a] The shareholders of Kelvin Power Station include foreign investors such as Macquarie Bank (Australia) (40%), FMO Netherlands (19%) and a spinoff company of AES (United States).

Box III.9. Stages of industrial development and infrastructure industries

Since the industrial revolution, today's developed countries have moved from endowed-assets-based industries to knowledge-based ones, as part of the process of economic development. This "ladder of development" reflects a progression of stages: natural-assets-driven (exemplified by apparel in labour-abundant economies and by raw materials and fuels in resource-rich economies) (stage I); scale-driven resource-processing (steel and basic chemicals) (stage II); assembly-based (automobiles) (stage III); R&D-driven (pharmaceuticals and microchips) (stage IV); and information-driven (stage V). At each stage of development, structural upgrading has led to different types of infrastructure to support the needs of the economy and society (box table III.9.1).

Today, developing countries are going through similar stages of development, sometimes a number of them simultaneously, since these stages can be combined or leapfrogged (e.g. the move to mobile telephony in countries where the cost of fixed-line telephony is prohibitive). It is in this context that infrastructure TNCs can actively assist developing host countries to improve and build up their infrastructure facilities and services.[a] Their role can time-compress the catch-up process, ensuring that various forms of infrastructure development which used to be related to the stage of a country's industrial development can now be built simultaneously in developing countries. Successful latecomers can thus telescope (and even strategically reassemble) the stages of economic development in catching up with, and thereby joining the ranks of, developed economies (chapter IV).

Box table III.9.1. Stages of development and related infrastructure industries

Stage	Related infrastructure
I	Essential infrastructure: water, sanitation, roads, canals and ports
II	Large-scale physical infrastructure: coal-based and hydroelectric plants, extensive rail networks, freighter-accommodating ports, telegraph and telephony
III	Transport and logistics, including an extensive highway network, airports and commuter infrastructure
IV	Infrastructure supporting science clusters
V	Wireless telecommunications and virtual ICT networks

Source: UNCTAD, based on Ozawa, 2008.

Source: UNCTAD, based on Ozawa, 2008.

[a] In other words, infrastructure TNCs are "infrastructure arbitrators" in the sense that they contribute to closing the gap between developed and developing countries, though perhaps not in all segments of infrastructure. This may, however, lead to another new gap within host countries, between the modern infrastructure provided by the TNCs in particular (notably in high-tech areas), and the still underdeveloped infrastructure in others – an unbalanced situation often described as "a cell phone for everybody, but no clean water."

also becoming significant players (Clifton, Comín and Díaz-Fuentes, 2007; Ernst & Young, 2007).

The new financiers, which as a group now provide some 20-30% of project finance in infrastructure (Orr and Kennedy, 2008; Hu, 2007),[19] are a heterogeneous set of institutions which belong to two broad categories. The first group are private equity investors attracted specifically by opportunities in infrastructure industries, both in their home and foreign markets.[20] This group includes: (i) infrastructure investment funds,[21] (ii) institutional investors, such as pension and mutual funds,[22] and (iii) investment vehicles created by banks or infrastructure companies for the purpose of supporting their project financing or investment activity (Orr and Kennedy, 2008; McKinsey, 2007).[23] These investors are very significant in their domestic and foreign markets, both in financing and systems integration. For example, in 2007 they raised some $34 billion of funds for infrastructure investment, and this is set to rise.[24] Several private equity firms are active in infrastructure in a number of developing countries.[25]

The second group of new financiers are a variety of State-owned or government-linked entities, including sovereign wealth funds (SWFs), which have arisen mostly in developing countries as a result of trade surpluses in manufactured goods and services (e.g. in China, India, Malaysia, the Republic of Korea and Singapore) or in commodities, especially oil (e.g. the Bolivarian Republic of Venezuela, Saudi Arabia and the United Arab Emirates) (McKinsey, 2008b; Part One of this *WIR*). These new players do not invest exclusively in infrastructure (including infrastructure TNCs); for strategic reasons, some of them (e.g. infrastructure financiers from China, India and South Africa) also invest to support other activities, including in the extractive industries overseas (as discussed in section D below and *WIR07*).

Despite the expansion of the private sector and the emergence of new players as both operators and financiers over the last two decades, the State's role in infrastructure remains critical (Sharan et al., 2007; Commission on Growth and Development, 2008). The State has always assumed multiple roles in infrastructure industries: as investor, customer, regulator and mediator (Doh and Ramamurti, 2003),[26] but is now increasingly involved as regulator and mediator (Sharan et al., 2007; Ure, 2008). Governments also recognize the crucial role that private operators and financiers play in establishing efficient and effective industries. Governments will continue to experiment with new models of building infrastructure facilities and delivering services, a good example of which is the rise of public-private partnerships (PPPs) in developed countries and, increasingly, in developing ones (Saghir, 2007; Northoff, 2008).

B. TNC involvement in infrastructure industries

This section analyses the generally rising trend in TNC involvement in infrastructure industries, focusing on developing and transition economies. Developments since the 1990s have historical parallels, since infrastructure services were commonly provided by private enterprises in the past, quite often by foreign investors (box III.10). After a rise in infrastructure FDI in the 1990s, mostly by TNCs from developed countries, the turn of the century witnessed a decline in infrastructure FDI flows, followed by a recovery more recently. Moreover, while developed-country TNCs divested from some failed or difficult projects, several developing-country infrastructure TNCs emerged, and are increasingly becoming significant players worldwide.

TNCs participate in infrastructure projects through equity or non-equity legal forms, or a combination of the two (box III.11). In addition, given the high risk, long gestation period and high capital intensity of such projects, they may enter host countries either as sole investors, or via special purpose vehicles or consortiums in cooperation with other investors. The overall range of modalities extends from 100% equity ownership to fully contractual forms, without any equity involvement.

Privatization sales and greenfield projects are forms which entail equity participation by TNCs. Privatization sales[27] resulting in FDI occur when a foreign TNC buys an equity stake in a former State-owned enterprise through a direct asset sale. This can be a full privatization(s) (i.e. the government sells 100% of the equity in a State-owned company to the new owner) or a partial one (the government sells only part of the equity).[28] Privatization sales can be accompanied by additional investments (Kessides, 2004). Greenfield FDI projects may be wholly owned by foreign investors or take the form of a joint venture with local (private or State-owned) partners. Foreign investors obtain ownership of assets at the beginning of such a project and build a new facility, with the government normally providing no guarantees of revenue. The investor also assumes construction, operating and market risk for the project.

Non-equity forms, such as management and lease contracts, usually involve no ownership by participating firms. Firms assume the management responsibilities of State-owned assets for a fixed period, while ownership and investment decisions

Box III.10. TNCs and the early globalization of the electricity industry

"Modern" infrastructure, especially electricity, telecommunications and transport, began primarily as a private, international phenomenon in the late nineteenth and early twentieth centuries. One of the best examples of this is the early history of electrification and the role of TNCs in propagating the industry globally.

The emergence of the electricity industry in the late nineteenth century coincided with the beginning of the first age of globalization and creation of the first modern TNCs. Despite the rise of nationalism after the First World War, foreign ownership of electric utilities in the early twentieth century was common, in both developed and developing host countries. For example, in around 1930, electric utilities in many developed countries had foreign ownership of 10% or more, including Austria (with foreign ownership of 20%), Canada (34%), France (10%+), Poland (74%), Romania (50%) and Spain (27%). A similar situation prevailed in many developing countries, sometimes with far higher levels of foreign ownership, examples being Brazil (67%+), Chile (88%), China (51%+), Ethiopia (100%), Malaysia (46%) and Thailand (88%). A large number of TNCs from developed countries were involved, including those from Canada, France, Germany, Spain, Switzerland, the United Kingdom and the United States, with extensive investments in Africa, Asia and Latin America and the Caribbean. As today, there were many types of players.

Only rarely did electric utilities become TNCs; instead, other TNCs made foreign direct investments in electric utilities – among them TNCs in electrical equipment manufacturing, holding companies, and free-standing companies (i.e. companies headquartered in rich countries, but with no operations there). TNCs did not necessarily establish or create the electricity industry in host countries; instead, they frequently acquired existing enterprises and offered advanced technology, expertise and capital, which raised productivity and service quality.

Public sector involvement and the "domestication" (the transformation from foreign private to domestic – private or public – ownership) of infrastructure began after the First World War, and accelerated after the Second World War. This process was the result of various push factors: the growing notion of public services for essential commodities, including electricity (giving rise to political pressures to control prices, for instance), "natural" monopoly considerations, host countries' perceptions of an "obsolescing bargain" (i.e. when the bargaining power shifts to the local authorities once an investment has occurred and operations begin), "national security" considerations and nationalism.

But just as it seemed as though TNCs had vanished from this industry by the end of the 1970s, there was a new round of TNC involvement that accelerated in the 1990s.

Source: UNCTAD, based on Hausman, Hertner and Wilkins, 2008.

Box III.11. Selected forms of TNC participation in infrastructure projects

In addition to pure equity or non-equity forms of participation in projects, TNC activities can take various forms that combine elements of both (box table III.11.1). In most cases, these mixed forms are either linked to concessions under which the TNC invests equity at least for a given period (the equity component) but also commits itself beyond that equity component, or to other equity-based participation in which the equity engagement is not time-bound. Taken together, these forms can be called "*concessions*". Some combined forms resemble the FDI forms, as the elements of TNC ownership and equity participation dominate. In *build, own and operate* (BOO) contracts, for example, the main difference from greenfield projects is that the investor also brings in resources related to the host government's guarantees for a minimum revenue. *Build, lease and own* (BLO) contracts are similar to BOOs, the main difference being that the foreign investor becomes full owner only at the end of a lease period. However, it builds a new facility largely at its own risk, although after the construction phase it transfers ownership to the government and leases the facility from the government. In this form, too, the government usually provides revenue guarantees.

In other combined forms, the foreign TNC is only a temporary owner of the facilities, and turns them over to the host country at the end of a concession period. However, as these periods are very long (often 20–25 years), the equity component of the investment realized during the concession period is still important. In such contracts, such as *build, operate and transfer* (BOT) and *build, own, operate and transfer* (BOOT) arrangements, the foreign investor builds the facility at its own risk, owns (and operates) it at its own risk, then transfers ownership of the facility to the government at the end of the concession period. The government usually provides revenue guarantees. In *build, rehabilitate, operate and transfer* (BROT) contracts, the foreign developer not only builds a new facility, but combines it also with the extension of an existing facility, or it completes a partially built facility and rehabilitates existing assets. Otherwise, it works like a BOT or BOOT contract. However, because of the element of rehabilitation, the non-FDI element can also be quite important.

Box table III.11.1. Equity and non-equity forms of TNC involvement in infrastructure

Fully equity								Fully non-equity
FDI projects (including privatization and greenfield projects and joint ventures)	Concessions							
	Build, own, and operate (BOO)	Build, lease, and own (BLO)	Build, own, operate, and transfer (BOOT)	Build, operate, and transfer (BOT)	Build, rehabilitate, operate, and transfer (BROT)	Rehabilitate, operate, and transfer (ROT)	Rehabilitate, lease or rent, and transfer (RLOT)	Management and lease contracts

Source: UNCTAD.

In contracts starting with a rehabilitation phase, the non-FDI element may dominate. Under *rehabilitate, operate and transfer* (ROT) arrangements, the foreign investor rehabilitates an existing facility, then operates and maintains the facility at its own risk for the contract period. In the case of *rehabilitate, lease or rent, and transfer* (RLOT) contracts, the foreign investor rehabilitates an existing facility at its own risk, leases or rents the facility from the government, then operates and maintains the facility at its own risk for the contract period.

TNCs have invested in the different legal forms of infrastructure projects described in this box through long-term public-private partnerships (PPPs) with the host government and/or its SOEs.

Source: UNCTAD.

remain in the hands of the State. In a management contract, the government pays the foreign firm a fee for managing the facility, while the operational risk remains with the government. In a lease contract, the government leases the assets to the foreign firm, which also takes on the operational risk.

Other forms of TNC participation, such as build, operate, transfer (BOT) contracts, combine equity and non-equity elements: TNCs invest equity capital for the period of their engagement in the contract, and normally obtain control over the operations of the project. However, the TNCs also provide non-equity finance in order to carry out their contractual obligations. In the majority of infrastructure projects, TNCs leverage their equity with significant debt, and the latter is often the higher of the two (IJ Online, 2008). Combined contracts are of two types: "greenfield" projects, if TNC participation involves a "build" phase in the project, or "brownfield" projects, if participation involves the rehabilitation of existing facilities. There is also a distinction between "concessions" (if at the end of the contractual period the assets revert to the State) and "other equity-based projects" (if at the end of the contractual period the TNC retains ownership of the facilities) (box III.11).

A range of factors affect the concrete form of TNC involvement in a given infrastructure project. Apart from issues such as regulations and the availability of takeover targets, other aspects include the scale, capital intensity and complexity of projects, their geographical extent (e.g. they may be regional in scope), the characteristics of the TNC and the level

of risk involved. Hence, there is no uniform pattern in the evolution of legal forms of TNC participation in infrastructure industries: the modalities vary between industries and regions, and over time.

1. Global trends

Trends in TNC involvement in infrastructure industries are difficult to discern because data are scarce and partial. The picture of global trends presented in this and the next section therefore relies on multiple sources of information, including data on FDI, cross-border mergers and acquisitions (M&As) and investment commitments, each with their respective strengths and limitations (box III.12).

Available data on *global inward FDI stocks* suggest that the share of infrastructure industries in total FDI globally currently hovers at close to 10%, but this represents a large increase over their roughly 2% share in 1990.[29] The biggest jump in this ratio occurred in the early 1990s, after which there was little change, despite a large absolute increase in infrastructure FDI (table III.4). Indeed, the share of electricity, gas and water as a group remained at around 2%, or less, of total FDI between 1995 and 2006; while that of transport, storage and communications reached a peak of 7% in 2000, but fell back to 6% in 2006. This global picture in FDI stock is also true at the regional level, with some exceptions, such as the relatively high share of electricity, gas and water industries in

Box III.12. Sources of data on TNC involvement in infrastructure

There is no single comprehensive source of data and information to provide a full picture of TNC involvement in infrastructure industries. The UNCTAD *FDI/TNC database* contains FDI data by industry for a limited number of countries. UNCTAD's *cross-border M&A database* provides information on individual deals in a larger number of countries, but their value does not necessarily correspond to the FDI value. In addition, there is little information available separately on FDI flow/stock data for transport infrastructure (airports, roads, railways, seaports), as it includes, for example non-infrastructure segments such as shipping and airlines. The World Bank's *Private Participation in Infrastructure (PPI) Database* covers all kinds of TNC involvement in developing countries, but only on a commitment basis. For these reasons, this and later chapters combine and utilize information from all of these databases, as well as other sources, including case studies prepared for this *WIR*.

The following are some observations on the coverage, strengths and limitations of each data source:

- Data on FDI stocks and flows (derived from UNCTAD's FDI/TNC database) are an accurate measurement of the equity participation of TNCs in infrastructure projects, but they only cover a limited number of countries. For example, inward stock data are available for 66 countries altogether, of which 28 are developing countries.
- Cross-border M&A data derived from UNCTAD's cross-border M&As database are available for almost all economies of the world, but cover only M&As, and not other modes of TNC entry, such as greenfield projects.
- The World Bank's PPI Database covers both equity and non-equity modes of TNC involvement. However, it is available only for the economies that are classified as "developing" by the World Bank.

Source: UNCTAD.

Table III.4. Inward FDI stock in electricity, gas and water, and in transport,[a] storage and communications, by region, 1990, 1995, 2000 and 2006
(Millions of dollars)

Region	1990		1995		2000		2006	
	Electricity, gas and water	Transport, storage and communications	Electricity, gas and water	Transport, storage and communications	Electricity, gas and water	Transport, storage and communications	Electricity, gas and water	Transport, storage and communications
World	**7 427**	**17 542**	**22 543**	**54 806**	**91 938**	**337 910**	**186 847**	**598 328**
Developed countries	5 120	13 026	14 591	30 514	57 833	253 380	137 996	439 217
Developing countries	2 307	4 488	7 824	20 476	33 277	78 566	47 270	151 626
Africa	-	132	73	1 901	180	5 737	15	12 813
Asia and Oceania	14	1 366	1 875	10 944	5 884	34 708	13 833	80 121
Latin America and the Caribbean	2 293	2 990	5 876	7 630	27 213	38 121	33 422[b]	58 692[b]
South-East Europe and the CIS	-	28	129	3 816	828	5 965	1 581	7 486
Memorandum item: LDCs	-	1	240	209	396	627	2 511	870

Source: Annex table A.III.1.

Notes: Regional and world totals cover only 42 countries in 1990, 62 countries in 1995, 67 countries in 2000, and 66 countries in 2006 accounting for over three-fourths in 1990 and about three-fifths in 1995, 2000 and 2006 of world inward FDI stock. Totals for LDCs cover 5 countries in 1990, 7 countries in 1995, 8 countries in 2000 and 5 countries in 2006, accounting for 3%, 17%, 37% and 18% of LDCs inward stock respectively in 1990, 1995, 2000 and 2006.

[a] Including transport services.

[b] Estimated on the basis of partial data, and of cumulative FDI inflows to Brazil (2001–2006), Colombia (2003–2006) and Panama (2001–2006) in the respective industries.

FDI to Latin America and the Caribbean during the 1990s (annex table A.III.1).

The share of developing countries in global FDI stock in infrastructure increased between 1990 and 2000, from 27% to 37%, but fell back to 25% in 2006. Despite divestments from Latin America and the Caribbean, the region remained the largest host in 2006 for electricity, gas and water (table III.4). In transport, storage and communications, developing countries accounted for 37% of world FDI stock in this industry in the peak year of 1995, but for only 25% in 2006. This decline was partly because of divestments in Latin America and the Caribbean. The share of this region fell behind that of Asia, which by 2006 had emerged as by far the largest developing host region, accounting more than half of the inward FDI stock in the industry in developing countries.

The origin of FDI stocks in infrastructure is predominantly from developed countries though the relative share of developing and transition economies in total outward FDI stock in infrastructure has increased markedly (annex table A.III.2). In electricity, gas and water, the share of developing and transition economies in FDI stock in the industry had reached 7% by 2006, while the equivalent share in transport, storage and communications was 9%. These two groups of industries also feature prominently in the outward FDI strategies of a number of developing and transition economies.

In terms of individual countries, the United Kingdom, France, Spain, the United States and Canada – in that order – are estimated to account for the largest share of worldwide of FDI stock in infrastructure (table III.5).[30]

TNC involvement is an important source of infrastructure financing for developing countries. For instance, according to the World Bank PPI Database, the share of *foreign investors* in total investment commitments in developing economies in infrastructure industries (box III.13) was 29% over the period 1996–2006 (figure III.1).[31] By region, the ratio of foreign to total commitments was relatively low in Asia (20%), where domestic private investment plays a relatively important role, and higher in Africa and Latin America and the Caribbean (36% and 33% respectively) (figure III.1). The ratio for South-East Europe and CIS was higher than that of any developing region in all infrastructure industries except telecommunications and water and sewage. In telecommunications, the share of foreign

Table III.5. Largest outward FDI stocks in infrastructure industries,[a] latest year available
(Millions of dollars)

Rank	Home country	Year	Value
1	United Kingdom	2006	208 196
2	France	2005	99 524
3	Spain	[b]	89 325
4	United States	2006	49 120
5	Canada	2006	41 610

Source: Annex table A.III.2 and UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics).

[a] Including transport services.

[b] Cumulative FDI outflows between 1992 and 2006.

Box III.13. Interpreting data from the World Bank's PPI Database

The *Private Participation in Infrastructure (PPI) Database* of the World Bank covers all forms of financial commitments by "private" entities in the infrastructure industries of countries that the World Bank defines as "developing". However, its definition of developing countries differs from that of the United Nations. On the one hand, it excludes the high-income developing economies of Asia, such as Hong Kong (China), the Republic of Korea, Singapore and Taiwan Province of China; on the other hand, it includes all middle- and low-income transition countries, as well as those new EU members that are not high-income economies. Moreover, some "private" investors in the database are publicly owned foreign enterprises, either entirely or in part. The database registers financial commitments by all partners in a project (State and private), provided the private participant's share of the total project value is at least 15%. These commitments include both equity and non-equity contributions to investment (such as debt instruments). The database aims to be as comprehensive as possible on projects in the countries it covers, resulting in improved coverage and better methodology, especially since the mid-1990s.

Statistics on foreign commitments in infrastructure industries shown in this *WIR* are based on the PPI Database, but they are presented differently from the original PPI data:

1. They include only projects in which foreign investors were involved.[a]
2. They show only the value of foreign investment commitments in the projects in which foreign investors participate.
3. They exclude projects the status of which was "cancelled" or "under distress".

These adjustments having been made, the PPI data presented in this report are a good proxy for the financial commitments made by foreign investors in infrastructure projects that took place in a large number of (but not all) developing and transition economies (including new EU member States).

Source: UNCTAD.

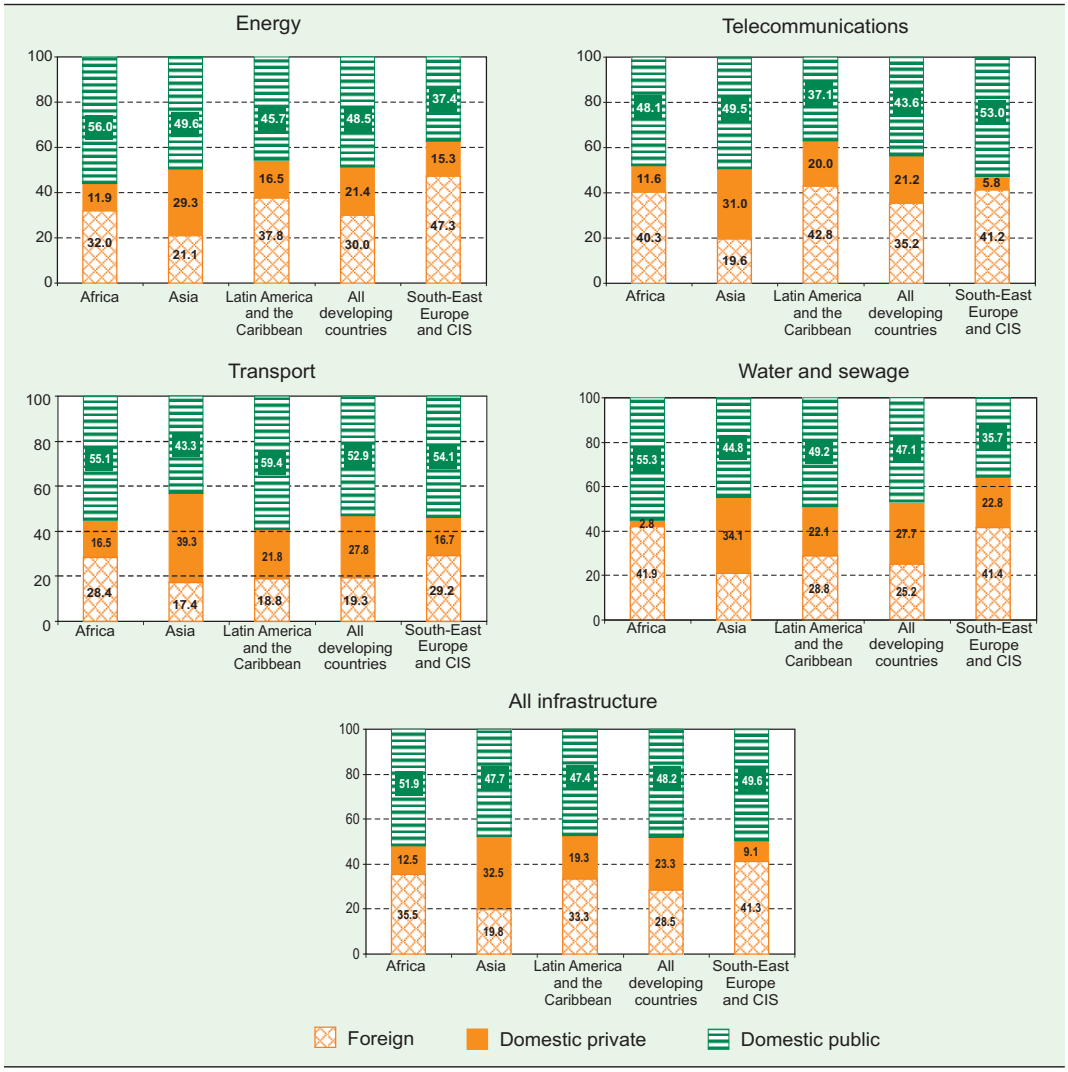
[a] Except figure III.1, which compares foreign commitments with domestic private and public commitments.

investors in total commitments was high, exceeding 40% in all developing and transition regions, except Asia. In other industries, foreign investors' share of commitments was significant in all regions, exceeding 15% in transport and 20% in energy and water (except in Asia) (figure III.1).

Data on *FDI flows* in infrastructure industries show that since the 1990s, TNC involvement in infrastructure industries has been rising, with a major surge (primarily in telecommunications) in the late 1990s and a downward correction in 2001−2003 (figure III.2).[32] The period 2004−2006 was characterized by a partial recovery. Cross-border M&A data for all infrastructure industries and for the majority of countries (including developing countries) confirm and complement this picture.[33] As in most industries, developed countries accounted for the bulk of cross-border M&As in infrastructure in 1991–2007 (figure III.3).

The worldwide industry composition of TNC involvement in infrastructure has changed over time. For example, the latest M&A data indicate a relative shift in emphasis towards electricity and away from other infrastructure industries, especially telecommunications (table III.6). In recent years, except for 2006, transport and water have been more modest target industries. Patterns of TNC involvement in infrastructure are largely determined by trends in mega transactions (box III.14).

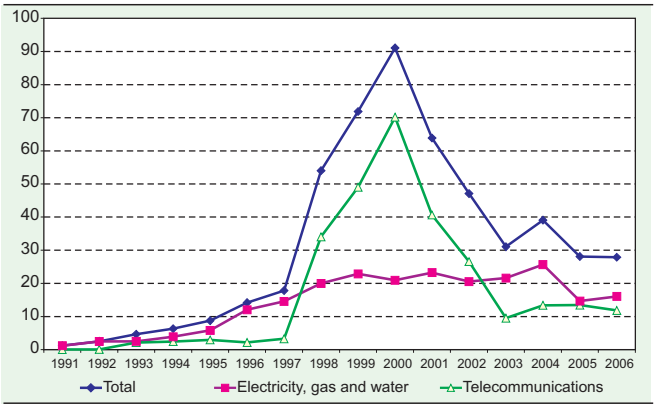
Figure III.1. Share of foreign and domestic private and public investors in the investment commitments of the infrastructure industries of developing and transition economies, by industry and region, 1996–2006
(Per cent)



Source: UNCTAD secretariat calculations, based on data from the World Bank's PPI Database.

Note: Data cover all developing economies, except high-income developing economies such as Hong Kong (China), the Republic of Korea, Singapore, Taiwan Province of China; and all the transition economies (i.e. South-East Europe and CIS), except Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Slovakia, which are members of the EU and are classified as developed countries by the United Nations.

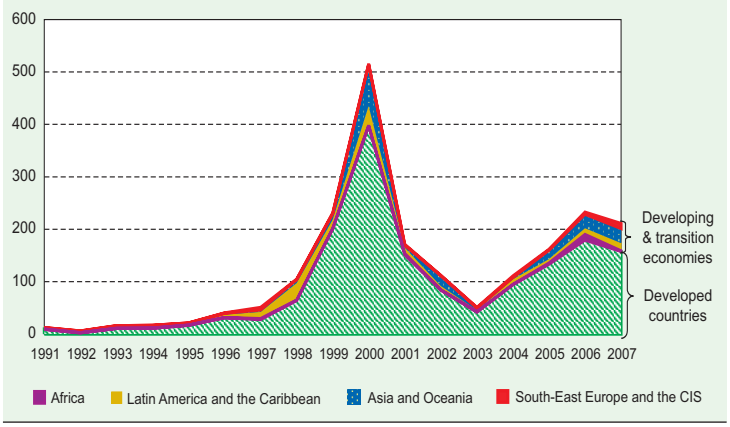
Figure III.2. FDI inflows in electricity, gas and water, and in telecommunications,[a] 1991–2006
(Billions of dollars, three-year moving averages)



Source: UNCTAD, FDI/TNC database (www.unctad.org/fdistatistics).

[a] This figure shows data for 62 economies. The availability of data varied by year, between 3 (1991 in telecommunications) and 45 economies (2003 and 2004 in electricity, gas and water).

Figure III.3. Cross-border M&As in infrastructure by target region, 1991–2007
(Billions of dollars)



Source: UNCTAD cross-border M&A database (www.unctad.org/fdistatistics).

Note: The data cover only those deals that involved an acquisition of an equity stake of more than 10%.

Table III.6. Cross-border M&As in infrastructure by target industry, 1991–2007
(Annual average, millions of dollars)

Target industry	1991-1995	1996-2000	2001-2005	2006	2007
All infrastructure	14 074	188 341	121 001	232 417	210 764
Electricity and gas	5 560	39 118	45 049	45 455	119 492
Electricity and related services	4 965	36 305	37 362	41 706	98 052
Gas production and distribution	595	2 813	7 687	3 748	21 440
Telecommunications	5 760	138 381	66 553	118 469	61 066
Transport	2 437	6 696	5 856	51 195	19 328
Airports and airport terminal services	111	1 485	1 895	26 291	4 649
Railways	1 489	1 479	986	1 020	3 252
Seaports	205	316	945	6 193	4 580
Roads	633	3 416	2 030	17 691	6 847
Water	317	4 146	3 544	17 299	10 878

Source: UNCTAD cross-border M&A database (www.unctad.org/fdistatistics).

2. TNC involvement in developing countries

TNC involvement in the infrastructure industries of developing countries, measured by FDI, cross-border M&A and PPI data, mostly followed global trends, though there were regional differences. The inward FDI stock of developing countries in electricity, gas and water increased rapidly between 1990 and 2000 (from an estimated $2 billion to $33 billion) and reached $47 billion in 2006 (table III.4), despite divestments in Latin America (ECLAC, 2008, box III.15). In transport, storage and communications, FDI stock in developing countries surged between 1990 and 2000, and continued to expand after the turn of the century, reaching a record $152 billion by 2006. Investments in Asia and Africa during the period 2000–2006 grew much faster than in Latin America and the Caribbean; for example, in Africa investment more than doubled, to reach nearly $13 billion in 2006 (table III.4).

As in the case of stocks, *FDI flows* to infrastructure in developing countries largely mirror global trends. For instance, in the *electricity, gas and water* industry, FDI flows to developing countries as a whole increased from around $2.5 billion per annum in 1991−1995 to $12 billion in 1996−2000, followed by a significant decline thereafter. In *transport, storage and communications*, FDI inflows into developing countries increased steadily, from $4 billion per annum in 1991−1995 to $13 billion in 1996−2000, and to $16 billion in 2001−2006. This group of industries avoided the global decline in FDI flows in 2001–2006 due to a strong increase of such flows to Asia, and a more moderate increase to Africa. The continued rise of these two regions more than compensated for the decline in Latin America and the Caribbean.

Data on *cross-border M&As* of infrastructure companies in developing countries (figure III.4) supplement FDI data, as they cover a larger number of host countries. These figures broadly confirm the trends in FDI flows, and suggest that developing countries paralleled world cross-border M&A trends in infrastructure industries, including the peak level reached in the late 1990s

Box III.14. The largest cross-border M&A deals in infrastructure

Cross-border mega acquisitions,[a] by way of reducing the number of large players and increasing the size of the remaining ones, are reshaping the global landscape of infrastructure industries. In the period 1991–2007, there were no less than 346 mega deals in those industries. Most of these transactions took place between TNCs headquartered in developed countries (annex table A.III.3). The acquisition of AirTouch (United States) in 1999, and of Mannesmann (Germany) in 2000 by Vodafone (United Kingdom), so far the two largest deals in the history of cross-border M&As, changed the configuration of the telecommunications industry, making Vodafone the largest company in the industry. The third largest transaction, France Telecom's acquisition of Orange (United Kingdom) in 2000, can be interpreted as a response by one of the main competitors of Vodafone to its huge concentration of market power. In electricity, similar trends took place in 2007, when Enel (Italy) acquired Endesa (Spain) and Iberdrola (Spain) bought Scottish Power (United Kingdom) (the 8th and 9th largest cross-border M&As in infrastructure) (annex table A.III.3). The airports industry also witnessed consolidation with the takeover of BAA (United Kingdom) by Grupo Ferrovial (Spain) in 2006. Some developing-economy TNCs also figure among acquirers, such as DP World (United Arab Emirates), Pacific Century (Hong Kong, China), and SingTel (Singapore), especially in industries in which those TNCs have aspired to become global players.

Source: UNCTAD.

[a] Mega deals are transactions of $1 billion or more.

(primarily because of deals in telecommunications). These trends were in part driven by changes in policies that privatized State-owned assets, especially in Latin America and the Caribbean,[34] and by private cross-border M&As, especially in Asia.[35]

The dynamics of foreign investment commitments of TNCs in the infrastructure industries of developing countries – including FDI, non-FDI and combined forms (box III.11) – also confirm the overall trends outlined above: A rise, followed by a

Box III.15. Divestment by TNCs of infrastructure operations in developing countries

Some infrastructure TNCs have either exited or scaled down their operations in developing countries, especially in the electricity and water industry (box table III.15.1). For example, the Spanish water TNC, Agbar, has exited or scaled down its operations in Brazil, Uruguay, Argentina and Chile. In telecommunications, Verizon (United States) pulled out of the Dominican Republic in 2006 and out of Puerto Rico in 2007, selling its assets in both countries to América Móvil (Mexico). Telekom Malaysia left Africa, partly as a result of changes in its investment strategy with a refocus on Asia (Telekom Malaysia, 2004). In electricity, some United States and European companies have pulled out of developing countries. In 2002 and 2003, AES (United States) suffered major losses and exited from India and Uganda, in addition to selling its operations in the transition economies of Kazakhstan and Ukraine (Nazareth, 2008).

Box table III.15.1. Examples of divestment of TNCs in the water industry in Latin America and the Caribbean, 2002–2007

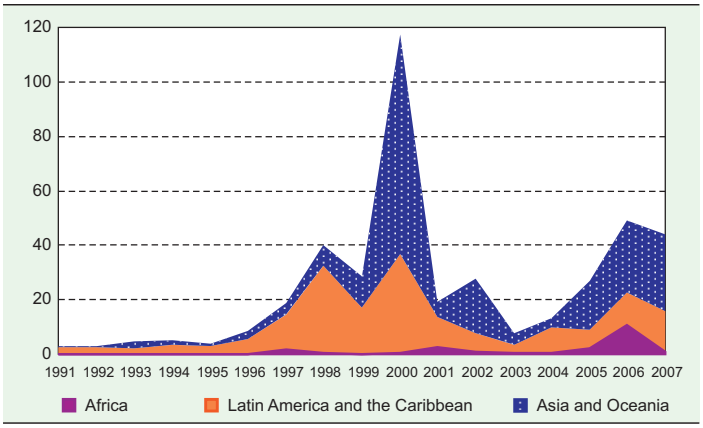
TNC	Home country	Contracts sold or terminated in host country	Year
Suez	France	Argentina (Buenos Aires)	2006
		Argentina (Santa Fé)	2006
		Bolivia (La Paz/El Alto)	2007
		Puerto Rico	2007
SAUR	France	Venezuela, Bolivarian Rep. of (Estado de Lara)	2002
Thames Water	United Kingdom	Chile (Concepción)	2006
Anglian Water	United Kingdom	Chile (Valparaíso)	2003
Aguas de Bilbao	Spain	Argentina (Buenos Aires)	2006
		Uruguay (Maldonado)	2005
Azurix	United States	Argentina (Buenos Aires)	2002
		Argentina (Mendoza)	2004
Aguas do Portugal	Portugal	Brazil (Rio de Janeiro State)	2007

Source: UNCTAD, based on Lobina and Hall, 2007.

The literature indicates that the main reasons for the exit of infrastructure TNCs reflect global and local strategic issues, such as a restructuring and consolidation of operations worldwide (e.g. many electricity companies are paying more attention to the significant infrastructure needs of developed countries, especially where these are their home economies); problems in the host countries, including unsuccessful renegotiations of contracts (usually arising from unforeseen events, such as the economic and financial crisis in Asia and other parts of the developing world in the late 1990s); and public opposition to TNC or private involvement in infrastructure (especially in electricity and water, e.g. in India and many parts of Latin America).

Source: UNCTAD.

Figure III.4. Cross-border M&A sales in infrastructure by developing target region, 1991–2007
(Billions of dollars)



Source: UNCTAD, cross-border M&A database (www.unctad.org/fdistatistics).

Note: The data cover only those deals that involved an acquisition of an equity stake of more than 10%.

significant fall, and then a partial recovery of TNC involvement in developing countries over the period 1996−2006, although with some differences in the peak years and the period of decline (figure III.5).[36]

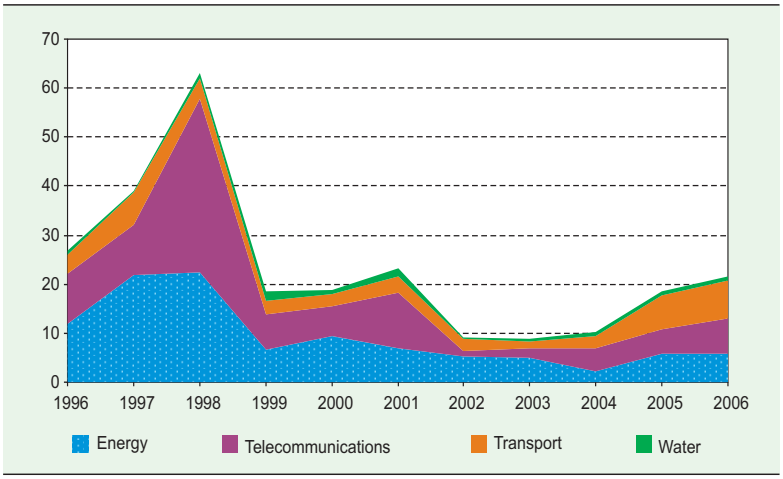
Most foreign investment commitments in the infrastructure industries of developing and transition economies during the period 1996–2006 were by developed-country TNCs. In electricity, France, Spain and the United States were the most important sources of commitments; in road projects, Spain dominated; while in water and sewage, France was the largest source country. In telecommunications, both developed and developing countries were important sources of commitments, led by France, Mexico and Spain. Finally, in seaports, Hong Kong (China), a developing economy was the main source (annex tables A.III.6–8).

An analysis of the regional composition of *foreign projects* in infrastructure industries in developing and transition economies indicates that over the period 1996–2000, TNC commitments were concentrated in Latin America and the Caribbean. This region accounted for more than half of the total value of commitments in infrastructure in developing countries (table III.7, figure III.6). However, after the turn of the century, TNC commitments shifted away from Latin America and the Caribbean to Asia and Oceania, which became the largest recipient region (table III.7). Africa's share of foreign commitments almost tripled (to 30%), largely owing to investments in telecommunications. In spite of this increase, commitments fall far short of the amounts needed to cover infrastructure investment needs. For instance, as a comparison, total TNC investment commitments in infrastructure in Africa during the *decade* spanning 1996–2006 were $45 billion – an amount (even if fully realized) that is barely equivalent to Africa's current *annual* investment needs of $40 billion (section A.2).

In terms of *industry composition* of foreign commitments in the infrastructure industries of developing and transition economies, telecommunications and energy have dominated. Together, they accounted for almost four-fifths of foreign commitments during the period 1996−2006. The share of transport infrastructure remained below 20%, despite its rise after 2000, and the share of water remained very low (less than 5%). Within transport infrastructure, roads and seaports were the most important sub-industries, while foreign commitments in the two other sub-industries – airports and railroads – were limited (table III.8).

There were major differences in the geographical composition of foreign commitments of individual infrastructure industries by developing and transition host regions. In the period 1996–2006, Latin America and the Caribbean was the largest recipient region, overall and in each industry (accounting for 52% of commitments), followed by Asia,

Figure III.5. Foreign investment commitments in the infrastructure industries of developing and transition economies, by industry, 1996–2006
(Billions of dollars)



Source: UNCTAD secretariat calculations, based on data from the World Bank's PPI Database.

Note: See figure III.1.

Table III.7. Foreign investment commitments in the infrastructure industries of developing economies, by industry and host region, 1996–2006
(Millions of dollars and per cent)

Region	Energy				Telecommunications			
	1996–2000		2001–2006		1996–2000		2001–2006	
	Value ($ million)	Share in total of developing economies (%)	Value ($ million)	Share in total of developing economies (%)	Value ($ million)	Share in total of developing economies (%)	Value ($ million)	Share in total of developing economies (%)
Africa	6 837	9.1	5 724	19.1	11 502	18.5	13 966	54.3
Asia and Oceania	20 532	27.4	10 652	35.6	4 957	8.0	9 678	37.6
Latin America and the Caribbean	47 688	63.5	13 544	45.3	45 755	73.5	2 063	8.0
Total for developing economies	75 057	100.0	29 920	100.0	62 214	100.0	25 707	100.0
Memorandum items:								
LDCs	1 314	1.8	3 256	10.9	3 878	6.2	2 517	9.8
South-East Europe and CIS	1 788	..	1 798	..	6 926	..	5 381	..
New EU members	2 108	..	11 871	..	19 836	..	1711	..

Region	Transport				Water			
	1996–2000		2001–2006		1996–2000		2001–2006	
	Value ($ million)	Share in total of developing economies (%)	Value ($ million)	Share in total of developing economies (%)	Value ($ million)	Share in total of developing economies (%)	Value ($ million)	Share in total of developing economies (%)
Africa	1 264	6.5	5 544	23.1	88	1.6	239	5.5
Asia and Oceania	6 091	31.1	8 691	36.3	1 753	31.6	2 383	55.0
Latin America and the Caribbean	12 232	62.4	9 723	40.6	3 709	66.8	1 708	39.5
Total for developing economies	19 587	100.0	23 957	100.0	5 549	100.0	4 330	100.0
Memorandum items:								
LDCs	557	2.8	1 460	6.1	30	0.5	2	0.04
South-East Europe and CIS	330	..	737	..	160	..	563	..
New EU members	287	..	4 604	..	1 398	..	239	..

Region	All infrastructure			
	1996–2000		2001–2006	
	Value ($ million)	Share in total of developing economies (%)	Value ($ million)	Share in total of developing economies (%)
Africa	19 691	12.1	25 473	30.4
Asia and Oceania	33 332	20.5	31 404	37.4
Latin America and the Caribbean	109 383	67.4	27 038	32.2
Total for developing economies	162 407	100.0	83 915	100.0
Memorandum items:				
LDCs	5 778	3.6	7 234	8.6
South-East Europe and CIS	9 203	..	8 478	..
New EU members	23 628	..	18 424	..

Source: UNCTAD secretariat calculations, based on data from the World Bank's PPI Database.
Note: See figure III.1.

Table III.8. Industry composition of foreign investment commitments in the infrastructure industries of developing and transition economies, 1996–2006
(Millions of dollars and per cent)

Infrastructure industry	Value ($ million)	Share in foreign commitments to developing and transition economies (%)
All infrastructure	264 003	100.0
Energy	108 562	41.1
Telecommunications	100 229	38.0
Transport	44 611	16.9
Airports	5 669	2.1
Railroads	7 111	2.7
Roads	18 450	7.0
Seaports	13 381	5.1
Water and sewage	10 602	4.0

Source: UNCTAD secretariat calculations, based on data from the World Bank's PPI Database.
Note: See figure III.1.

Africa and South-East Europe and CIS, in that order (table III.7). In telecommunications, Africa received more commitments over the entire period than Asia, and the share of South-East Europe and CIS was only just short of Asia's, which was 15%. In water, Africa's share was miniscule compared to the other regions, at less than 1%, but appreciable in energy and transport.

Foreign commitments in particular infrastructure industries in developing regions have been concentrated in a handful of host economies. In electricity, for example, Brazil alone attracted 54% of the total foreign commitments in Latin America and the Caribbean in 1996−2006. During the same period, China accounted for almost one quarter of the Asian total, and Morocco was the largest recipient in Africa, with almost 50% of that region's commitments. There were similar patterns in other industries, with countries

such as Brazil, Chile, China, Ecuador, Egypt, Nigeria and Turkey among the largest recipients.

The *group of LDCs,* accounted for less than 1% of world FDI inward stocks in infrastructure in 2006 – and 2% of the FDI inward stocks of developing countries (table III.4). Their share of world FDI inflows in infrastructure also remained low (less than 5%). This marginal status is also confirmed by data on *foreign commitments*. LDCs attracted only 5% of the total foreign commitments in developing and transition economies over the period 1996–2006 (table III.9). The telecommunications industry was by far the largest recipient (accounting for almost half of total commitments to LDCs) (table III.9).

Table III.9. Industry composition of foreign investment commitments in the infrastructure industries of LDCs, 1996–2006
(Millions of dollars and per cent)

Infrastructure industry	Value ($ million)	Share in LDC total (%)	Share of LDCs in foreign commitments to developing and transition economies (%)
All infrastructure	13 013	100.0	4.9
Energy	4 569	35.1	4.2
Telecommunications	6 394	49.1	6.4
Transport	2 017	15.5	4.5
Airports	208	1.6	3.7
Railroads	652	5.0	9.2
Roads	433	3.3	2.3
Seaports	724	5.6	5.4
Water and sewage	32	0.2	0.3

Source: UNCTAD secretariat calculations, based on data from the World Bank's PPI Database.
Note: See figure III.1.

In the period 1996–2006, developing countries accounted for a high proportion of foreign investment commitments in the transport and telecommunications industries of LDCs (table III.10), but they had virtually no investments in water and sewage. Overall, their share in total foreign investment commitments in infrastructure was higher in LDCs (almost 40%) than in all developing and transition economies (32%) (table III.10). This difference was particularly pronounced in transport, where, because of TNCs such as DP World (United Arab Emirates), investors from the South accounted for 65% of foreign investment commitments in LDCs (table III.10). In energy and telecommunications, their shares in foreign commitments in LDCs were almost as high as they were in all developing and transition economies (table III.10).

Finally, turning to *modalities of foreign investment commitments* (legal forms), in *energy* – electricity and natural gas – concessions appear to have been the dominant form of TNC involvement in developing and transition economies during the period 1996–2006 (62%, figure III.6), especially BLO and BOO (box III.11), which together represented 35% of the number of investment projects. Other concessions represented 27% of the cases, while equity forms/FDI (privatizations/acquisitions and greenfield) together accounted for 36%. Management and lease contracts were marginal during the entire period.[37]

In the *transport* infrastructure of developing and transition economies over the same period foreign participation was largely in the form of concessions: these alone accounted for 86% of the number of projects (figure III.6). Privatizations, the second most important form, accounted for less than one-tenth of the total. The dominance of concessions in transport worldwide has resulted in a proliferation of individual operators. This is particularly evident in ports,[38] where the majority of international players have expanded by winning new concessions, and only more recently, through M&As.

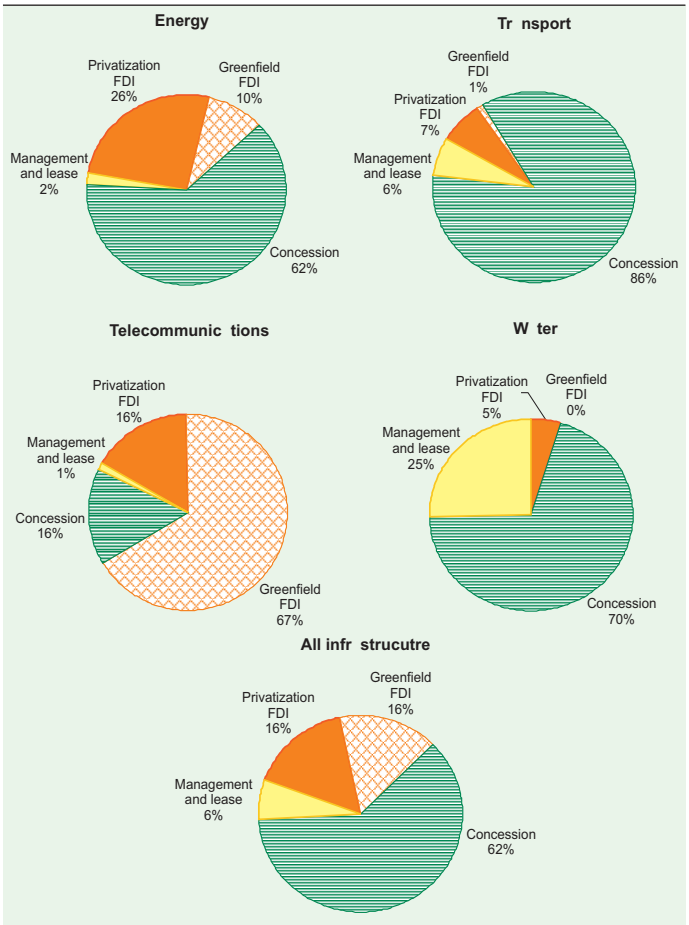
Telecommunications was the only industry among those covered in developing and transition economies, in which TNC involvement was largely through equity forms (figure III.6). Reflecting the importance of mobile telephony in developing countries, 67% of the investment projects registered in 1996–2006 were greenfield FDI projects, while privatization (mostly of fixed-line operations) accounted for only 16% of the cases of investment. In recent years, non-privatization M&As (which are not covered in the World Bank's PPI Database) have also been an increasingly important mode of

Table III.10. Sources of foreign investment commitments for the infrastructure industries of LDCs, and of developing and transition economies, 1996–2006
(Millions of dollars and per cent)

	Host region: LDCs			Host region: Developing and transition economies		
	Source of commitment		Share of developing economies (%)	Source of commitment		Share of developing economies (%)
Infrastructure industry	World	Developing economies		World	Developing economies	
All infrastructure	13 013	5 029	38.6	264 003	85 456	32.4
Energy	4 569	1 083	23.7	108 562	20 912	19.3
Telecommunications	6 394	2 629	41.1	100 229	46 701	46.6
Transport	2 017	1 317	65.3	44 611	16 376	36.7
Water and sewage	32	-	-	10 602	1 467	13.8

Source: UNCTAD secretariat calculations, based on data from the World Bank's PPI Database.
Note: See figure III.1.

Figure III.6. Main legal forms of foreign investment commitments in the infrastructure industries of developing and transition economies, by industry, 1996–2006
(Based on the number of projects; in per cent)



Source: UNCTAD secretariat calculations based on data from the World Bank's PPI Database.

Note: See figure III.1.

foreign market entry by TNCs in telecommunications (Curwen, 2005; Ure, 2008).

In the *water* industry, TNCs entered developing and transition economies mostly through concessions (70% of the projects, figure III.6). Management and lease contracts were also used frequently, reflecting pressure in some countries for public sector financing and owning infrastructure facilities (section A.3). In the water industry there were few instances of privatizations.

C. The universe of infrastructure TNCs

The universe of infrastructure TNCs is diverse: the firms have different characteristics by size, industry and geographical reach. This section focuses on the main corporate players and their key features, with special reference to dynamic changes in the composition of these players, especially the rise of infrastructure TNCs from developing and transition economies. The analysis distinguishes between firms whose main activities are in infrastructure (infrastructure TNCs), and those for which it represents activities additional to their core business.[39]

1. Major infrastructure TNCs

In 2006, the world's 100 largest infrastructure TNCs, ranked by foreign assets, was dominated by developed-country companies, and by three industries: electricity, telecommunications and transport (annex table A.III.4). However, there is also a significant presence of TNCs from developing and transition economies – much larger in fact (22 firms) than those in the list of the world's 100 largest TNCs in all industries (6). Moreover, in some sub-industries, such as ports, developing-economy firms – DP World (United Arab Emirates) and Hutchison Whampoa (Hong Kong, China) – are industry leaders, while in others, such as telecommunications, they are gaining in importance (table III.11).

Of the top 100 infrastructure TNCs, 78 were headquartered in a developed country, with the United States accounting for 14, Spain for 10, and France and the United Kingdom 8 each (table III.12). Among developing and transition economies, half of the 22 TNCs in the list were based in three Asian economies, Hong Kong (China) (5 firms), Malaysia (3) and Singapore (3). The internationalization of the top 100 infrastructure firms, as measured by the ratio of foreign to total assets, varied considerably: TNCs from Italy and the United States, for instance, had particularly low levels of internationalization, while the ratio was high among most other European Union-based firms. The industry composition of the top 100 infrastructure TNCs included 37 firms in telecommunications, 28 in electricity (with an additional 3 in electricity and water combined),[40] and 19 in transportation (table III.13). Eight of the largest infrastructure TNCs were active in more than one industry.[41]

In general, developed-country infrastructure TNCs are much larger than developing-country ones, and their foreign assets in particular tend to be much larger as well.[42] Vodafone (United Kingdom) was the largest company in 2006, while Hutchison Whampoa (ranked 8th in the top 100) was both the

Table III.11. Largest TNCs in infrastructure industries, ranked by foreign assets, 2006
(Companies highlighted are based in developing or transition economies)

Rank	Electricity	Telecommu-nications	Transport	Water and sewage	Natural gas	More than one infrastructure industry
1	Electricité de France	Vodafone Group	Grupo Ferrovial	Veolia Environnement	Gaz de France	Suez
2	E.ON	Telefónica	Abertis	Grupo Agbar	Spectra Energy Corp.	**Hutchison Whampoa**
3	Endesa	Deutsche Telekom	AP Moller-Maersk	Waste Management Inc	Centrica	RWE Group
4	Vattenfall	France Télécom	**DP World**	Shanks Group	Gas Natural	Bouygues
5	National Grid	Vivendi Inc	**China Ocean Shipping**	Waste Services Inc	Transcanada Corp.	**YTL Power**
6	AES Corp.	Liberty Global Inc	Canadian National Railways Co.	Stericycle Inc	Enbridge Inc	Babcock & Brown Infrastructure
7	Fortum	TeliaSonera	Skanska	**Hyflux Limited**	Sempra Energy	**Enka Insaat ve Sanayi**
8	Duke Energy Corp.	**SingTel**	**PSA International**	Clean Harbors Inc	El Paso Corp.	**NWS Holdings**
9	EDP Energias de Portugal	Telenor	Hochtief	..	Hunting Plc	..
10	International Power Plc	Nortel Networks	Vinci	..	Williams Companies	..
11	**CLP Holdings**	KPN	Macquarie Airports	..	**Hong Kong & China Gas Co.**	..
12	Iberdrola	BT Group	Deutsche Bahn	..	Distrigaz 'D'	..
13	Unión Fenosa	Verizon Communications	**Orient Overseas International**	..	Canadian Utilities Ltd.	..
14	PPL Corp.	SES	Grupo ACS	..	Iwatani International Corp.	..
15	Atel - Aare Tessin	Telecom Italia	Obrascon Huarte Lain	..	..	..
16	Public Service Enterprise Group	**América Móvil**	Kansas City Southern	..	..	..
17	**Keppel Corp.**	**Mobile Telecommuni-cations Co.**	Canadian Pacific Railway	..	..	..
18	Cofide-CIR Group	TDC A/S	First Group	..	..	..
19	Edison International	Portugal Telecom	BBA Aviation	..	..	..
20	Enel	Tele2	**China Communications Construction Co.**	..	..	..

Source: UNCTAD, based on annex tables A.III.4 and 5.

Table III.12. Foreign and total assets of the world's 100 largest infrastructure TNCs, by home economy and region, 2006
(Millions of dollars and per cent)

Home region / economy	Number of firms	Foreign assets		Total assets		Foreign assets as a share of total assets (%)
		Value	Share in total (%)	Value	Share in total (%)	
World	100	1 601 063	100.0	4 062 647	100.0	39.4
Developed economies	78	1 416 178	88.5	3 712 743	91.4	38.1
European Union	53	1 228 041	76.7	2 586 748	63.7	47.5
France	8	368 835	23.0	737 063	18.1	50.0
Germany	6	270 926	16.9	571 337	14.1	47.4
Spain	10	233 338	14.6	440 796	10.8	52.9
United Kingdom	8	185 705	11.6	301 174	7.4	61.7
Sweden	4	62 849	3.9	95 198	2.3	66.0
Denmark	2	18 562	1.2	68 965	1.7	26.9
Portugal	2	17 990	1.1	49 547	1.2	36.3
Italy	4	15 681	1.0	205 530	5.1	7.6
Luxembourg	3	15 501	1.0	15 656	0.4	99.0
Austria	2	2 971	0.2	17 302	0.4	17.2
Other European Union	4	35 683	2.2	84 181	2.1	42.4
Other developed economies	25	188 137	11.8	1 125 995	27.7	16.7
United States	14	119 079	7.4	948 638	23.4	12.6
Canada	6	34 230	2.1	100 402	2.5	34.1
Australia	3	13 638	0.9	45 740	1.1	29.8
Other	2	21 190	1.3	31 214	0.8	67.9
Developing economies	20	180 493	11.3	321 413	7.9	56.2
Africa	2	8 319	0.5	22 540	0.6	36.9
Latin America and the Caribbean	2	14 490	0.9	53 739	1.3	27.0
Mexico	2	14 490	0.9	53 739	1.3	27.0
Asia and Oceania	16	157 683	9.8	245 134	6.0	64.3
Hong Kong, China	5	84 663	5.3	116 771	2.9	72.5
Singapore	3	29 583	1.8	47 503	1.2	62.3
Malaysia	3	10 046	0.6	24 639	0.6	40.8
Kuwait	2	9 818	0.6	14 504	0.4	67.7
Other Asia	3	23 573	1.5	41 718	1.0	56.5
South-East Europe and CIS	2	4 392	0.3	28 491	0.7	15.4
Russian Federation	2	4 392	0.3	28 491	0.7	15.4

Source: UNCTAD, based on annex table A.III.4.

Table III.13. The world's 100 largest infrastructure TNCs, and the 50 largest infrastructure TNCs of developing and transition economies: industry breakdown, 2006
(Number of firms)

Industry	World	Developing and transition economies
Airports	2	1
Airports and roads	1	-
Electricity	28	10
Electricity and water	3	1
Natural gas	7	1
Railroads	5	-
Roads	6	8
Roads and electricity	1	1
Roads, electricity, water and seaports	-	1
Roads and telecom	1	-
Seaports	5	5
Seaports, electricity and telecom	2	1
Telecom	37	20
Water	2	1
Total	100	50

Source: UNCTAD, based on annex tables A.III.4 and 5.

largest developing-country infrastructure TNC and the largest infrastructure conglomerate overall (annex table A.III.4).

A separate list of the 50 largest infrastructure TNCs from developing and transition economies (referred to here as the top 50 developing-country infrastructure TNCs) by foreign assets shows a wide geographical spread in terms of home countries (annex table A.III.5). In 2006, no less than 16 home economies were represented in the top 50, with the largest number of firms headquartered in Malaysia (8), Hong Kong (China) (7), Singapore (6) and South Africa (5). By continent, Asia dominated (38 of the 50 TNCs). There were also notable differences in size among infrastructure TNCs headquartered in different economies. Hong Kong (China), the home economy for Hutchison Whampoa accounted for 25% of the total assets and more than 40% of the foreign assets of the firms on the top 50 list.[43] Firms from Singapore and China were also large in terms of foreign and total assets, while Russian TNCs have exceptionally large total (but not foreign) assets due to the energy monopoly UES (annex table A.III.5, table III.14).

As noted above, developing-country TNCs were especially well present in seaports, road transport and telecommunications: they accounted for two-thirds of the total number of developing-country TNCs (table III.13). Only 11 firms in the list were involved in electricity and gas together, and only 1 firm was in the water industry.

A large number of infrastructure TNCs have mixed private-public ownership. This reflects the fact that a number of major TNCs have roots in publicly owned domestic entities,[44] some of which were partly or wholly privatized prior to internationalizing.[45] In developed countries in the past this was especially the case in electricity and water, but less so in telecommunications and transport in which private firms were established and active at the outset. In contrast, many developing-country infrastructure firms, which later became TNCs, were established to support economic development at home, and therefore honed their competitive advantages in this process. Whether they are SOEs or private companies often reflects the endowments and strategies of their respective home economies. For example, infrastructure TNCs from Hong Kong (China) are private companies, whereas many from Singapore are SOEs.

Table III.14. Foreign and total assets of the 50 largest infrastructure TNCs of developing and transition economies, by home country and region, 2006
(Millions of dollars and per cent)

Home region / economy	Number of firms	Foreign assets		Total assets		Foreign assets as a share of total assets (%)
		Value	Share in total (%)	Value	Share in total (%)	
Total	50	196 542	100.0	499 267	100.0	39.4
Developing economies	47	191 636	97.5	412 298	82.6	46.5
Africa	7	9 880	5.0	35 236	7.1	28.0
South Africa	5	5 051	2.6	25 747	5.2	19.6
Egypt	2	4 829	2.5	9 490	1.9	50.9
Latin America and the Caribbean	2	14 490	7.4	53 739	10.8	27.0
Mexico	2	14 490	7.4	53 739	10.8	27.0
Asia and Oceania	38	167 267	85.1	323 323	64.8	51.7
Hong Kong, China	7	85 699	43.6	124 714	25.0	68.7
Singapore	6	31 041	15.8	53 039	10.6	58.5
China	2	11 560	5.9	34 969	7.0	33.1
Malaysia	8	11 236	5.7	30 118	6.0	37.3
Kuwait	2	9 818	5.0	14 504	2.9	67.7
Turkey	3	4 134	2.1	13 260	2.7	31.2
Korea, Republic of	2	1 344	0.7	23 601	4.7	5.7
India	3	691	0.4	7 803	1.6	8.9
Thailand	2	273	0.1	2 185	0.4	12.5
Other Asia	3	11 471	5.8	19 131	3.8	60.0
South-East Europe and CIS	3	4 906	2.5	86 969	17.4	5.6
Russian Federation	3	4 906	2.5	86 969	17.4	5.6

Source: UNCTAD, based on annex table A.III.5.

Interestingly, infrastructure TNCs from the North and the South are competing head-on in international markets (table III.11), including in developing countries, and it is important for governments to understand their relative advantages and disadvantages (section D).

2. Major infrastructure investors in developing countries by industry

The composition of the universe of infrastructure TNCs investing in developing economies varies by industry. The analysis in this section focuses on the main features of investors in individual infrastructure industries, concentrating on the period 1996–2006.

The global *electricity industry* has been and still is dominated by TNCs from developed countries, because of their technological advantages as well as financial, technical, project management and other expertise. The world's largest electricity TNCs in terms of foreign commitments in developing countries are primarily from Europe and the United States (annex tables A.III.6–8). The consolidation of the electricity industry in Europe through M&As has led to the emergence of a few very large electricity firms known as the "Seven Brothers" (EDF, Electrabel, Endesa, Enel, E.ON, RWE and Vattenfall), all of which are active international investors (IEA, 2003).[46] In North America, electricity firms such as AES, American Electric Power and TransAlta are also investing abroad. In general, cross-border M&As are a preferred strategy for consolidating an international presence in electricity. M&As in electricity have soared in recent years, both in terms of volume and magnitude of deals, reflecting the trend towards industry consolidation (PricewaterhouseCoopers, 2006). Cross-border M&As in electricity are concentrated in Europe, the United States and developing Asia.[47]

TNCs' participation in the global electricity industry has evolved substantially, reflecting changing policies, market opportunities and corporate strategies over the years. The increasing trend towards PPPs in the provision of electricity services is an example, as is the emergence of new players, such as independent power producers in developing countries (ECA and UNEP, 2007). In addition, some technology providers have moved up the value chain and become producers and suppliers of electricity themselves. For example, technology suppliers such as Suzlon (India) and Alstom (France) are beginning to compete with traditional utilities in developing countries for transmission and distribution activities (Gils et al., 2007; Nazareth, 2008). In addition, government policies aimed at encouraging the use of renewable energy in power generation have prompted some equipment suppliers, such as GE, Siemens and Westinghouse, to become producers and suppliers of electricity (Ernst & Young, 2006).

Although developed-country TNCs are the largest players in the electricity industry, including in developing countries, most remain regional entities, with a significant proportion of their revenues generated from, and assets located within, their home regions.[48] Thus there is considerable scope for developing-country TNCs in this industry to invest abroad, and indeed several of them, particularly those from Brazil, India, Malaysia, Singapore and Thailand, have begun doing so in recent years. Some of them have seized on the opportunity of openings created by the withdrawal of some developed-country TNCs from developing-country markets (Tenenbaum and Izaguirre, 2007). Their expansion, mainly to other developing countries, is thereby strengthening South-South cooperation in electricity infrastructure development, especially in Asia.[49]

In *telecommunications*, most of the largest investors in developing and transition economies are headquartered in developed economies, especially in Europe. Telefónica (Spain), France Telecom (France) and América Móvil (Mexico), in that order, had the largest investment commitments in developing countries in 1996–2006, followed by Telmex (Mexico), Vodafone (United Kingdom) and Deutsche Telekom (Germany) (annex tables A.III.6–8). In addition to infrastructure TNCs, some of the major investors in telecommunications in developing countries are banks, such as Bank of America (United States), and conglomerates from current-account-surplus developing countries, such as the Abu Dhabi Group or Dubai Holding. The geographical spread of telecommunications TNCs often reflects considerations of geographical or cultural proximity (such as the Latin American investments of América Móvil and Telefónica) (Gerpott and Jakopin, 2007), or a combination of technological considerations and first-mover advantages, as with the largest mobile operators in Africa (Curwen, 2005; box III.16).

The structure of the telecommunications industry is changing both globally and in developing countries as a result of mega mergers or as some TNCs sell off foreign assets to new players. It is notable that the 7 largest M&A deals in infrastructure industries between 1991 and 2007 all took place in telecommunications, amounting to a total of $437 billion (annex table A.III.3).[50] The main sell-off of affiliates by TNCs took place in Latin America and the Caribbean, where United States TNCs such as BellSouth, Verizon and AT&T, sold their assets to local and regional players (ECLAC, 2008; box III.15). Mexico's América Móvil and Telmex have been the most active in this restructuring of the

Box III.16. The entry of TNCs in the mobile telephony market in Africa

In recent years, Africa has experienced a "mobile revolution". The continent had about 190 million mobile subscribers in 2006 following an annual growth rate of 46% in subscribers between 2001 and 2006; and mobile penetration had reached 22%, in comparison to 29% in Asia, for example. In 2001, mobile phones overtook fixed telephone lines, and now outnumber fixed lines by nearly seven to one.

TNCs have contributed substantially to this rapid market growth. Among the top 10 mobile operators in Africa in terms of national subscribers, 8 of them are foreign affiliates (box table III.16.1). MTN in Nigeria, Djezzy GSM in Algeria and Mobinil in Algeria are affiliates of operators headquartered in other African countries, highlighting a strong South-South (especially intraregional) feature of FDI flows in Africa's mobile telephony market.

Box table III.16.1. Top 10 mobile operators in Africa, ranked by number of local subscribers, 2006

Rank	Operator	Host country	Parent company (equity share)	Home country	Total subscribers	Revenues ($ million)
1	Vodacom	South Africa	Vodafone (50%)/Telkom (50%) (local)	United Kingdom	21 800	2 661
2	MTN	South Africa	Local	South Africa	12 483	2 859
3	MTN Nigeria	Nigeria	MTN (100%)	South Africa	12 281	2 053
4	Glo Mobile	Nigeria	Local	Nigeria	11 000	..
5	Maroc Télécom	Morocco	Vivendi (53%)	France	10 707	1 627
6	Djezzy GSM	Algeria	Orascom Telecom (100%)	Egypt	10 531	1 531
7	Mobinil Egypt	Egypt	France Télécom (Orange) (71%)/Orascom Telecom (29%) (local)	France	9 267	1 114
8	Vodafone Egypt	Egypt	Vodafone (100%)	United Kingdom	8 704	1 243
9	Mobinil Algeria	Algeria	France Télécom (Orange) (71%)/Orascom Telecom (29%)	France/Egypt	7 476	..
10	Celtel Nigeria	Nigeria	Zain Group (100%)[a]	Netherlands[b]	6 400	1 381
Total of Africa					**110 649**	**14 469**

Source: UNCTAD, based on ITU 2007a and company reports.

[a] Previously MTC Group.

[b] Celtel is an affiliate of Zain Group (Kuwait).

Source: UNCTAD.

regional industry.[51] Of developed-country TNCs, only Telefónica (Spain) followed suit with the acquisition of BellSouth's mobile telephony operations in Latin America in 2004–2005.

In *transport infrastructure*, in addition to major transport TNCs, such as Bouygues (France), Grupo ACS (Spain) and Hopewell Holdings (Hong Kong, China), a number of leading investors in developing countries are from related industries such as electronics (e.g. Siemens, Germany) (annex tables A.III.6–8). Since transport is also a very diverse industry, it is necessary to analyse it by sub-industries (i.e. roads, airports, seaports and railroads).

In *airports*, developed-country firms dominate. Many are affiliates of larger groups, mostly from developed countries (annex tables A.III.6–8). British Airport Authority[52] (United Kingdom) has been by far the most active in developing and transition economies, especially during the period 2001–2006. Also significant in terms of investment commitments are Fraport (Germany), Copenhagen Airport[53] (Denmark), and ACS Group, the largest Spanish construction TNC. Developing-country TNCs, such as Bidvest Group (South Africa), Senai Airport Terminal Services (Malaysia) and Airport Authority of Hong Kong, also increased their commitments in developing countries in 2001–2006.

In *railways*, too, developed-country TNCs had the largest share of foreign commitments in developing countries over the period 1996–2000.[54] In 2001–2006, however, a developing-country TNC, Mass Transit Railway Corporation (Hong Kong, China) became the largest investor.[55] In Africa specifically, railway concessions have often involved partners from the South (Bullock, 2005).[56]

In *road* infrastructure in developing countries, large European firms, such as OHL (Spain), SyV (Spain) and Impregilo (Italy) have dominated investments. However, a significant number of Asian and Latin American firms, such as ICA (Mexico) and Cheung Kong Infrastructure Holdings (Hong Kong, China), also made substantial investment commitments during the period 1996–2000.[57] In addition, a new batch of TNCs from the South, including Odebrecht (Brazil) and MTD Capital (Malaysia), emerged in this area during this period.

In *seaports*, TNCs from the South are world leaders, and compete with their developed-country counterparts on a global scale. As noted above, Hutchison Whampoa is the largest investor worldwide, and DP World and PSA (Singapore) are among the top four (annex table A.III.4).[58] In terms of total physical capacity (throughput) worldwide, rankings are similar (table III.15), although the capacity of PSA exceeds that of DP World. The industry structure is also highly concentrated, with the four largest operators in seaports together responsible for almost half of global throughput (table III.15).

Today, most of the world's large port operators are TNCs specialized in this sub-industry. This is quite

Table III.15. Major port operators, ranked by their share in world container port throughput, 2006
(Millions of TEU[a] and per cent)

Ranking	Operators	Home economy	Throughput (million TEU)[a]	Share in world total (%)
1	Hutchison Port Holdings	Hong Kong, China	61	13.8
2	APM Terminals[b]	Netherlands	52	11.8
3	PSA	Singapore	47	10.7
4	DP World	United Arab Emirates	42	9.4
5	Cosco	China	22	5.0
6	Eurogate	Germany	12	2.7
7	Evergreen	Taiwan Province of China	9	2.1
8	MSC	Switzerland	9	2.0
9	SSA Marine	United States	8	1.7
10	HHLA	Germany	7	1.5

Source: UNCTAD, based on Drewry, 2007.
[a] Twenty-foot equivalent unit.
[b] Affiliate of AP Moller-Maersk (Denmark).

different from a decade ago, when most terminals were operated by ocean carrier TNCs seeking to secure dedicated terminal facilities for their ships.[59] This shift towards greater specialization has taken place because port operators now require more specialized knowledge and skills in terminal operations in the context of extensive trade expansion and growing competition. This competition has come mainly from new individual terminal operating companies in response to the spread of port concessions worldwide. However, apart from DP World, the majority of new entrants in the industry are small individual port operators that, having matured in their own economies, are seeking new opportunities abroad (e.g. the Irish Port of Dublin is partnering with Sabang Port in Indonesia).

In *water and sewage,* a few very large European TNCs, such as Veolia (France), Agbar (Spain), Suez (France) and RWE (Germany), dominate investment commitments in developing countries (annex tables A.III.6–8). TNCs in the water industry, such as Suez, RWE and EVN (Austria), often combine water and sewage with electricity services.

The shares of the largest (top 5 and top 10) investors in individual infrastructure industries in developing and transition economies fell in 2001–2006 – with the exception of transport – although from very high initial levels of concentration in the late 1990s (table III.16). For example, in 1996–2000, the 5 largest investors in the water industry[60] accounted for almost 75% of the total foreign commitments in developing and transition economies, but by 2001–2006, their share had declined to less than 50% of the total.[61]

Table III.16. Share of the top 5 and top 10 investors in total foreign investment commitments in infrastructure industries in developing and transition economies, 1996–2006
(Per cent)

Industry	Top 5		Top 10	
	1996–2000	2001–2006	1996–2000	2001–2006
Electricity	35.4	29.9	50.7	42.9
Telecom	58.7	48.0	75.6	69.4
Transport	27.0	31.0	42.2	46.2
Water	73.7	45.5	85.6	65.4

Source: UNCTAD's calculations, based on data from the World Bank's PPI Database.
Note: See figure III.1.

3. South-South investors in developing countries

TNCs from the South are undertaking more foreign investment commitments in other developing regions (table III.17), and especially in LDCs (section C.2), although developed-country TNCs still remain the largest investors. In Africa, the bulk of investment commitments still originate in developed countries, except, notably, in telecommunications. Moreover, 19 of the top 50 investment commitments in infrastructure in Africa are by TNCs from the South. Regional proximity seems important: 9 are headquartered in West Asia, and most of the others (8) in other African countries, especially South Africa and Egypt (annex table A.III.6). The second largest investor in the region, MTC (Kuwait)

Table III.17. Origin of foreign investment commitments in the infrastructure industries of Africa, Asia and Oceania and Latin America and the Caribbean, 1996–2006
(Per cent)

Host region/industry	Developed economies	Developing economies	Transition economies
Africa total	**60.8**	**39.1**	**0.1**
Energy	91.3	8.5	0.2
Telecom	42.0	58.0	-
Transport	82.1	17.9	-
Water	100.0	-	-
Asia and Oceania total	**57.1**	**42.8**	**0.1**
Energy	78.7	21.3	-
Telecom	24.1	75.7	0.2
Transport	43.5	56.1	0.4
Water	76.0	24.0	-
Latin America and the Caribbean total	**83.9**	**15.7**	**0.4**
Energy	92.3	7.7	-
Telecom	73.6	25.3	1.1
Transport	85.6	14.4	-
Water	97.6	2.4	-

Source: UNCTAD's estimates, based on data from the World Bank's PPI Database.
Note: See figure III.1.

– renamed Zain in 2007 – is a developing-country firm, and the fourth largest is an intraregional investor (MTN of South Africa). The list includes not only large TNCs, but also intraregional niche investors, such as Trans Century (that invests in transport in Kenya) and Econet Wireless (that invests in telecommunications in Botswana).

In Asia, South-South investment commitments – especially intraregional – are very significant, reflecting the dominant position of the region's firms in the top 50 developing-country infrastructure TNCs. These TNCs account for over 40% of the total foreign investment commitments in the region, and for 56–76% in telecommunications and transport (table III.17). China Light and Power (Hong Kong, China) is the largest investor in terms of commitments registered in 1996−2006 (annex table A.III.7). Of the top 50 investors, more than half (27 firms) were from developing countries, and half (25 firms) were from developing Asia, with TNCs from Hong Kong (China) (9 firms) and Malaysia (5 firms) being the most active.

In Latin America and the Caribbean, the role of developing-country investors has been more limited. Of the total foreign commitments, developing-country TNCs accounted for less than 20% in infrastructure industries on average. Their most significant investments were in the telecommunications industry. Of the 50 foreign firms with the largest commitments in 1996–2006, only 7 originated from developing countries (annex table A.III.8).

D. Competitive advantages, drivers and strategies of infrastructure TNCs

Although a number of today's major infrastructure TNCs have operated overseas for many decades, most have internationalized only since 1990 (section C). TNCs internationalize in order to increase their profitability and/or protect their capital value. Whether they internationalize, in what forms (e.g. through FDI or management contracts) and where (e.g. in nearby countries or further afield) depends on a number factors. Among the most important are, first, the possession of competitive advantages, which enables them to compete with other firms, including in the host economy;[62] second, there must be location-specific reasons why a TNC chooses to operate in a particular host economy, rather than another one (or in the home country); and finally, the relative costs of a TNC internalizing and managing an operation in a host country, as opposed to selling the knowledge of how to do this to a local firm, which determines its modality of participation in a foreign market.[63]

With these factors in mind, this section discusses the competitive advantages possessed by infrastructure TNCs, and then examines what drives and motivates these companies to internationalize. The overall aim of the section is to understand the patterns of TNC participation in infrastructure in developing countries, including geographical and industrial dispersion and entry modalities, as well as potential future developments. The analysis below is based on an UNCTAD survey of infrastructure TNCs (box III.17), as well as literature on their internationalization.

1. Sources of competitive advantages

Sources of TNC competitiveness can be firm-specific advantages (FSAs) or non-firm-specific advantages.[64] Firm-specific advantages include technologies or brands owned or possessed by the firm, or other advantages enjoyed by the firm because of external factors, for example, as a result of privileged access to cheap capital in the home economy. There are four categories of FSAs: technology and expertise, production and service capabilities, business models and forms of governance. Each of these is explained below in the context of the results of the UNCTAD survey of infrastructure TNCs.

- Advantages based on *ownership or possession of technology and expertise* are the most commonly cited in the TNC literature. They include proprietary technology and expertise arising from sustained investment in R&D and other capabilities or resources. For infrastructure TNCs responding to the survey, only a little over a third (37%)[65] of competitive advantages fell into this category. However, there is a big difference in responses by the origin of TNCs. The majority of FSAs mentioned by developed-country TNCs (61%) fell into this category. Among developing-country TNCs, only 12% of the FSAs were related to technology and expertise. There were also differences by industry. Nearly all responses by TNCs in the water industry were FSAs of this type,[66] as were 43% of advantages mentioned by electricity companies. Most of the ownership advantages mentioned arise not from product technology or brands, but rather from various types of embedded expertise. This was the case for both developed and developing countries. Companies mentioned, among others, expertise in network design and operation, engineering skills, environmental know-how, financial techniques, and project management capabilities. This underscores the nature of infrastructure industries, where the ability to manage complex networks of activities is generally more important than possessing state-of-the-art technology per se.

Box III.17. UNCTAD survey of infrastructure TNCs

UNCTAD conducted a global questionnaire-based survey of infrastructure TNCs during April-May 2008, in which executives answered detailed questions on a range of issues, including competitive advantages possessed by respondent companies, as well as their motives, strategies, international operations and attitudes towards home- and host-country policies. A sample of 175 major infrastructure TNCs was constructed based on a number of databases, focusing on larger TNCs in each industry and those with significant levels of involvement in developing and transition economies. Other TNCs with infrastructure interests were excluded. Care was taken to ensure that the sample of companies reflected the overall population of infrastructure TNCs (section C). The response rate was 22% (38 companies), and was broadly representative of the sample and population of infrastructure TNCs. By industry, 18 were in the telecommunications industry, 12 in electricity, 6 in transport and 2 in water; transport was slightly underrepresented. All of the major home economies were represented, including Australia, France, Japan, the Netherlands, Spain, Sweden and United States among developed economies; and Brazil, China, Hong Kong (China), India, Malaysia, Mexico, the Republic of Korea, Singapore, South Africa, Turkey and the United Arab Emirates among developing economies. Several companies were SOEs, in keeping with the significant number of such TNCs in infrastructure industries. As a whole, infrastructure TNCs in the survey sample were large, with average overall sales of $15 billion (some are much larger), and they employed an average of 39,000 people. The average number of people employed overseas was high, at nearly 9,000, reflecting considerable international involvement, including in nearby countries. With regard to international orientation, on average, responding companies were active in 4.6 host economies.

Source: UNCTAD.

- *Production and service capabilities* derive from specialization in segments of industries or from a particular focus on certain aspects, such as ensuring minimum costs or customer orientation. Unlike the previous category of FSA, such advantages do not necessarily derive from embedded industry-level expertise; rather, they depend on factors such as scale or network coverage maximization, cost-consciousness, or flexibility and fast response (all of which were mentioned by respondents).[67] A significant proportion of infrastructure TNCs – proportionally more from developing countries – indicated that they possessed production and service capabilities (23% of all advantages mentioned). Such capabilities are important for all industries, especially telecommunications, and 30% of FSAs were in this category. This is not surprising, given that many telecommunication operators do not possess fundamental technology, but rather focus on its exploitation (Ingelbrecht, 2008).
- *Business models* include FSAs associated with the development and exploitation of relationships, including with suppliers and customers. About 15% of infrastructure TNCs in the survey mentioned FSAs in this category, including reliable partnerships worldwide and strong and well-organized marketing channels. Telecommunications are well represented in this group because of the importance of the retail segment in this industry, and the use of various innovative approaches to selling services to relatively poor customers (e.g. the approach taken by Reliance Communications). A large number of TNCs also mention their financial structure and strength and large cash flows as FSAs, especially in telecommunications, which are important for fostering rapid expansion and gaining market share. In the survey, TNCs were asked to cite their primary source of international investment finance: all telecommunications firms indicated that the preponderance of investment was from internal cash flow, sometimes up to 100%. In some cases, financial strength also signifies a strong, perhaps monopoly, position in the home economy, which allows infrastructure TNCs to invest some of their profits at home and overseas. In the case of all infrastructure TNCs in the survey apart from telecommunications, a sizeable share of their investments (or a particular investment) – about 20–30% – was financed from internal resources, primarily generated from profits in the home economy.[68] An important consequence of the financial prowess of infrastructure TNCs is the acquisition of created assets, an issue taken up further in section D.2.
- *Forms of ownership and organization*, including its organizational culture or whether a TNC is State-owned, represent 10% of FSAs mentioned in the survey. TNCs mainly stressed the extent to which organizational culture made companies flexible or open to new ideas, which were seen as conducive to business, especially in transport and telecommunications.
- *Non-FSA advantages*[69] can derive from a number of sources, including home country endowments, home government policies, or some specific relationship with the host country. Some 18% of competitive advantages mentioned could be categorized as non-firm-specific, ranging from access to capital (especially in countries with trade surpluses) to good working knowledge of developing host economies (particularly where the TNC is from a neighbouring country or already has operations in similar economies). Other non-FSAs mentioned by respondent TNCs included

experience of liberalization in the home economy (providing useful lessons for entry into host economies undergoing similar experiences).

As the survey indicates, competitive advantages of companies differ by industry. Competitive advantages in the *water industry* are mostly intangible and difficult to develop and sustain. This explains why nearly all TNCs in this industry with significant international investments – such as Agbar (Spain), Suez (France), RWE (Germany) and Veolia (France) – are long-established companies (some founded in the nineteenth century), and continue to invest considerable amounts in specialist technology and network expertise (Pinsent Masons, 2007; Singh, 2008; Hall and Lobina, 2007). There are very few significant developing-country TNCs in the water industry, apart from Hyflux (Singapore) and YTL (Malaysia) (table III.11); and both are far smaller than their developed-country equivalents.

In contrast to water, *telecommunications* has largely shed its natural monopoly characteristics (section A), primarily because of rapid technological change.[70] Moreover, unbundling in this industry is along the entire value chain, and competitive assets or advantages can now be created or acquired relatively easily. However, these advantages can seldom be retained in the long term, even by incumbents.[71] These developments have facilitated the rise of new players, including developing-country TNCs, as observed in section C. In the survey, telecommunication TNCs – especially those from developing countries – indicated frequently that their FSAs derived from production and service capabilities or business models, rather than ownership of proprietary technology or expertise. This wide range of competitive advantages, along with more opportunities along the value chain and a high level of liberalization in most countries, have led to more telecommunications TNCs featuring among the top 100 infrastructure TNCs than those in any other industry (section C),[72] of which about a quarter are headquartered in developing countries. However, incumbency does matter to some degree, and most foreign participation by developing-country TNCs is in the form of South-South involvement, since their competitive strengths are largely insufficient to compete as yet in developed country markets.[73] The largest developing-country TNC in telecommunications, Singtel (Singapore), is still far smaller (and possesses fewer competitive advantages) than industry leaders such as Vodafone, France Telecom, Verizon Communications and Telefónica, which continue to dominate developed-country markets.

The situation in electricity and transport is somewhere between that in telecommunications and water. In *electricity*, as with the water industry, there are some benefits to incumbency, and long-term network experience remains important. However, innovation, especially in upstream segments of the value chain such as power generation, has resulted in considerable unbundling and entry by domestic private companies and TNCs (section A above; and Woodhouse, 2006).[74] In addition, the pivotal role of power in fostering industrial development has encouraged massive investment in the industry by both State and private enterprises, resulting in some developing-country electricity firms gaining extensive production capabilities. A few well-established TNCs, such as Eskom (South Africa) and KEPCO (Republic of Korea) have also acquired proprietary technologies.[75] Nevertheless, to date, advantages and expertise gained by these companies have been insufficient for them to expand much beyond their home regions or compete head-to-head with developed-country counterparts. Thus, of over 30 electricity TNCs in the top 100, only 3 are from developing countries (section C).[76] CLP (Hong Kong, China), the largest developing-country TNC had overseas assets of $6 billion in 2006, well short of the $112 billion of the largest TNC, EDF (France) (section C).

As with electricity, TNCs in *transport infrastructure,* especially those in roads and ports, have grown in the context of an immense expansion in international trade.[77] As a result, primarily as a consequence of "learning-by-doing", TNCs from both developed and developing countries have acquired considerable FSAs related to production and service capabilities. In addition, the concentration of export-orientated industrialization in a few developing countries over the past few decades has encouraged the emergence of a number of large, competitive players in transport (section C). The competitive advantages of both developed- and developing-country TNCs engaged in port activities consist of managerial and operational expertise in running terminal operations efficiently and effectively; and the largest also benefit from client loyalty fostered by global portfolios of facilities, services and customers (Olivier et al., 2007; Drewry, 2007; UNCTAD, 2007h; Valentine, 2008). Developing-country TNCs engaged in ports are making inroads into developed countries (e.g. the acquisition of P&O Ports (United Kingdom) by DP World (United Arab Emirates) in 2006). However, as with other sub-industries in transport (e.g. intraregional transport networks), most of the emerging opportunities are in other developing countries. More particularly in the case of ports, the main global shipping lanes run east-west, and connections to developed countries are already well served. Furthermore, changing global patterns of production and trade are encouraging further links to the South, especially to Africa and South America.

The significant variations in types of FSAs by industry, as a consequence of differing patterns of corporate origin and evolution in each industry, also manifest themselves at other levels, such as size

and ownership (state versus private). Particularly significant, as indicated above, is whether a TNC is from a developed or developing country. Overall, developed-country TNCs are much more likely to possess competitive advantages derived from ownership of technology and expertise. These are often built up over the long term, and are characteristic of industries such as electricity and water. In contrast, FSAs of developing-country TNCs generally relate to production and service capabilities and novel business models – key characteristics, among others, of sub-industries within telecommunications and transport, such as mobile telephony and seaports.

Competitive advantages can ultimately be eroded, though the rate of this varies by industry. In the survey, the majority of infrastructure TNCs reported undertaking R&D and innovation in order to upgrade their FSAs. Nearly all of the sample companies backed up their FSAs in management and environmental quality standards with ISO 9001 and 14001 certification,[78] while some had specific quality certification from the Occupational Health and Safety Advisory Service (OHSAS 18001 for safety) and EMAS (eco-management and audit scheme). Two of them had ISO 27001, which relates to security issues.

2. Drivers, motives and modalities of infrastructure TNCs

a. Drivers and motives

Drivers are factors that trigger a company's internationalization or further expansion, while its motives (e.g. market-seeking versus efficiency-seeking) often determine the specific outcome. The drivers most mentioned by almost 100% of infrastructure TNCs in the UNCTAD survey are closely tied to market-related factors, especially in host countries. Therefore drivers and motives are treated together in this section.

Home country drivers. Infrastructure TNCs in the UNCTAD survey most frequently mentioned that liberalization of the industry in the home country led them to further exploit their competitive advantages in foreign markets in a number of ways. First, a number of TNCs decided to internationalize because the home economy offered few growth opportunities (e.g. because the home market was "mature"), or in order to use expertise and know-how where opportunities might be available ("worldwide development with no boundaries"), or because of a desire for diversification (i.e. to reduce overdependence on the home economy). Second, a few TNCs also opted to internationalize as competition had started to cut into their home market share after government liberalization policies encouraged market entry by domestic and foreign companies. In some cases, infrastructure TNCs improved their FSAs against the competition posed by foreign TNCs in the domestic market prior to their own internationalization; good examples are Indian TNCs in telecommunications (Nazareth, 2008).

Although mentioned by only a few companies, technological changes, especially in telecommunications and electricity, which create new possibilities for competition at home and abroad, are also widely viewed as key drivers in the internationalization of infrastructure TNCs (Ramamurti and Doh, 2004; Clifton, Comin and Diaz-Fuentes, 2007; Minges, 2008). Overall, infrastructure TNCs from many developed and developing countries, including Brazil, China, France, India, the Republic of Korea, Singapore, South Africa, Sweden, Thailand, Turkey, the United Arab Emirates and the United Kingdom, reported that their home Governments actively supported or encouraged their overseas investments.

Host country drivers. Host country market-related factors were more frequently mentioned by TNCs in the survey than home country drivers, and by virtually every company. In particular, TNCs mentioned market-pull opportunities arising from: (a) liberalization and deregulation, leading to business opportunities, including acquisitions (e.g. China's entry into the World Trade Organization (WTO) was seen as highly significant by a number of infrastructure TNCs); (b) tenders from governments for new infrastructure development (e.g. facilities in South Africa for the 2010 World Cup); (c) strategic acquisitions of created assets, in nearly all cases facilitating entry into new markets (e.g. recent acquisitions by Indian telecommunications TNCs of submarine cables and other assets from various companies); (d) following clients in the infrastructure business (e.g. ports developments linking into transportation networks being established in Latin America); (e) regional growth opportunities and the realization of economies of scale (a common motive for many infrastructure TNCs, except those in the water industry); and (f) other market-related motives, such as targeting central and local governments in offering solutions, for example for energy efficiency or water purification (including advisory services).

Motives less frequently mentioned included, labour cost reduction, the achievement of synergies (e.g. with other businesses of the company), as well as the possibility of gaining experience and knowledge, and establishing good relations with clients such as local municipalities. This last set of motives was mentioned more by electricity and water companies.

The primacy of the host country market as a motive for infrastructure TNC involvement in developing economies creates significant obstacles

for LDCs, which almost by definition have small markets, both in general and in infrastructure industries more specifically. However, some infrastructure TNC involvement in LDCs does occur, despite market limitations, for strategic reasons (discussed below) or because companies – often but not exclusively from the South – have spotted niches that others have missed (e.g. Reliance Communications (India) in Uganda or Millicom's (Luxembourg) LDC orientation).

Country- or region-specific market factors influence the location of TNCs by industry. For example, liberalization with respect to existing infrastructure, such as water and electricity utilities, were a major driver for inward investment and other forms of involvement in Latin America (and a number of other markets) in the 1990s. And the installed base of such infrastructure facilities remains a significant pull factor, especially for companies specializing in operation and maintenance activities.

Another pull factor since the 1990s has been the demand for new infrastructure facilities, especially in electricity and transportation in Africa and Asia, to support industrial expansion and trade. Indeed, this is behind recent trends in FDI and other forms of TNC participation in developing countries (section B). The situation in telecommunications is very varied. Greater liberalization of this industry in Latin America than in Asia as a whole would explain the difference in telecommunications TNC involvement in these two regions. It also depends on the extent of an existing fixed-line base. In regions such as Africa, where fixed-line telecommunication systems are not extensive, mobile telephony is usually subject to relatively liberal regulations and few strong incumbents (in mobile telephony) exist, there have been significant levels of FDI by TNCs from both developed and developing countries (sections B and C).

Other drivers. In addition to market-related drivers, the strategic economic and political considerations of home economies and governments have assumed greater importance in the internationalization of infrastructure TNCs. A good example of such considerations is the role that infrastructure TNCs from China and India are playing in supporting their respective countries' investments in extractive industries such as oil, gas and mining.[79] Infrastructure investments by Chinese and Indian TNCs, in Africa, for instance (figure III.7), include both "parallel" investments (i.e. those supporting the extraction and transport of raw materials) and "barter" investments (i.e. those made in return for rights to extract raw materials (Corkin, 2007; Davies et al., 2008).[80]

"Strategic" infrastructure investments of this sort are not a unique phenomenon; for example Japanese TNCs were involved in significant investments in extractive industries and infrastructure projects during a parallel period of rapid economic growth and "resource insecurity" in the 1970s and 1980s (Ozawa, 2008). Other countries pursuing strategic investments in infrastructure include Spain in Latin America (Clifton, Comin and Diaz-Fuentes, 2007) and South Africa. South African infrastructure companies – many of them State-owned, such as Eskom (electricity) and Spoornet (railways) – have been encouraged to invest in Africa in order to foster regional trade and integration, as well as particular policies such as the trans-Africa electricity grid (South Africa, MPE, 2004; 2007; section A.3).

Strategic motives for TNC involvement in infrastructure are generally related to export interests (e.g. exports of minerals or electricity). This explains why investment by some Chinese, Indian and some other developing-country TNCs takes place in developing countries – including LDCs – whose markets are deemed too small or risky, especially by developed-country TNCs.

b. Modalities of TNC involvement

The modalities of involvement by infrastructure TNCs in developing countries are determined by three factors: their competitive advantages, the degree of risk of a particular project, and host government objectives and policies. Overall, the legal forms under which they operate in developing countries differ significantly from the FDI-centred modalities that prevail in many other industries, notably manufacturing. Looking first at competitive advantages, the expertise, production capabilities and tacit-knowledge-based characteristics of most FSAs in infrastructure industries are best utilized through modalities that allow the direct participation of TNCs in projects.[81]

Regarding the issue of risks, according to infrastructure TNCs in the survey, since the scale of infrastructure projects can be extremely large, and the payback long term, in many cases the potential risks necessitate modalities involving partnerships, although other techniques are also used to reduce the risk. The two most common risk-related factors identified by respondents in the survey were political and economic instability (mentioned by 35% of TNCs) and regulatory and legal issues (cited by 47%).[82] In order to disperse risk, TNCs make use of risk mitigation insurance cover,[83] and are adept at securing financing from a wide variety of sources (which is why financial expertise is an important FSA, as mentioned earlier),[84] as well as entering into partnerships of various kinds (e.g. joint ventures and consortiums). Partners take many forms, including private equity funds, international organizations and national agencies, and other infrastructure firms.

This explains the importance of project management expertise.

Finally, in addition to issues of FSAs and risk, the modality of a particular project is determined by host government policies. Many governments are reluctant to relinquish full ownership of State or public assets to the private sector, including TNCs, and often seek options short of this, such as management contracts and BOTs. Reflecting competitive advantages, risks and host government preferences together, a variety of legal forms prevail for infrastructure TNCs' participation in developing countries. This is borne out by the survey. Only 25% of cases of TNC involvement in the survey (multiple responses were allowed) were pure FDI, and most of these were in telecommunications or smaller scale electricity generation investments (which entail fewer risks and government resistance). Apart from FDI, of the remaining cases 55% were concessions (25% BOO, 16% BOT and 14% other types of concession) and 12% management contracts, depending on the specific nature of a project, TNC strategies and government objectives. (The remaining 8% of cases were denoted as "other".) These results support the evidence presented on legal forms (section B).

3. Internationalization strategies of infrastructure TNCs

Three types of TNCs can be discerned from the UNCTAD survey, each with a relatively clear strategy and geographic orientation. Companies in the first and largest group are from all regions and in all the infrastructure industries,[85] and they are internationalizing mainly at a regional level.[86] They are mostly small or medium-sized companies (though relative size differs by infrastructure industry) which have expanded into geographically proximate markets with which they are familiar, and which allows them to expand in scale and benefit from synergies, but at a relatively lower risk. Within developing regions, this results in the high share of South-South investment in total investment (table III.17), especially in Africa, Asia and the LDCs. This pattern is confirmed by other studies (Aykut and Ratha, 2004; Aykut and Goldstein, 2007; Naidu and Mbazima, 2008; Pradhan, 2005). These regionalization strategies are expected to continue in the future.

A second group of companies identified by the survey comprises large, developed-country TNCs, mainly European, and strongly represented in electricity, telecommunications and water.[87] Generally these firms have affiliates around the globe, but tend to be concentrated more in some host regions, such as Latin America for Spanish companies and Africa for French companies, reflecting historical and cultural affinities. As a consequence of the liberalization of infrastructure industries in the 1990s, they were the first to expand internationally, with the aim of benefiting from first-mover advantages, such as securing favourable terms of entry into host economies, having the best choice of local partners and establishing barriers to entry for latecomers (Ramamurti and Doh, 2004).

Latin America had the highest level of participation by this second group of TNCs during this period because it was the first region to liberalize extensively in infrastructure in the early 1990s (section B). For the same reason, and because so many investors were from developed countries, the South-South share is still relatively small (table III.17). However, this first wave of international expansion was a case of "over-reach" by a number of the major developed-country TNCs, because of their limited international experience among other factors. As a result, it subsequently led to a retrenchment from Latin America and to a relative shift to other regions, especially Asia. All companies in this group are planning to expand in the near future, both in host regions and countries where they are currently invested, as well as into new ones. Host regions and countries primarily targeted by this group for expansion are West Asia (especially the Gulf), the Russian Federation and CIS, and China and India.

The final group of infrastructure TNCs are large emerging Asian infrastructure companies from many economies, including China, India, Hong Kong (China), Malaysia, the Republic of Korea, Singapore and the United Arab Emirates.[88] They are well represented in electricity, telecommunications and transport and, though some are not as large as their developed-country counterparts, they can make formidable competitors (section D.1). Until the early 2000s, international investment by these companies focused on nearby countries, with some forays into other regions. However, unlike the first group of TNCs mentioned above, their scale and scope have allowed them to pursue global ambitions,[89] and their recent and near-term plans are the most expansionist of all three groups.

In the survey, all of the Asian infrastructure TNCs reported that they were planning expansion in Africa and South-East Europe and CIS, as well as further expansion within Asia itself; and nearly all mentioned plans to expand in Latin America and the Caribbean. A number of the TNCs in this group stated that one of their major objectives was to become a global player in their respective industry. In order to do this, they reported using a high proportion of their profits[90] to finance the acquisition of created assets in other developing countries, as well as in developed countries, in some cases to augment their competitive advantages (*WIR06*; Stenvert and Penfold, 2007).

Figure III.7. Significant Chinese and Indian investments in infrastructure in Africa, up to April 2008

Source: UNCTAD, based on research by Arno Nepgen and Johanna Jansson, Centre for Chinese Studies, Stellenbosch University, South Africa.

E. Conclusions

Infrastructure is the backbone of economic activity and competitiveness, and demands for its large-scale expansion are burgeoning on a global scale. At the same time, a number of countries, especially LDCs, have been unable to secure the necessary investment to establish sufficient infrastructural facilities and services. Overall, developing countries face large financing gaps in their plans to invest in physical infrastructure; and their lack of institutional capabilities is preventing the realization of such investment. These gaps can be filled if all sources, including financing by TNCs, are mobilized.

There has been a fundamental change in the role of the State in infrastructure industries around the world, as governments have opened them up to much greater involvement by the private sector – including TNCs – in financing, investment, ownership and management. This new relationship between the State and the private sector will continue to change and deepen, at least for some infrastructure industries, as technological and other changes remove natural monopoly elements as a whole (e.g. in most telecommunications) or in part (e.g. electricity generation), thereby opening them up to participation and competition by a number of players.

The following are some of the main characteristics and features of TNC involvement in the infrastructure industries, especially in developing and transition economies:

- Infrastructure TNCs' involvement in developing and transition economies takes a variety of legal forms or modalities, including FDI, non-FDI and mixed forms. These modalities are context specific, and vary by industry and region, and they shift over time. Since ownership advantages are not easily externally traded (e.g. in the form of licensing agreements), the modalities preferred by TNCs include management contracts, BOTs and FDI. The modalities selected also depend on other factors, including host country policies (which may only permit certain modalities) and risk-related issues (which may encourage partnerships and consortiums). In some segments such as mobile telephony, where the market structure facilitates competition, FDI forms are usually very important. In other segments, especially in water supply, TNCs are usually permitted only to operate through non-FDI forms, such as management contracts.
- TNC involvement has taken different forms depending on the region. In Latin America and the Caribbean, for instance, equity forms were common in the 1990s, but there has been an increasing shift towards non-equity forms in the new millennium. In contrast, non-equity forms of TNC entry have been more common in Asia.
- The extent of TNC participation has evolved in cycles. After a rise in the 1990s, mostly by TNCs from developed countries, the end of the decade and the beginning of the new millennium witnessed a brief decline in infrastructure-related FDI and other forms of involvement FDI flows globally, followed by a recovery from 2002 onwards. In the latest wave, there are also differences in the extent of involvement in various infrastructure industries compared to earlier periods. For instance, the extent of new TNC involvement is relatively less pronounced in telecommunications. As a whole, the share of FDI in infrastructure in total FDI

globally was about 10% in 2006, compared to only about 2% in 1990.

- Over the period 1990–2006, the stock of FDI in infrastructure in developing countries, as a measure of TNC involvement, increased 29-fold to $199 billion. Throughout the period it continued to grow in most infrastructure industries, though the expansion in water has flattened out since 2000. However, despite the large increase in TNC involvement, it is still small compared to the overall investment needs.
- Until 2000, Latin America had the highest amount of TNC involvement, both in absolute and proportional terms, but following a sharp decline there, Asia now has the highest in absolute terms. TNC involvement in Africa has been significant to date in transport and telecommunications, but less so in electricity and water. Overall, allowing for data limitations, Asia accounted for about 47% of the total stock of infrastructure FDI in developing countries in 2006, with Latin America and the Caribbean accounting for 46% and Africa for about 7%.
- The group of LDCs has remained by and large marginalized in the process of globalization of infrastructure investment, accounting for about 2% of the stock of infrastructure-related FDI in developing countries in 2006. Given the scale of the infrastructure gap faced by these countries, an important question is the degree to which TNCs can help in financing the gap, and what this participation entails in the wider context of sources of finance. In some LDCs, firms from other developing countries are prominent investors in infrastructure, especially in telecommunications and transport.
- The universe of the largest TNCs investing in the infrastructure industries of developing and transition economies is changing:
  - There has been a marked rise in international involvement by developing-country TNCs. In some industries, such as telecommunications, they have become major players, and in others, such as transport, they have even become world leaders.
  - The universe of infrastructure TNCs has also changed through mergers between large players. Both developed- and developing-country TNCs have enhanced their competitive advantages by purchasing and utilizing created assets through M&As. This has generally increased their size in terms of assets, employment and revenue and propelled them to higher positions in the list of leading infrastructure TNCs.
  - Many major infrastructure TNCs, from both developed and developing countries and across all industries, are State-owned enterprises.
  - Increasingly a number of new types of players are emerging, including private equity firms and sovereign wealth funds, which increases the range of options available to governments, both in terms of prospective operators and sources of finance.
- The types of competitive or ownership advantages that infrastructure TNCs possess are primarily related to specialist expertise or capabilities, such as network design and operation, engineering skills, environmental know-how, project management capabilities, and tacit, hands-on skills. Specialized business models and financial prowess are important in some industries and segments, such as telecommunications.
- Differences in competitive advantages by type of company are a key consideration for host country governments. For example, TNCs from developed countries retain a significant competitive edge in water and electricity, but not in transport and telecommunications. In some areas, such as ports and telecommunications, developing-country TNCs already compete head-on with global leaders. Within industries, the unique competitive advantages of TNCs are likely to vary along the value chain, from the setting up of physical infrastructure (e.g. submarine cables or wireless towers in the case of telecommunications) to specialized services for specific customers.

Looking to the future, infrastructure TNCs as a whole, including those in the UNCTAD survey, appear to be very optimistic about the global outlook for infrastructure in general, and prospects in developing countries in particular.[91] Apart from the major recipient host countries of recent years (e.g. Brazil, China, India and South Africa), many other economies are being targeted by infrastructure TNCs, including some LDCs. Given this, it is necessary to ask how, and to what extent, infrastructure TNC involvement in their economies affects developing and transition countries, both positively and negatively, and how governments should respond in order to maximize the benefits and minimize the costs arising from TNC involvement. These issues are taken up in subsequent chapters.

Notes

1 The term "infrastructure" used throughout this report denotes "economic infrastructure", but excludes "financial infrastructure", which is often included under economic infrastructure. This is in order to keep the analysis cogent, and in line with current usage by organizations dealing with development issues, including the United Nations, the World Bank and the Organisation for Economic Co-operation and Development (OECD), among others.

2 The term "infrastructure", rather than "economic infrastructure", will be used in the rest of the Report.

3 The term "physical" infrastructure is sometimes used to denote this set of industries to distinguish them from other types of infrastructure (e.g. financial).

4 Water is recognized as a right in a number of international treaties and forums. Most notably the United Nations Committee on Economic, Social and Cultural Rights declares it a human right as follows: "The human right to water entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses" (ECOSOC, 2002: 2).

5 In transport, for instance, provision of services and regional linkages and interconnectivity is key to economic growth: it links different parts of the world, regions and countries and integrates them into the global economy (OECD, 2006a). Improvements in transport infrastructure not only save travel time but also influence land values and people's choices of modes of travel and shipment (e.g. using public transportation rather than the family car).

6 For example, the quality and coverage of transport networks influence the costs of inputs, production and distribution, and therefore national competitiveness (Aoki and Roberts, 2006). It is estimated that logistics costs, which account for 20% of sales on world average, are 50% higher in landlocked countries than countries having access to the sea (ESCAP, 2006). Some countries in East and South-East Asia are successful examples of "instrumentalizing transport for their overall national economic development" (ESCAP, 2006: 26).

7 According to ESCAP (2006: 34), "Transport is crucial to tackling the region's poverty" because "distance is a key factor depriving the rural poor of access to basic services, such as health and education and to economic opportunities".

8 Vertical unbundling relates to the separation of competitive and monopoly components of an industry. Horizontal unbundling refers to, for example, the splitting of a national network into regional ones and/or permitting several producers to supply one network.

9 See World Bank, "Issues Brief: Infrastructure" (http://web.worldbank.org/).

10 Domestic private sector investment in Africa's infrastructure is typically low.

11 For example, the telecommunications industry has been more successful than transportation in attracting private investment. Chile has attracted more private investment in infrastructure than other countries in the region.

12 Partly because of divergent political perceptions of the role of infrastructure services in the economy and society, and partly because of the complex set of reasons behind the reforms (*WIR04*).

13 Although in broad terms "reforms" in infrastructure make industries more competitive, there are various types of reform (which are mutually reinforcing): (a) public sector reform, including corporatization, so that State-owned enterprises act autonomously of the State and in accord with "market discipline"; (b) market liberalization, including the unbundling of competitive segments from uncompetitive ones, and private participation in infrastructure financing and operations (to tap into the private sector's assets, as discussed in Chapter IV, section D); and (c) regulatory reform, for example by establishing a regulatory agency in order to make the process of regulation independent of both the State and the operators (Sharan et al., 2007; Foster et al., undated; section A.1).

14 Prior to the late 1970s the United States' model of dealing with the natural monopoly attribute of infrastructure involved the regulation of privately owned enterprises. The State was seldom involved in ownership or operations of infrastructure facilities (Ure, 2007). Unbundling effectively involved breaking up private monopolies.

15 However, the universe of infrastructure TNCs also includes many that are State-owned (section C), which also acquire companies and assets from "privatizations".

16 Infrastructure TNCs emerged in various economies, including France, Hong Kong (China), Malaysia, Singapore, South Africa, Spain, Sweden, the United Kingdom, and the United States, entering both nearby and distant markets in the 1990s.

17 Many of them were engineering and construction companies, such as Bechtel (United States) and Hyundai Heavy Industries (Republic of Korea). Given the scale, scope and intricacies of infrastructure, they managed large, complex projects, often as lead firms in consortiums, establishing transport, electricity generating plants or other facilities.

18 Examples include CLP (Hong Kong, China), KEPCO (Republic of Korea), KDDI (Japan), Odebrecht (Brazil) and Transnet (South Africa).

19 The remainder is provided by commercial banks (Orr, 2008; Rodriguez and Santiso, 2007).

20 Among the most important reasons private equity investors give for investing in infrastructure are: rising population and strong demand, even in times of sluggish economic growth; attractive risk-adjusted yields; strong, predictable, inflation-linked cash flows; close compatibility with pension funds and insurance companies that require high-quality, long-term, income-oriented investments to match their long-term liabilities; lack of government bonds; and lack of correlation to equity and bond markets (Orr, 2007).

21 These are usually managed by private equity firms, and created to raise funds from institutional investors in order to invest in pre-defined sectors. There are now a large number of such funds, including Barclays Private Equity, Macquarie and the Galaxy Fund.

22 These invest directly in infrastructure assets as part of their diversification strategy. Examples of such investors particularly active in infrastructure are Ontario Teachers' Pension Fund and Prudential.

23 For example, most major banks create such vehicles. Examples of infrastructure companies creating such vehicles (e.g. to facilitate systems integration) are Balfour Beatty and Babcock & Brown.

24 "Infrastructure Funds: Building on strong foundations", *Financial Times*, 13 March 2008.

25 For example, Renaissance Capital, already very active in the Russian Federation and other CIS countries, is increasingly involved in Africa, especially in Kenya and Nigeria. Similarly, the Macquarie Bank Group, which probably has the largest number of infrastructure funds under management ($22 billion), is active in both developed and developing countries, such as India and South Africa (Orr and Kennedy, 2008). Some developing countries, such as India, are actively encouraging funding in infrastructure by private equity funds (Nazareth, 2008).

26 For instance, in facilitating a dialogue with local groups.

27 Or "divestitures" in the terminology of the World Bank's Private Participation in Infrastructure (PPI) Database.

28 In principle, the acquisition of a private stake can be separated from a full or partial takeover of the management of the facility, but this is rare.

29 These percentages have been calculated on the basis of the total and infrastructure-related FDI stocks of only those countries for which data on FDI stock in infrastructure were available. This is largely a consequence of differing country coverage of FDI data for the infrastructure industry, which shows that such information should be treated with caution.

30 This pattern is confirmed and complemented by the list of the world's largest infrastructure TNCs (see section C) many of which are from these countries, together with others from Germany, Hong Kong (China) and Spain.

31 No information is available on actual investment.

32 Data on FDI flows and cross-border M&As indicate that the increase lasted till 2000, but data on commitments suggest a decline already in 1999.

33 It has to be stressed however, that cross-border M&A and FDI data are not directly comparable, and the fluctuations in the former have been much larger than in FDI flows (*WIR2000*).

34 For instance, in 1998, Telecom Portugal acquired 20% of Telesp Celular Participacoes (Brazil) for $3 billion; in 2000, Telefónica (Spain) acquired the majority of Telecommunicacoes de Sao Paulo (Brazil) for $10 billion, while in 2007 Telefónica acquired a 50% stake in Colombia Telecomunicaciones for $3 billion.

35 In 2007, Vodafone (United Kingdom) acquired a majority stake in Hutchison Essar (India) for $13 billion, while Qtel (Qatar) acquired majority shares in Wataniya (Kuwait) for $4 billion.

36 These trends in foreign investment commitments are based on the dates the agreements were reached, rather than when

investments were actually made – however the latter data are not available.

37 These findings differ partly from the results of previous studies. In one previous study of 34 independent power projects (IPPs) in 13 developing and transition economies, the majority of investments were in the form of FDI (Woodhouse, 2006).

38 In 1993, State-owned terminals accounted for 42% of world container throughput (i.e. the quantity of cargo that can pass through a port), but by 2006 this figure was down to 19%. The share of State-owned terminals in world throughput varies by region: in Northern Europe it is 6%, in South-East Asia 42%, Eastern Europe 24% and Africa 68% (Drewry, 2007). Even within the same region, the situation differs. For example, the Port of Tanjung Pelepas in Malaysia is 30% owned by the shipping line Maersk Sealand (part of the A.P. Moller-Maersk Group), whereas the adjacent Port of Singapore remains one of the few ports still owned by its national Government, although it has been corporatized. Yet today, most of the top 100 container ports, which represent over 80% of total world container port throughput, have some form of private participation.

39 Usually involved in directly related activities (e.g. construction companies also running toll roads, or electricity machinery operators moving into power generation).

40 Suez (France), RWE (Germany) and YTL Power (Malaysia).

41 For example, Suez (France) and YTL Power (Malaysia) are involved in electricity and water, Hutchison Whampoa (Hong Kong, China) operates in both seaports and telecommunications (and other, non-infrastructure industries), and Bouygues is involved in both roads (through its affiliate Colas) and telecommunications.

42 In the case of seaports, however, developed- and developing-country TNCs are on par; for instance, AP Moller-Maersk (Denmark) and DP World (United Arab Emirates) have practically the same amount of foreign assets (annex table A.III.4).

43 Foreign assets of infrastructure TNCs, especially firms that operate in a number of different industries (conglomerates), can include non-infrastructure businesses.

44 But not in the United States, as mention in section A.3.

45 The emergence of private TNCs in developed countries was also made possible by the fact that privatization in these countries seldom involved inward FDI, but rather domestic investments or foreign portfolio investments (though there was also a spate of cross-border M&As).

46 In 2007, the number of these firms fell from 7 to 6, as Enel, in partnership with Acciona (Spain), acquired control of Endesa (Spain) (annex table A.III.6).

47 Recent mega deals include the acquisition of Powergen (United Kingdom) by E.ON (Germany) in 2002, Electrabel (Belgium) by Suez (France) in 2005, and Endesa (Spain) by Acciona (Spain) and Enel (Italy), and Scottish Power (United Kingdom) by Iberdrola (Spain) in 2007 (annex table A.III.6). In 2008, EDF (France) and ACS (Spain) planned to mount a joint bid for Iberdrola (Spain) and Suez intended to merge with Gaz de France. European utilities are also acquiring assets in the United States. For instance, National Grid (United Kingdom) acquired Keyspan (United States) in 2007 (annex table A.III.3), which gave the former a strong foothold in that host country.

48 Regional integration and market liberalization have encouraged the formation of large regional electricity TNCs, especially in Europe and the United States. The EU's attempts to unbundle power generation, transmission and distribution from each other may further reshape the structure of the industry in the region, as utilities owning different segments would be obliged to re-sell some of the segments to new players.

49 Examples of such investors, most of which are not in the top 100 or top 50 infrastructure TNCs, include the following: Malaysian companies such as Malakoff, MMC, YTL and Zelan; Thai companies such as Banpu, EGCO and Ratchaburi; Brazilian companies such as Alusa, Petrobras and Votorantium; Singaporean companies such as Singapore's Power International and Asia Power; Kepco from the Republic of Korea); and India's Tata and Reliance Groups.

50 Of which Vodafone's acquisition of Mannesmann in 2002 alone accounted for more than $200 billion.

51 América Móvil started its international expansion in 2000 by establishing a joint venture in Brazil with global players Bell Canada and SBC Inc. of the United States. Two years later, it acquired its partners' Latin American assets, and BellSouth's (United States) full Brazilian business. Between 2003 and 2006, it acquired the assets of Verizon (United States) in Argentina, Puerto Rico and the Dominican Republic, France Télécom's stake in Compañía de Telecomunicaciones de El Salvador, Telecom Italia's affiliate in Peru, and a company formed by Endesa (Spain) in Chile (Smartcom). Telmex's purchase of other TNCs' assets was smaller in scale: in 2002, it bought MCI's (United States) stake in a Brazilian long-distance operator, followed by the purchase in 2003–2006 of AT&T's (United States) assets in Argentina, Chile and Ecuador (ECLAC, 2008).

52 This company was acquired by Ferrovial Group (Spain) in 2006 (Deloitte & Touche, 2006).

53 Copenhagen Airport is an affiliate of Macquarie Airports (Australia).

54 Kansas City Southern Industries (United States) was the largest investor in railways in developing countries.

55 Bouygues (a major French construction TNC), Bombardier (a major Canadian manufacturer of aircraft and rail transportation equipment and systems) and CAF (Spain).

56 Examples are Comazar (South Africa), New Limpopo Bridge Project Investments (a joint venture between Mauritian and South African finance institutions), Railways of India Technical and Engineering Services (India).

57 Others include NWS Holdings (Hong Kong, China), Citra Lamtorogung Persada (Indonesia), Road King Infrastructure (Hong Kong, China), Hopewell Holdings (Hong Kong, China), Tribasa (Mexico), and Sideco Americana (Argentina).

58 AP Moller-Maersk Group (Denmark) is in second place, and, until its acquisition in 2006 by DP World, P&O Ports (United Kingdom) was fifth. Another significant player in developing countries, Modern Terminals (Hong Kong, China) has emerged more recently and its investment commitments in 2001–2006 exceeded those of PSA (Singapore).

59 For example, Sealand, Maersk, APL, P&O Containers and Mitsui O.S.K. Lines.

60 Agbar, Suez, Veolia, RWE and Southern Cross, in that order.

61 There was a similar, but less marked decline in the share of the top 10 investors (from 86% to 65%).

62 Local competitors have the advantage of familiarity with the host economy, everything else being equal.

63 In summary form, these factors are the essence of the eclectic or OLI (ownership-location-internalization) paradigm (Dunning and Lundan, 2008). In order to explain the existence of TNCs and their foreign involvement, it is essential to examine three issues. First, the ownership advantages (O) (e.g. technology, managerial expertise, or a recognized brand) a company possesses in order for it to be able to compete with other firms, especially in overseas markets (Hymer, 1976; Kindleberger, 1969; Dunning, 1979; Caves, 1982; Wernerfelt, 1995; Buckley, 1998; Dunning and Lundan, 2008). Secondly, there have to be some location advantages (L) to operating in the foreign host economy as opposed to at home (e.g. larger markets, acquisition opportunities, or lower costs of production). Finally, the modality of entry into a host economy depends on the internationalization decision (I) of the company – whether it is more cost-effective for a firm to utilize its competitive advantages through direct ownership and control of a foreign facility (FDI) or some other means (e.g. a management contract) (Buckley and Casson, 1976; Hennart, 1982; Dunning, 1995; Dunning and Lundan, 2008).

64 Early theory on competitive advantages tended to focus on a narrow set of advantages, such as the possession of proprietary technology, brands or other assets, hence "ownership advantages". However, research has shown that firms can draw on a wider set of assets or advantages, both firm-specific and non-firm-specific, such as access to cheap capital. The typology of FSAs used in this section draws on a framework established in *WIR06* (chapter IV).

65 Respondents were asked to mention up to three competitive advantages they possessed, so the denominator for this and

equivalent figures below is the number of TNCs responding multiplied by 3.

66 All the water companies in the survey were from developed countries.

67 Unlike other industries, in manufacturing for example, it is harder to distinguish between FSAs deriving from "ownership of technology and expertise" and "production and service capabilities". The main difference is that the former are advantages embedded in the organization and employees, and are based on long-term experience and tested knowledge. The latter type of FSAs are more akin to solutions that work, but which need to be tested further before they are acknowledged to work or become a part of regular routines.

68 Since many projects in electricity, transport and water are large-scale, the remaining investment generally comes from partners in a consortium or bank loans.

69 These nevertheless have eventually to be transformed into "ownership" advantages (footnote 67).

70 As discussed in "Nomads at last: a special report on mobile telecoms", *Economist,* 12 April 2008, as well as UNCTAD 2007g; Guislain and Qiang, 2006; and Clifton, Comin and Diaz-Fuentes, 2007.

71 For example, mobile virtual network operators (MVNOs) – where a company such as Virgin Mobile (United Kingdom) repackages a telecommunications service actually being run and operated by another company under its own brand – were recently pioneered in Europe, but are already being imitated by companies in Asia and elsewhere (Ernst & Young, 2008c).

72 There are also 20 telecommunications TNCs in the top 50 developing-country infrastructure TNCs.

73 The established position of incumbents also affects new players from developed countries, who therefore – like developing-country TNCs – find it easier to enter markets in the South. This is one of the reasons that companies such as Sithe Global (United States) in electricity and Millicom (Luxembourg) in telecommunications are focusing on investments in developing economies.

74 This topic is discussed in various articles published in Ernst and Young's online journal, Utilities Unbundled, at: www.ey.com.

75 Some of them may have a competitive edge over incumbent TNCs because the formation of their FSAs has occurred relatively recently, during a high-growth, export-orientated development phase in their home economies, although these advantages must be critically juxtaposed against the well-honed, long-term experience of developed-country companies.

76 However, there are 12 electricity companies (two combined with other industries) in the top 50.

77 In the top 100 there are only 5 railroad companies, and none feature among the developing-country top 50.

78 The ISO 9000 and 14000 series are quality standards in management/business processes and environmental management respectively, set by the International Organization for Standardization and widely used by businesses.

79 Of course, not all investments by Chinese and Indian TNCs are intended to support their respective Governments' strategic goals.

80 Apart from Chinese TNC involvement in infrastructure to support the home country's extractive industry investments, there may also be other, longer term strategic interests at play in Africa. For example, China has started to establish a series of industrial zones, commencing with one in Mauritius.

81 In theory, internalization of markets occurs fully with FDI, partly with BOTs and not at all with management contracts.

82 Including controls, such as foreign exchange controls.

83 TNCs in the survey generally reported using risk mitigation insurance cover. The most commonly used are "breach of contract cover" and "partial credit guarantees", but "political risk cover" and other types of insurance are also used. However, the use of risk mitigation cover and debt financing is less common in telecommunications and more frequent in electricity, transport and water, because of both higher short-term profitability and lower costs in telecommunications.

84 Commercial bank loans were the most commonly used by companies responding to the survey, though significant amounts were also raised from governments, international financing organizations (e.g. the International Bank for Reconstruction and Development (IBRD)) and private equity funds.

85 Apart from water, but this may be an artefact, because only a small number of water companies participated in the survey.

86 Here, region is viewed with respect to the location of company, rather than in a predefined way. For example, a Swedish company in the survey is investing in South-East Europe and CIS countries, while a Turkish company has investments around the Mediterranean.

87 Again a lack of representation in the survey may be an artefact, since proportionally larger companies were targeted. For example, many European port companies involved in developing countries – such as Mersey Docks (United Kingdom) – are relatively small.

88 A very small number of African and Latin American infrastructure TNCs have similar profiles, but generally these companies focus on their local region.

89 In some cases, their home governments see these companies as national champions and encourage their global strategies.

90 And in some cases, privileged access to cheap funds in their home countries.

91 Over 75% of the infrastructure TNCs in the UNCTAD survey have expanded their involvement in developing countries over the past five years, and virtually all said they would continue their expansion over the next five years.