



# 450 bn reasons to invest in India's infrastructure

November 28, 2007

**Huge need for investment.** The strong population growth in India and its booming economy are generating enormous pressures to modernise and expand the country's infrastructure. This applies all the more since the past few decades have seen the development of an investment backlog going into the billions. More than USD 450 bn worth of investment is to flow into India's infrastructure by 2012.

**Investment in infrastructure drives growth.** Infrastructure is the basis of economic activity. India's annual GDP growth could be 2 percentage points higher but for the shortcomings in its infrastructure. For one thing, the required construction activity has a direct impact on output; for another, all economic sectors benefit from more comprehensive infrastructure.

**Urgent need for private capital.** The pronounced demand for investment cannot be covered by government funding alone. Therefore, India requires private capital from home and abroad. The government realises this. So far, the consequences have been an increase in public-private partnerships and greater scope for foreign investment in comprehensive projects. Other deregulation moves are likely to follow.

**Transport and telecommunications command special interest.** One major reason is the particularly big investment gap in these two segments. But more importantly, it is easier to charge market prices here than in the water and energy segments with their greater political sensitivities.

**Immense regional differences.** India boasts a diverse mix of geographies and locations. A number of thriving business centres have emerged. In our view, the states of Gujarat, Maharashtra and those adjacent to Delhi, the capital, offer the greatest potential.

**Institutional risks bear watching.** Of course, the big opportunities inherent in investments in Indian infrastructure are not without specific risks. Besides the usual macroeconomic risks linked with emerging markets, the low degree of market liquidity and the unsatisfactory transparency of the markets and players are factors particularly worth mentioning.

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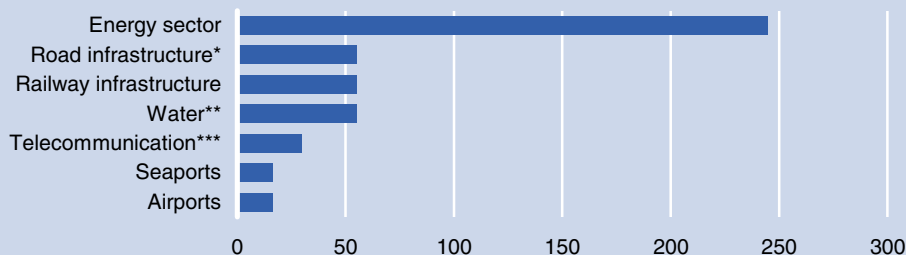
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### Planned investment in infrastructure in India till 2012

USD (bn) according to 11th FYP



\* Costs of National Highway Development Programme till 2015 \*\* Water supply and sewage disposal

\*\*\* Network, transmission masts, optical fiber cables; without customer premises equipment

Sources: Government of India, appropriate ministries

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## 1. Introduction

In 2006, Deutsche Bank Research and RREEF Research published a paper on the prospects of the Indian real estate markets.<sup>1</sup> Following that publication, this paper looks at the opportunities and challenges of India's infrastructure market.

### India could grow even faster

Infrastructure services support many aspects of a country's economic and social activities and are crucial for business development. India has seen years of booming economic growth. However, for years it has underinvested in its infrastructure networks. India's rapid economic development places intense demands on its physical infrastructure. According to official estimates from the Indian finance ministry, the country's GDP growth could be 2 percentage points higher but for the shortcomings in infrastructure. This, in turn, puts pressure on national and state authorities' budgets as well as administrative bureaucracies to keep up with fast-changing needs. In this paper we start by discussing what infrastructure is and the impact it can have on an economy. We then take a closer look at the different infrastructure sectors in India, their current state as well as development plans.

### Significant funding problems

India's power supply is unreliable to such an extent that it is holding back a more rapid development of the Indian economy. This is not the only Achilles' heel of the Indian economy; its transport infrastructure network is another major constraint on economic growth. There are many extensive investment programmes for transport, utilities as well as the power sector. For many of these programmes, funding problems are the biggest hurdles to cross in realising the projects. The government realises that there is a significant gap between its budget and the investment needs and that this gap cannot be filled by assistance from multilaterals, like the World Bank, alone. Targeting private capital has begun to play an important part in financing India's infrastructure investment needs.

Similar to what we have seen in other parts of the world, legislative and regulatory initiatives are starting to pave the way for greater private-sector involvement. At the same time, international investors are starting to show increasing interest in infrastructure investment opportunities in India. India is a big country and regional differences are immense. In this paper, we use a scoring tool to screen the different regions and to rank them by their relative attractiveness and medium-term prospects for infrastructure projects.

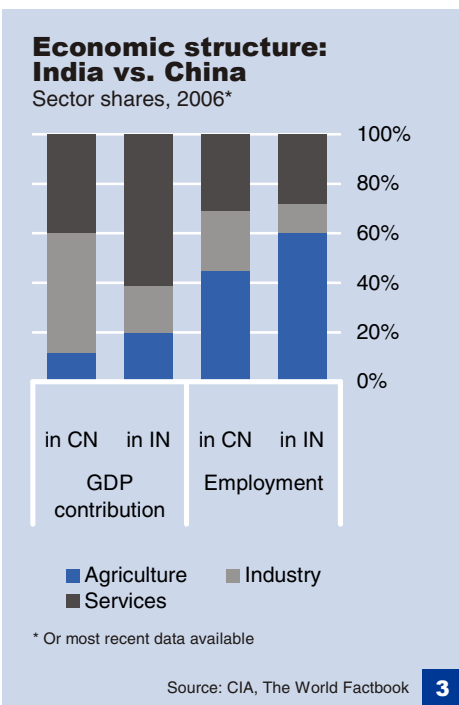
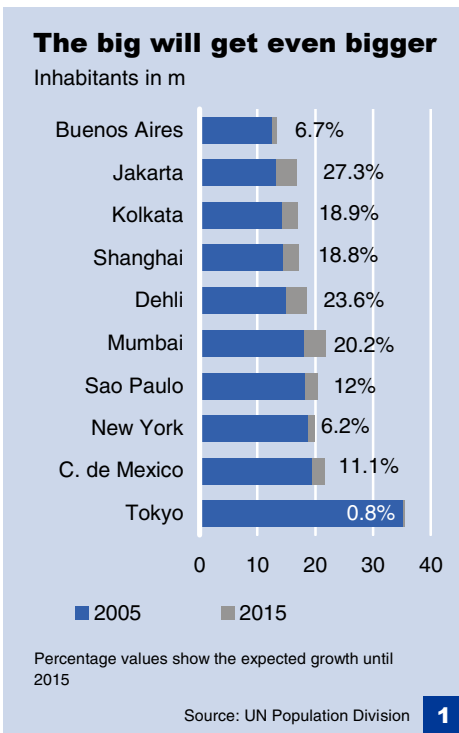
## 2. India's infrastructure challenge in brief

### 2.1 What is infrastructure?

Infrastructure assets are the physical structures and networks used to provide essential services to a society. These tangible assets, and the businesses set up to manage them, can be viewed as the backbone of an economy. Due to its importance to a country's economic and social development, government institutions historically have provided infrastructure.

<sup>1</sup> Just, T., H. Chin and M. Vaeth (2006). Building up India. Deutsche Bank Research, Current Issues.

**No sustainable economic development without adequate infrastructure**



Broadly speaking, infrastructure can be split into two categories:

- Economic infrastructure consists of assets and services that have weak positive externalities<sup>2</sup>, such as transport, utilities and communications. Private agents can easily provide these goods efficiently (for example toll roads);
- Social infrastructure consists of assets and services with strong positive externalities that for political reasons are provided either as a free or subsidised good. Examples are education and health care.

### Infrastructure sectors

Economic Infrastructure			Social Infrastructure
Transport	Energy & Utility	Communications	Healthcare facilities
Toll roads	Gas	Cable Networks	Education facilities
Bridges	- Distribution	Satellite systems	Social Housing
Tunnels	- Storage		Judicial and correctional facilities
Sea ports	Electricity		
Airports	- Distribution		
Rail	- Generation		
Ferries	Water		
	- Treatment		
	- Distribution		

Source: RREEF Infrastructure **2**

Infrastructure and related services have significant implications for achieving sustainable development objectives, as infrastructure services underpin many aspects of economic and social activity. As a consequence, infrastructure failure can have a widespread impact across the community. Without reliable power, well-connected utilities and a modern transport network a country's economy is not able to develop successfully in the long term.

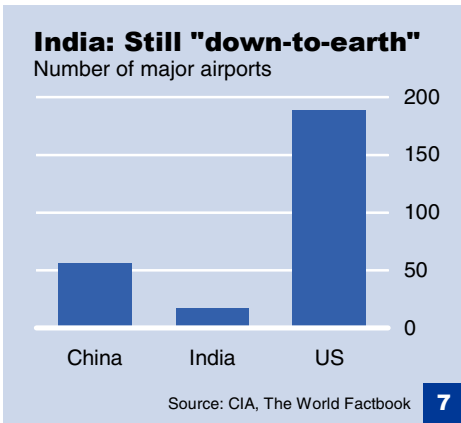
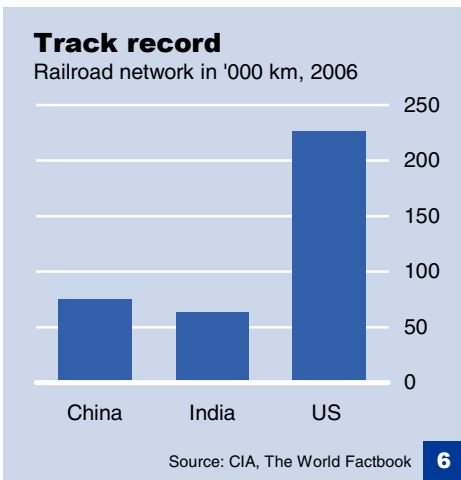
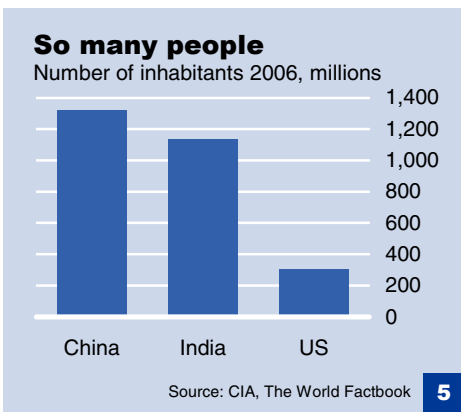
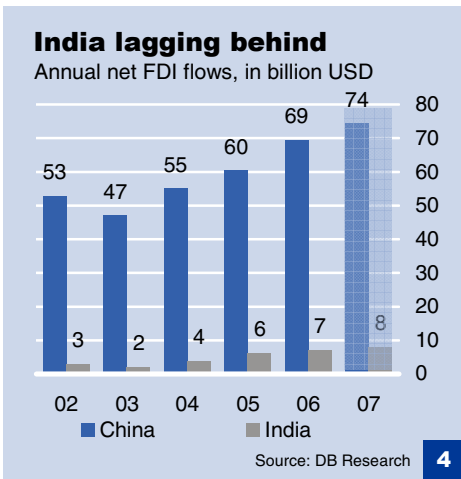
In the increased competition of today's global market, a good infrastructure network has become even more vital. Good infrastructure can raise competitiveness through more efficient links, both domestically as well as internationally, and as such it can help to create sustainable economic centres. It is also important to recognise that a reliable social infrastructure such as health care and education services are the necessary pre-conditions for sustained long-term growth.

## 2.2 India's economic structure reflects its infrastructure gap

It is widely known that India's current infrastructure is fraught with many weaknesses and that it is below international standards even when compared with other emerging markets. India's infrastructure is marked by a weak transport network, ports and airports that do not cope with demand and, most of all, power cuts.

India's economy is expanding rapidly, with a GDP growth rate of around 8.5% in 2007. This has in turn propelled rapid growth in disposable income, allowing consumers to afford and demand good infrastructure services. However, with the Indian economy growing

<sup>2</sup> A (technological) externality is an effect that occurs to third parties that are not directly involved in a transaction. In case of a positive externality a market mechanism leads to too little investment in this activity as private contracts would not cover the positive externality.



at such a fast pace, the already weak supply cannot keep up with this growing demand.

If we look at India's urban infrastructure we see poor and overcrowded public transport, jam-packed roads, inadequate water and sewage systems, and uncollected solid waste. The situation is even at risk of worsening, because the economic boom confronts India with a significant increase in urbanisation. Three of the ten biggest cities in the world ("mega-cities") are located in India, and according to a widely accepted UN estimate all are expected to grow by 20% by 2015.

Outside the cities the situation is not better. With the economy of rural India still lagging, the development of rural infrastructure is very important to overcome this inequality. A good infrastructure network not only provides the basic services such as clean drinking water and electricity, it also helps to create income-generating opportunities in agriculture.

Agriculture still plays a key role in India as it generates 20% of GDP. This role is even more important with regard to employment: about 60% of the labour force works in the agricultural sector; there is a large share of subsistence farmers. The services sector is rapidly expanding, and – with regard to its share of GDP – it has become the country's most important economic pillar, contributing over 60% of GDP. However, only slightly more than 25% of all employees find a job in this sector. The industrial sector is only gradually outgrowing its niche. About 20% of GDP is generated by industry (including the construction and energy sectors), but it employs only about 12% of the labour force. By contrast, China has been evolving from an agriculturally based economy into an industrial society at a breathtaking pace. Roughly 25% of China's labour force already works in the industrial sector.

### 2.3 Infrastructure challenges

The bottlenecks in transport infrastructure are a major reason why India's economic structure has developed as discussed above. The sluggish pace of investment in transport infrastructure over the past few decades impacted the transport-intensive industrial sectors much more severely and seriously impeded the development of an industrial base. It is still premature to consider modern logistics concepts such as just-in-time production in India since the poor transport infrastructure and also bureaucratic obstacles such as border crossings between states lead to delays and unpredictable transport times and costs. This scares off foreign investors, as indicated by the extremely low level of foreign direct investment in India (2006: USD 8 bn) compared to China (2006: USD 70 bn). In the context of transport infrastructure, India is estimated to lag behind other countries such as China by at least ten years. Ultimately, India's small share in global goods trade is partly attributable to its inadequate infrastructure. For example India's export trade totals 1.5% of global trade, and is expected to grow to 1.9% in 2011. This contrasts with China's 7.7% of global trade, which is forecasted to grow to 10.8% by 2011.<sup>3</sup>

It is undisputed that India urgently requires a stronger industrial base in order to employ the growing army of jobseekers over the coming years.<sup>4</sup> The building of infrastructure could achieve positive

<sup>3</sup> Global Insight (2007).

<sup>4</sup> Asuncion-Mund, J. (2005). India rising: A medium-term perspective. Deutsche Bank Research. India Special.



### Political reforms facilitate reforms

### State governments are gaining importance in infrastructure planning

employment effects in the construction industry. Going by the availability of labour and wage levels, India is just as attractive a location as China. To tap this potential, though, it is necessary to press ahead with an extensive expansion of the transport infrastructure.

The government of India (GoI) is keen to address this and is committed to economic reforms to stimulate the development of basic infrastructure to improve the lives of the rural population and to boost the economy. Its goal is to close the gap with the main competitor countries within the next 5 to 10 years, so the development of infrastructure has a high priority in the 11<sup>th</sup> Five Year Plan (FYP) for the years 2007 to 2012.

## 3. Framework for infrastructure

### 3.1 Political barriers

Investments in infrastructure have a long-term horizon, and as such the need for political continuity and stability is a vital concern. This implies that investment in infrastructure is highly political in nature and it is often the lack of political stability that holds back necessary investment. Investors are hesitant to make long-term commitments for fear of government intervention and breaches of contractual obligations.

India has a well-established democracy and policy liberalisation has progressed in recent years. But India's current fractious government – the United Progressive Alliance (UPA), a 19-party coalition led by the Congress Party – has made some investors nervous due to the potential for derailment. The Congress Party constantly competes with many of its coalition partners, which slows necessary reforms. As the privatisation of government-owned businesses, for example, continues to generate political debate, advances are being made but only at a slow pace.

The balance of power for infrastructure planning and control among the central government, the 28 states and seven territories (including the National Capital Territory of Delhi) is gradually changing. In the past, the central government was dominant. At the moment the state governments are playing an increasingly important role, as regional parties have grown in strength. This decentralisation trend has developed more or less autonomously within the different states or infrastructure sectors, which has resulted in a complex bureaucratic system that foreign players find difficult to understand. But most of all it has slowed the process of infrastructure development in India.

### 3.2 Financing India's infrastructure

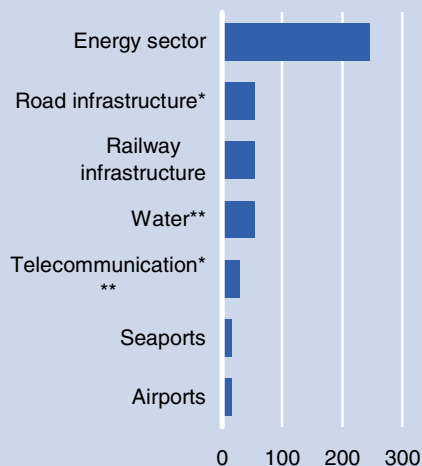
One obstacle blocking a more rapid development of India's infrastructure is restrictions on the public purse. The expansion plans are chronically underfunded. For this reason, the conditions for investing private-sector capital are being improved. There is a major government drive to promote public-private partnerships (PPPs), e.g. on the basis of operator models, using tax incentives and direct investment subsidies.

After decades of underinvestment and political apathy, India's national and state authorities have realised the seriousness of India's infrastructure needs. The Indian government admits that the maintenance of roads has not been given adequate importance



### India: Planned investment in infrastructure till 2012

USD (bn) according to 11th FYP



\* Costs of National Highway Development Programme till 2015

\*\* Water supply and sewage disposal

\*\*\* Network, transmission masts, optical fiber cables; without customer premises equipment

Source: Government of India, appropriate ministries

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mainly due to a lack of resources. The 12<sup>th</sup> Finance Commission recently recommended additional grants of INR 150 bn (USD 3.6 bn) to the states for maintenance of roads and bridges for the four-year period 2006/07 to 2009/10.<sup>5</sup>

India's 11<sup>th</sup> FYP envisioned annual economic growth of above 8%. In order to achieve this goal significant infrastructure investments are needed. The Committee on Infrastructure, chaired by the prime minister, has identified an ambitious programme for infrastructure development. It has estimated that approx. USD 320 bn in capital is required to realise this programme. The World Bank, in fact, expects the investment requirements to amount to USD 425 bn.<sup>6</sup> According to the 11<sup>th</sup> FYP, even more than USD 450 bn worth of investment is to flow into India's infrastructure by 2012. In order to fund these investments India's Planning Commission has called on the government to increase the current gross capital formation for infrastructure from around 5% of GDP to 9% of GDP for the period 2008 to 2012.

### Important infrastructure deals of the recent past

Date	Sector	Company	Investor	Deal size (USD m)
Oct-06	Telecom	Idea Cellular	Providence, TA Associate, CitiGroup, Chryscapital	550
Mar-06	Telecom	Tatatele Services	Temasek	341
Apr-06	Infra Holding	L&T Infrastructure	JP Morgan, Indian Development Fund	126
Jan-06	Infra Holding	GMR Group	ICICI Bank	56
Oct-06	Oil & Gas	Cairn India	IFC	45
Dec-05	Infra Holding	Gammon Infrastructure	Ochziff	31
Apr-05	Port	Gujarat pipavav	IDFC PE	29
Jun-06	Infra Holding	GMR Group	Citibank	23
Mar-04	Power	GMR Energy	IDFC PE	23
Nov-04	Oil & Gas	Gujarat State Petronet	IDFC PE	20

Source: Deutsche Asset Management

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### More money to spend for infrastructure

The government currently spends nearly half of its revenue on debt-servicing, salaries, pensions and the public debt, the latter adding up to around 53% of GDP (federal and state debt combined).<sup>7</sup> However, India's foreign-exchange reserves, the world's fifth largest, now stand at USD 130 bn. The Indian government is considering using USD 5 bn annually to fund infrastructure projects.<sup>8</sup>

In the beginning of this year a USD 5 bn infrastructure initiative was launched to assist in the financing of airports, ports, roads and the power sector. This plan sees collaboration with (private) companies and will provide USD 2 bn in equity capital and USD 3 bn in long-term debt financing with maturities exceeding ten years.

<sup>5</sup> Global Insight (2007).

<sup>6</sup> The World Bank (2005).

<sup>7</sup> CIA, The World Factbook.

<sup>8</sup> BMI (2007).

**Huge gap between investment needs and government funding**

However, the Indian government realises that there is a significant gap between the investment needs and the potential government funding, and this gap cannot be filled by assistance from the multilaterals, like the World Bank, alone. In August 2005 the World Bank announced that it was lending India USD 9 bn over three years for infrastructure investments. Targeting private capital is therefore crucial to close the gap.

**Importance of PPP recognised by government**

The Indian government anticipates a major role for PPPs in its infrastructure development plans across all major sectors and strongly encourages the involvement of the private sector. In 2005, India passed a groundbreaking law permitting officials to tap PPPs for infrastructure initiatives. Developers ante up most of the money, collect tolls or usage fees, and eventually hand the facilities back to the government. At the end of last year, the government had awarded 86 PPP contracts, mainly for roads, ports and airports, and more are in the pipeline.<sup>9</sup> For these long-term contracts, contractual certainty is key (see 3.4 for legal & regulatory framework).

**3.3 Policy on foreign direct investment**

India's government encourages not only domestic but also foreign private capital to invest in India's infrastructure. The government says India can absorb as much as USD 150 bn of foreign direct investment by 2012 (USD 30 bn a year), divided down into USD 25 bn for telecommunications, USD 55 bn for air, road and rail infrastructure, and USD 75 bn for the power sector.<sup>10</sup>

At the moment India receives only about USD 8 bn in FDI per year, which is far from the targeted USD 30 bn. Although FDI increased by 140% between 2002 and 2006, it is still only just over a tenth of the annual FDI flows to China (USD 70 bn). In order to increase FDI inflows the government has introduced significant policy reforms.

**Less bureaucracy helps to speed up FDI**

As part of these policy reforms the Foreign Investment Promotion Board (FIPB) has been changed and the Indian Investment Commission established to act as a one-stop shop between the investor and the bureaucracy in order to speed up the FDI project review process. The FDI caps in the telecom and aviation sector have already been raised and the authorities are considering eliminating FDI restrictions across a broad range of sectors. FDI inflows into various infrastructure sectors are now permitted up to 100% under the automatic route, i.e. without prior approval of the FIPB and the Ministry of Finance. Appendix 1 gives an overview of the policy on FDI for the different infrastructure sectors.

**3.4 Legal and regulatory environment**

Although India has a well-developed rule of law, its current legal and regulatory framework is not robust enough to give investors full confidence and as such is a serious obstacle blocking the necessary injections of (foreign) private capital into India's infrastructure. Infrastructure projects are often governed by concession agreements signed between public authorities and private entities. In these concessions tariff and performance standards are determined. Tariff determination and performance standards are typically matters of independent regulation.

**No single framework for infrastructure sectors**

Since the beginning of economic liberalisation in 1991 India has started to privatise government-owned businesses and to make space for PPPs in the provision of infrastructure in combination with

<sup>9</sup> Ernst&Young (2007).

<sup>10</sup> Global Insight (2007).

state regulation for safeguarding user interest. However, the regulatory framework for infrastructure has developed autonomously within each sector. Political constraints and vested interests are partly to blame, but it is also the result of many (local) authorities taking an ad hoc approach and applying inconsistent and overly-complex rules. This has resulted in delays, corruption, incompetence and an uneven regulatory framework.

#### **Different competencies of federal, state and local authorities**

The enforceability of obligations and concession arrangements is also a matter of related concern. India's constitution distributes legislative and executive powers vertically between the Union, states and local government and this should be reflected in the regulatory structure as well. In reality, each of the sectors is regulated differently (see table "Legal and institutional framework" in Appendix 2). For example, India's rail network, including the commuter railway, is owned and controlled by the national government (public company), while the road network is a state affair. What is more, the concession framework used for the national highway projects varies significantly among the projects. The absence of a regulator who can standardise concession agreements in the road sector has hampered the development of this sector.

#### **More and more positive examples despite regulatory barriers**

Despite these difficulties some sectors have developed reasonably well without a regulatory framework. The building of the Delhi Metro, the recent airport upgrades and the national highway projects are good examples.<sup>11</sup> Though, of course, it can be argued that all of them were undertaken too late.

The authorities are looking into ways to hasten the development process and have set up a Public Private Partnership Appraisal Committee (PPPAC) and announced an appraisal mechanism. Rather than hammer out the complex and time-consuming agreements on a project-by-project basis, they have created standards based on due diligence (Model Concession Agreements, MCAs). So far, MCAs have been issued for national highways, ports, state highways, and operation and maintenance agreements for highways.<sup>12</sup>

### **3.5 Infrastructure planning**

#### **Infrastructure dominates India's FYPs**

Infrastructure planning is high on the political agenda, with the Committee on Infrastructure being chaired by the prime minister. Infrastructure has always been an important part of India's FYPs (since independence in 1947 nearly half of the total outlays of the FYPs have been allocated to infrastructure<sup>13</sup>) and the current 11<sup>th</sup> FYP includes several significant national infrastructure programmes (see Appendix 3). Some national programmes are already underway, like the National Highway Development Programme (NHDP) thanks partly to private participation, while the Pradhan Mantri Gram Sadak Yojana (PMGSY) programme, which aims to connect 1000+ habitations with all-weather roads by 2008/2009, follows the public route and is lagging behind its planned targets.<sup>14</sup>

Despite these national infrastructure development programmes, India does not have one overall infrastructure plan. This has resulted in a wide variety of formats, bidding processes and agreements, and this delays the urgent developments. India's national government is concerned that some states are less efficient and active in develop-

<sup>11</sup> Foreign Affairs Magazine (2007).

<sup>12</sup> DFC Annual Report 2006-2007.

<sup>13</sup> Sankaran, S (1994).

<sup>14</sup> OECD (2006).

**More pressure on federal states to promote infrastructure projects**

ing their necessary infrastructure and is starting to put pressure on the state authorities. India's road network, for example, is the responsibility of the states, but given the urgency of expanding the network, the national government stepped in and introduced the NHDP to connect India's major cities.

The planning authorities of the different states and cities have different responsibilities and authorities. Appendix 4 tries to capture most of the administrative and planning functions for India's major cities.

**3.6 Infrastructure investment market**

The pace of economic growth in India is the main reason why the Indian government is considering getting the private sector involved in the provision of infrastructure services.

**Limited use of private-sector funds**

Despite the huge need for investment in infrastructure there has been limited use of private-sector funds so far, but this is now changing rapidly. In the period 1990 to 2005 there were 172 private-sector projects, worth a total of USD 51.4 bn<sup>15</sup>, but by the end of last year the government had awarded another 86 PPP contracts, mainly for roads and ports, with more projects in the pipeline.

India's relative immaturity in private-sector involvement is due to a combination of risk factors. Historically, India has had issues with concession commitments and had a shortage of long-term local currency financing at fixed interest rates, while corruption and poor governance practices have been widespread. This has limited the degree of interest from international investors. However, owing to the government's strong political will the situation is now improving quickly. India has made significant reforms in the regulatory framework for infrastructure and in approval processes besides lifting caps on foreign investment.

**State initiatives to encourage private investment**

One of India's government initiatives to encourage private investments is the promotion of lending to infrastructure projects. Indian state-owned commercial banks provide medium to long-term finance, but are still predominantly in the business of short-term banking. Public-sector development banks and insurance companies specialise in long-term lending. The Indian Infrastructure Finance Company Ltd. (IIFCL) was incorporated in 2006 as an entirely state-owned company and is the financial intermediary for development and financing of infrastructure projects. It borrows long-term funds on GoI guarantees from multilateral organisations and other international financial institutions. The purpose is to assist infrastructure projects either through direct lending for eligible projects or through refinance to banks and financial institutions for loans with a tenor of five years or more.

The Indian government has also earmarked specific resources for leveraging commercial investments in infrastructure, like viability gap funding. The scheme has been established to ensure a stable environment for PPPs with a concession agreement so the private sector can obtain the necessary financing.

**Private participation in some infrastructure sectors not yet perceptible**

As a result of these and other government initiatives investments in infrastructure have been growing and the sector is now increasingly receiving attention from international investors. Indian infrastructure funds are emerging rapidly. In the last year these funds have been responsible for about 80 deals, totalling around USD 1.6 bn across different sectors. However, the private sector is so far not very

<sup>15</sup> The World Bank (2007).

interested in investing in areas such as rural roads, irrigation or certain parts of the country that are economically disadvantaged, so the funding for these sectors/regions will have to come from the public sector. To date, foreign players are primarily investing in the transport (airports or ports) and telecom sectors.

Given India's complex bureaucratic structure, local partnerships are vital and international investors are generally either buying stakes in local companies that own infrastructure assets or setting up partnerships with local developers and investors. Most of the infrastructure developers and contractors are from Asia, Australia or Europe, while the global investors in India's infrastructure markets are mainly private equity funds and other investors from the US and the EU.<sup>16</sup>

## 4. A look at India's infrastructure sectors

### 4.1 Transport infrastructure: Achilles' heel of the Indian economy

The inadequacy of the transport infrastructure, in both quality and quantity terms, is one of the biggest curbs on economic growth in India. The economic losses from congestion and poor roads alone are as high as USD 6 bn a year.<sup>17</sup>

#### Road infrastructure

With a total length of over 3.3 m kilometres India's road network is one of the most extensive in the world, a fact explained mainly of course by the size of the country. Relative to population size India's road network is almost twice as extensive as that of China.<sup>18</sup>

However, in India only about 6% of all roads are relatively well-developed national highways (2%) or state highways (4%), whereas in China the percentage of major highways is much higher. In India, by contrast, many of the rural and urban roads have little in common with what people visualise in Western industrial countries. In many cases, there are no paved surfaces or there is only one lane for all of the traffic. Therefore, it is no wonder that the national highways alone carry about 40% of the total traffic.

The modal share of road traffic in total traffic (measured in tonne-kilometres or passenger-kilometres) has increased steadily in India over the past few decades. While roads accounted for merely 15% of goods and passenger traffic in 1950, its market share has expanded of late to over 60% of goods traffic and as much as 87% of passenger traffic (excluding air traffic and inland waterways). This came of course at the expense of rail traffic, which lost the corresponding market share. Going forward, the increase in road traffic is expected to continue. Up to 2015 the volume of passenger and goods traffic is likely to rise by roughly 15% per year on average, with the national and state highways having to bear the brunt of the increase. Some of the main reasons for the increase in road traffic are the country's ongoing economic expansion and the rising level of motor vehicle usage, from a low basis. Another factor is the relatively low entry barriers in the road haulage market. As the industrialisation of India continues, road traffic will be able to outshine rail traffic in terms of flexibility and speed.

#### Extensive road network in India, 2006

Category	Length in km	Share in %
National highways,	65,590	2%
of which		
single lane	21,674	33%
two lanes	36,936	56%
four/six/ eight lanes	7,980	12%
State highways	128,000	4%
Major and other district roads	470,000	14%
Rural roads	2,650,000	80%
<b>Total</b>	<b>3,313,590</b>	

Source: Dpt. of Road Transport & Highways

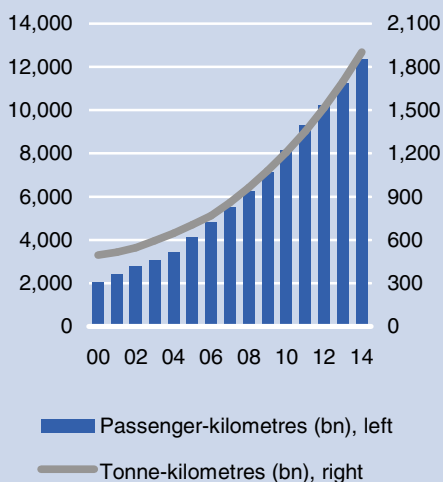
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<sup>16</sup> Ernst&Young (2007).

<sup>17</sup> Financial Times. India's big built begins ground level up. May 14, 2007.

<sup>18</sup> The United States have eight times as many roads per inhabitant as India and road quality is much higher in the US.

### Road traffic in India growing fast

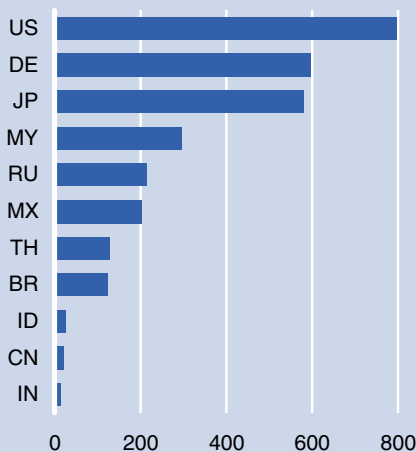


Sources: Indian Planning Commission, Indian Committee on Infrastructure, DB Research

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### Ratio of vehicles to inhabitants low by int. standards

Vehicles/1,000 inhabitants, 2006



Source: VDA

13

### Railway network in India, 2006

Gauge	Length in km	Electrification
Narrow (610/762 mm)	3,034	0%
Metre (1.000 mm)	12,662	1.2%
Broad (1.676 mm)	47,749	36.5%
<b>Total</b>	<b>63,445</b>	<b>27.5%</b>

Sources: Indian Railways, SCI/Verkehr

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### Plans for extensive investment programme

India's prospective growth hinges on a crucial prerequisite, though: a rapid improvement in the quality and quantity of highways in the road network. For this reason the Indian government has launched an extensive investment project called the National Highway Development Programme (NHDP). The NHDP, which provides for a total investment volume of around INR 2.3 tr (USD 55 bn) up to the middle of the next decade, consists of various sub-projects. The most important one is to upgrade the Golden Quadrilateral to become a four-lane dual carriageway, a project which – although roughly two years behind schedule – is nearing completion. This will significantly improve the almost 5,850 km of highway linking four main cities and business centres, i.e. Delhi, Mumbai, Chennai and Kolkata. Furthermore, a north-south and an east-west corridor are to be four-laned by about 2009. The total project covers about 7,300 km and the costs of these two road-building projects alone run to approximately INR 524 bn (USD 12.5 bn).

Other NHDP sub-projects include the upgrading of the roadways linking the country's 12 most important ports with the national network and with other business centres, respectively. Additionally, another roughly 11,000 km of national highways are to be upgraded to four-lane roads using the BOT (build, operate, transfer) model in order, for example, to improve the potential for developing the state capitals. This will further raise the share of toll roads in India. Today, user fees are already charged or are currently being phased in on 4,000 km of roads.

The government hopes to rely on the support of private investors from India and abroad for financing the NHDP and other road construction projects. Some 50% of the investment costs announced in the current 11<sup>th</sup> FYP that runs to 2012 are to be shouldered by the private sector. This is a very ambitious target, bearing in mind that private investors have so far only taken limited interest in many projects – despite fiscal incentives – because of risks related to the expected traffic volumes and the users' ability to pay. So, ultimately, the financing remains a major bottleneck factor. Further delays in implementation of the NHDP are likely. In order to boost the country's economic output and strengthen its industrial base it is probably the right strategy for India to focus on developing the road links between its main business centres. But this of course implies that hooking up rural areas in particular is likely to remain very slow.

### Railway network

The pictures of overcrowded trains in India in which the passengers cling to the outside walls of the railway cars or travel on top are in some ways symbolic of the condition of rail transport in India: the railway infrastructure is reaching its limits in terms of quantity and quality, or has already exceeded them.

India has one of the most extensive railway networks in the world with roughly 63,000 km of track – owing partly to early investment during the days of the British Empire. However, investment in maintenance and expansion of the overall infrastructure has been insufficient in recent decades. In terms of length of railway network per capita, India boasts a railway network roughly matching that of China; however, it is less than 10% of the size of the US network.

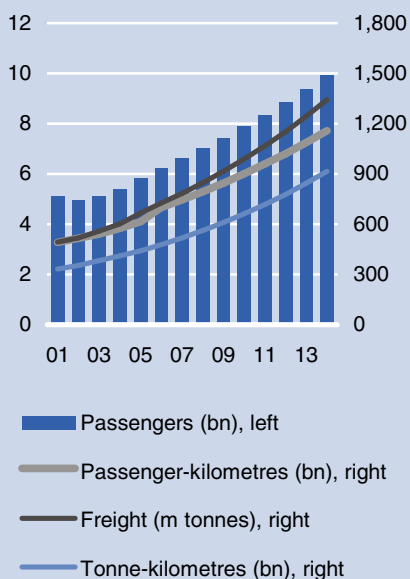
Therefore, it is not surprising that railway traffic has been losing market share to road traffic for many decades. This applies to both freight and passengers. Besides, rail passenger traffic is increasing-

ly feeling the pinch from the expansion of air traffic. State-owned Indian Railways, the main user of the railway network, was slow to react, responding to the intermodal competition with a spate of price cuts and productivity increases. However, freight traffic is suffering from quite high charges due to cross-subsidisation of passenger traffic.

### **Generally good prerequisites for rail traffic**

At first glance, the prerequisites for rail traffic in India are ideal. Compared to other emerging markets India already has a good railway network. The long distances and the goods structure, including a large percentage of bulk cargo (e.g. coal) and agricultural products, the transportation of which is practically predestined for the railways, argue for this mode of transport. However, even though rail traffic is expected to grow until 2015 at a respectable 6% p.a. on the passenger side and roughly 8% p.a. on the freight side, this will probably be the weakest performance of all the modes of transport. Besides the capacity bottlenecks on heavily travelled routes, the system-related advantages of other transport modes – road traffic in particular – will make themselves felt. Furthermore, private investors will probably play a smaller role in financing the necessary railway infrastructure than is the case with other modes of transport.

### **Large increase in railway traffic in India**



Sources: Indian Ministry of Railways, DB Research

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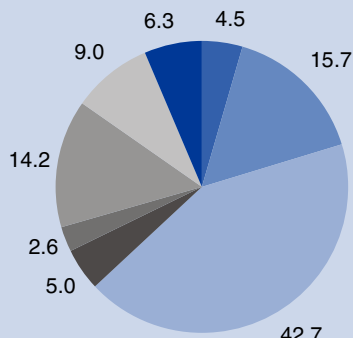
### **Important railway projects on the drawing board**

Wide-ranging measures pertaining to the expansion of the railway infrastructure are contained in the current FYP and other plans. The most important projects include the development of two so called dedicated freight corridors especially for goods traffic. They are meant to connect the country's by far biggest container port, Jawaharlal Nehru Port Trust (J.N.P.T.), on the west coast with cargo terminals in the area of Delhi (Dadri and Tughlakabad), as well as Ludhiana in northern India with the new deep-sea port in Kolkata on the east coast. All in all, the route will be some 2,700 km in length. For this project, too, private investors are expected to be taken on board via PPPs. Some proposals being considered, for example, are to turn over operation of the terminals or the marketing of property owned by Indian Railways to the private sector in order to secure the funding.

Rail traffic will probably be given a major boost by the admission of private-sector companies to the container segment. This is a growing market segment anyway, and meanwhile the authorities have issued 14 operating permits to domestic and foreign companies. Additional measures to improve rail infrastructure will include, among others, further electrification of the network (objective of the 11<sup>th</sup> FYP: 3,500 km, compared with 1,800 km during the 10<sup>th</sup> FYP), a doubling of the tracks on heavily used routes (approximately 3,300 km), continued harmonisation of track gauges, improvement of the connections linking ports, Special Economic Zones (SEZs) and other transport hubs with the railway network, modernisation of railway stations in India's major cities (e.g. Delhi, Kolkata and Mumbai), and construction or expansion of freight terminals. There are also plans for extensive investments in rolling stock. The total earmarked funding in the 11<sup>th</sup> FYP comes to around INR 2.3 tr (USD 55 bn). This seems very ambitious, especially since the investment sum is nearly three times the amount in the 10<sup>th</sup> FYP. Moreover, experience shows that it is much more difficult to include private investors in the funding of rail infrastructure compared to roads, ports or airports, since it is virtually impossible to recoup

### Rail freight traffic in India by product group

Shares in %, 2006/07



- Mineral oil & lubricants
- Iron ore
- Coal
- Fertiliser
- Iron & steel
- Other\*
- Cement
- Cereals

\* e.g. general cargo

Source: Indian Ministry of Railways

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investments in rail traffic via user fees alone. What this boils down to is that several question marks hang over near-term implementation of the plans. Undisputably, however, it makes sense to focus the planned investment on the key business centres and on integration of the different modes of transport.

#### Plans for urban public transport systems

All the major cities in India will post rapid population growth over the next few years. Many people will relocate from rural areas to urban areas, the main driver being the prospect of better job opportunities in the cities. At the same time, the incomes of broad sections of the population are likely to grow faster in the urban business centres than elsewhere. This will boost demand for individual mobility and ultimately also for cars. However, the road network systems in India's cities are not designed for vehicle use on a mass scale. If no countermeasures are taken the already nearly daily traffic gridlock in many cities of India will become even more severe in future. Therefore, over the longer run cities such as Bengaluru, Mumbai and Chennai have plans to build mass public transport systems modelled on the Delhi Metro. Here, too, funding problems will no doubt be one of the biggest hurdles to cross in realising the projects.

#### Airports

There are roughly 125 airports in India today, 16 of which offer international services. The eight biggest airports handle nearly 80% of the country's total passenger traffic, and the airports at Mumbai and Delhi alone account for around 45% of total traffic. Almost all of India's airports experienced a veritable growth boom over the past few years. Since the 2001/02 accounting year<sup>19</sup> total air freight traffic has risen by close to 13% p.a. on average, while passenger traffic has increased by no less than 22% p.a. The main reasons for this were the sizeable pent-up demand and the opening of India's air-space to private airlines in the mid-1990s; the first low-cost carriers (LCCs) started operating in the Indian air transport market in 2003. On domestic routes, private airlines claim a market share of nearly 80%.

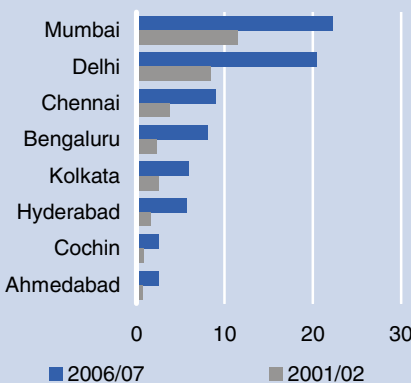
Owing to the strong growth in the past India's larger airports in particular are working at, and at times over, their capacity limits. This holds for both the runway systems and for passenger and baggage-handling facilities. Despite rapid growth which far outstrips the average in a global comparison, the Indian airports are still relatively small by international standards. In terms of passenger traffic there was no Indian airport among the world's top 50 in 2006, but four from China. Taken together, passenger traffic at all of India's 16 international airports (2006/07 accounting year: 83 m passengers) still fell slightly short of the level at Hartsfield-Jackson International in Atlanta, the world's largest airport. In cargo traffic, the airports of Mumbai and Delhi are among the top 50, but here too the size differences are most striking: the freight volume at Frankfurt Airport surpassed the combined reading for all 125 Indian airports by more than one-third.

#### Air traffic in India set to post strong growth

There is general agreement that air traffic in India is set to boom over the next few years. Up to 2015, passenger traffic is likely to increase by roughly 15% p.a. and cargo traffic by 11% p.a. on average. The reasons are obvious: the statistics show that at

### Passenger traffic at Indian airports heading skyward

Passengers, m



Source: Airports Authority of India

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<sup>19</sup> The fiscal years in Indian statistics last from April till March in the following year.



present every Indian boards less than 0.1 flights per year, as opposed to roughly three times that number in China. Indeed, the figure in Germany is over 2 flights per year. This is an indication of the enormous pent-up demand. Business and population growth as well as the desire for individual mobility are major driving factors.

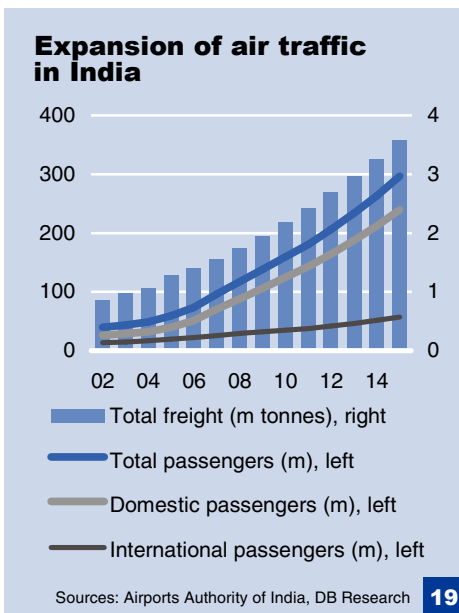
On the supply side, the trend towards deregulation of the Indian and Asian air transport markets is likely to continue. There will probably be further steps to dismantle the remaining market entry barriers for private airlines in cross-border traffic. This will boost traffic in the international segment; currently, the segment is dominated by state-owned Air India. Low-cost carriers are only just starting to make inroads in the Asian market and have a much higher growth potential than the established carriers. A further indication of the growth potential is that there are virtually no direct scheduled flights between the world's two most populous nations by far, China and India. Furthermore, all Indian airlines are investing massively in their fleets. This will boost competition and bring pressure to bear on ticket prices. Last but not least, India is upping its efforts to sell itself abroad as a holiday destination. However, only about 4.4 million foreign tourists came to visit in 2006 – with the trend rising. This is only one third of foreign visitors to Thailand in 2006.

In the air freight market it is mainly the robust economic growth and the increasing industrialisation of the country that are driving the growing demand for air services.

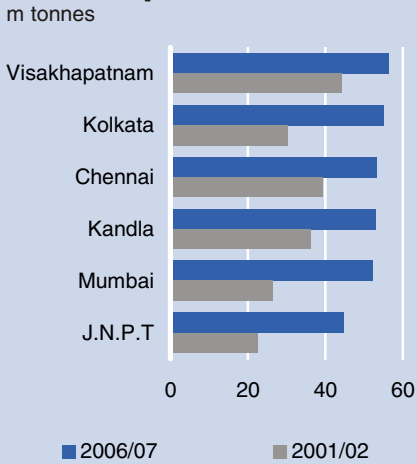
#### Wide-ranging programme to build and upgrade airport facilities

The Indian government is responding to the expectations of higher air traffic and investing in the modernisation of existing airports as well as the construction of completely new ones. Private investors and airport operators are intended to play a central role in these endeavours. The Cochin airport, opened in 1999, was the first in India to be mainly funded by private-sector capital. Today, the major stakeholders in the country's two largest airports at Mumbai and Delhi are from the private sector. PPPs were set up to modernise and expand these airports to handle 40 m and 35 m passengers per year, respectively. Expansion plans also exist for the airports in Kolkata and Chennai, and these have already been partly realised. Two completely new airports are currently being built in Hyderabad (planned capacity: 50 m passengers) and Bengaluru (11 m passengers for the time being and a further need for expansion already looming); project construction is under private management as will be operations at a later date.

Given the hitherto positive experience with PPP projects in the airport segment, other greenfield airports are to be built in Goa, Pune, Navi Mumbai, Nagpur (as a central hub for freight traffic) and Greater Noida. Around 80 other small airports are to be expanded in part and/or modernised over the coming years. The public funds needed for these projects are estimated to run to INR 400 bn (USD 9.5 bn) up to 2010 alone. An additional INR 300 bn (USD 7.1 bn) or more is expected from private sources. Since it is easier to find private partners in this traffic segment, these plans are more likely to be realised than say those in the railway segment.



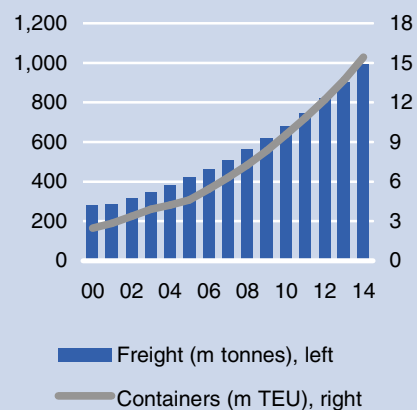
### Goods trade picking up at Indian ports



Sources: Indian Ports Association, port websites, Tariff Authority of Major Ports

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### Veritable boom at India's seaports



Sources: Indian Ports Association, Indian Ministry of Finance, DB Research

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## Seaports

There are twelve major ports and close to 190 small ports along India's 7,500 km of coastline. The twelve big ports account for roughly three-quarters of total maritime trade with foreign countries. Overall, the ports handle 95% of India's trade in goods by volume and 70% by value. The country's economic structure is reflected in the goods structure at the ports. Currently, bulk goods such as iron ore, coal, agricultural products and mineral oil are predominant. Container traffic is still insignificant at most of the ports (the exception being J.N.P.T.).

Since 2000/01, cargo turnover has increased by close to 9% per year on average – despite the structure of port traffic. The mean growth rate for container traffic, 14% p.a., shows where the international business is focused, however. Still, it must not be forgotten that goods traffic at many of India's ports showed flat growth in the last two decades of the past century, partly on account of a trade policy that was much more restrictive than today's. For example, the traffic level at the port of Mumbai for the fiscal year 2001/02 had already been reached once before back in the mid-1980s.

As in air transport the Indian seaports are not to be found in the upper echelons of the global charts. Freight traffic at Singapore, the world's largest port (measured in millions of tonnes), was only slightly less than the total for all of India's major ports combined. The world's top 50 ports did not include a single Indian port in 2005. By contrast, nine Chinese ports were to be found in this ranking.

The picture looks a bit better for container port traffic. In fact, in this area, J.N.P.T. makes it into the top 30 with 3.3 million standard containers<sup>20</sup> handled at the latest reading. However, J.N.P.T., located on the west coast of India (and often also referred to as Nhava Sheva), is the country's only major container port. It accounted for 60% of India's total container traffic in 2006/07. Nevertheless, it is very small in comparison with the international "giants" in the market. To illustrate, container business in Singapore alone is over four times as high as the traffic generated at all of India's ports together. The difference between India and China is again tremendous: three of the four world's largest container ports in 2006 were in China.

The growth of business at Indian ports is set to continue. Up to 2015, tonnage traffic is likely to increase by around 10% per year on average. In fact, container traffic could conceivably grow at a rate of 14% p.a. This would put growth at Indian ports high above the global average of about 9% p.a. However, the expected growth would still look very modest compared with the dynamic expansion of some Chinese ports in recent years. Container traffic in Shenzhen, the fastest-growing big port in China and now fourth busiest in the world, has jumped since 1996 by over 3,000%.

### Success story of private investment in port terminals

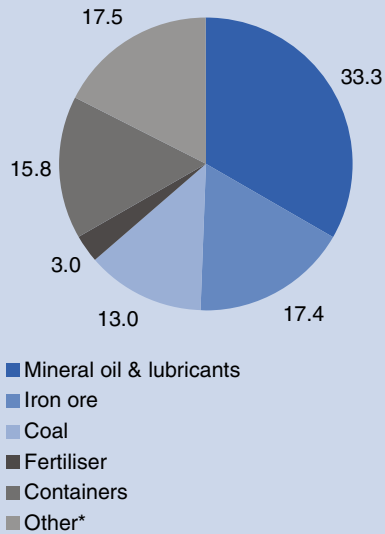
The Indian government realises that it can only reach its target of more rapid industrialisation and becoming a bigger player in global trade by expanding its port capacities. Given its geographical location and topographical features the country is ideally placed to develop into one of the pre-eminent freight transshipment places linking East Asia and Europe. This is why India is currently pressing ahead rigorously with nearly all of its port expansion and

<sup>20</sup> Standard containers are measured in twenty foot equivalent units (TEU).



### Traffic at the most important Indian ports by product group

Shares in %, 2006/07



\* e.g. agricultural products, general cargo

Source: Indian Ports Association

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modernisation plans. In many cases, the projects are being implemented by PPPs. The record to date has been basically as good as with airports, especially since it has been possible to buy private stakes in ports since the early 1990s. One particularly important factor for bringing about an industrial revolution is to expand the container shipping capacities.

As part of the National Maritime Development Programme (NMDP) of 2006, the Indian authorities have identified approximately 300 major and minor projects pertaining to port infrastructure. Their implementation is targeted for the fiscal year 2011/12 – an ambitious goal. The NMDP covers, for example, the development and construction of new berths and container terminals, the deepening of canals and coastal shipping lanes, the improvement of links with other modes of transport (especially rail and road) as well as with the increasing number of SEZs, and modernisation of the existing freight-handling facilities. Examples include the building of a further container terminal at J.N.P.T. under private-sector management, a container terminal at the port of Cochin, new container terminals in Chennai and Kandla, and the construction of a bulk goods terminal at the port of Ennore nearby Chennai. Moreover, the vehicle export capacities at the port of Chennai are to be expanded. The funding earmarked for these and other measures add up, according to the 11<sup>th</sup> FYP, to close on INR 700 bn, half of which is to come from private investors and/or port operators. As with airports, there is also widespread confidence for seaports that the investment plans can be realised in the relatively near future.

## 4.2 Energy sector

In India, installed electricity generation capacities currently total roughly 135 gigawatts (GW), and are thus 29% higher than the 2002 level and 58% above the 1997 level. However, India's installed capacity is only about one-third of China's. The picture is similar for electricity consumption per capita: India's estimated 650 kWh per year fall far short – despite an over 50% increase since 2001 – of the reading for China (approx. 1,900 kWh).

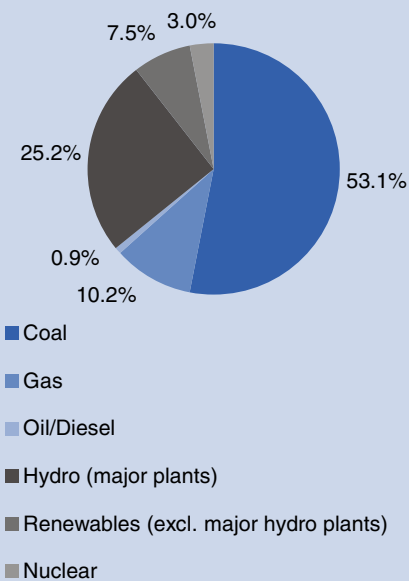
Coal is India's most important fuel source for electricity generation by far with a share of 53%. Hydropower (large plants) ranks second with a share of roughly 25%; in Indian statistics they do not fall under the heading of renewable energy. Electricity from gas-fired power stations accounts for 10%, while renewables (primarily wind power) produce nearly 8% and nuclear energy merely 3%. Power supply is mainly in the hands of the central government and/or the states, although the significance of the private sector is gradually rising. The two levels of government account for about 86% of total generating capacities with the rest coming from the private sector.

### Unreliable power supply is holding back industry

Besides the poor traffic infrastructure, the inadequate and unreliable power supply is one of the main impediments hampering a more rapid industrialisation of the Indian economy. Power outages occur regularly even in the big metropolitan areas – especially during the summer months when the demand for electricity temporarily sky-rockets on account of the use of air conditioning systems. The supply gap is – according to the Infrastructure Development Finance Company Ltd. – estimated to reach 15% during peak load times (so in purely arithmetical terms more than 150 m people have to go without power). In rural regions, in particular, supply is inadequate and this weighs on efforts to catch up with the urban economy.

### Coal dominates electricity generation in India

Share in installed capacity in 2007\*



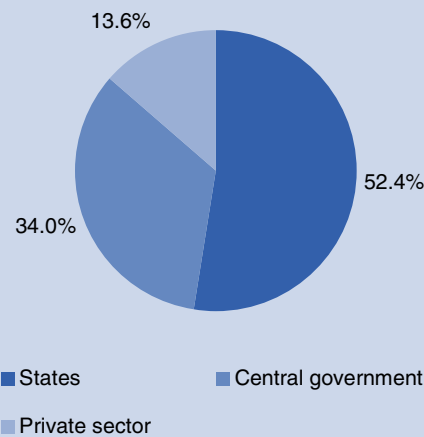
\* Excl. captive power plants

Source: Central Electricity Authority

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**States dominate electricity sector**

Share in installed capacity in 2007 (%)



Source: Indian Ministry of Power **24**

Besides, the lack of electricity in rural areas causes serious humanitarian problems. The Indian Ministry of Power states that over 50% of the rural households have no access to electric power, albeit some progress has been made here over the past few years.

The main reason for the supply bottlenecks is the past shortage of investment in power stations and grid which failed to keep pace with the increase in demand. For example, the target in the 10<sup>th</sup> FYP to expand installed capacity by over 40 GW was missed by a long way (roughly 25%). Add to this extremely high supply and transmission losses which – even though they are trending down – equal about 34% of generation, according to information from India’s Ministry of Power. The losses are partly attributable to the overloading of the network infrastructure, and partly to the poor functioning or complete absence of electricity meters at customers’ premises as well as theft (referred to as “aggregated technical and commercial losses”). Low efficiency at many of the old power generating stations as well as low and sharply fluctuating capacity utilisation are further negative factors.

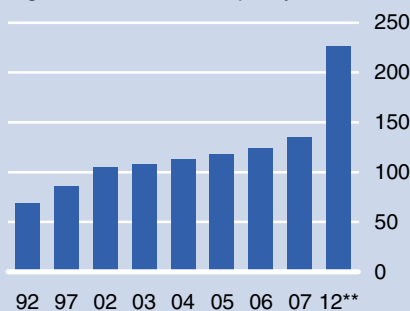
In response to frequent blackouts many privately owned industrial companies have now built their own generating stations, which are intended for virtually exclusive in-house use (captive power plants). The over 135 GW in generating capacities mentioned above do not include the capacities of these company-owned plants. They already total no less than 15 GW of installed output. The construction of captive power plants was made possible by the Electricity Act of 2003. It provides, among other things, for a gradual opening of the market to new operators and for free choice of supplier for customers. However, implementation has been only slow because of, for example, an overlapping of competences between the central government and the states. Surplus electricity from the captive power plants is generally allowed to be fed into the grid; however, according to the Infrastructure Development Finance Company, this is made difficult by complicated government regulations. Further obstacles blocking the greater involvement of private-sector players include the low electricity prices for certain user groups (e.g. farmers), owing to politically motivated subsidisation, and the metering difficulties mentioned above.

**Huge investment programme launched**

To deal with the power-supply problems outlined above and to enable India to attain ultimately sustainable high economic growth, the government has launched a series of development programmes and set very ambitious goals for the current 11<sup>th</sup> FYP. The plans address all the major factors: in respect of generation, costs are to be lowered by modernising the power stations (higher efficiency), achieving better utilisation levels and building new facilities; also, the security of supply is to be boosted substantially. In respect of transmission, the development of a national power grid and the reduction of power losses are given top priority on the agenda. More efficient metering systems should help reduce the amount of illegal tapping into the grid, improve payment behaviour and curb energy waste. In rural areas where the connection to a supra-regional network does not pay, the electrification of private households is to be improved through decentralised supply systems. Further liberalisation moves aim to strengthen the rights of consumers (e.g. free choice of supplier), as well as increase the opportunities for new (private) operators to enter the market. Greater involvement of the private sector is desired. Finally, many measures are focused on

**Surge in generating capacity**

Gigawatts of installed capacity\*



\* 1992 - 2006: as of end-March; 2007: end of August; excl. captive power plants

\*\* Planned capacities up to 2012, excl. captive power plants

Source: Central Electricity Authority **25**

**More than 50% of additional power plant capacities are based on coal**

making more efficient use of the electricity generated. The target of this wide-ranging strategy is reflected succinctly in the slogan "Power for all". The Indian government seeks to reach the target by the end of the 11<sup>th</sup> FYP, i.e. by 2012, which is extremely ambitious. The current 11<sup>th</sup> FYP targets an expansion in India's installed power station capacities to a total of some 240 GW by 2012. This would mean a more than 100 GW, or nearly 80%, increase on today's total.

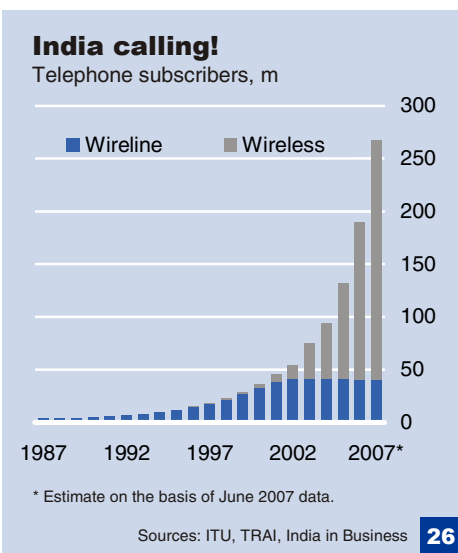
**Coal remains primary source of energy**

Coal-fired power stations will bear the main burden; they will account for more than half of the additional capacities. A big role will be played in this regard by the planned construction of (mostly coal-fired) ultra-mega power projects, which are to be built and operated via PPPs. Large hydropower plants (15% share of additional capacities up to 2012) and renewable energies (13%) will also make a significant contribution. For the medium term, great hopes are being pinned on large hydropower plants (dam projects), since only 20% of the country's current potential of around 80 GW has been tapped so far. However, the projects have the disadvantage of very long lead and construction times, which is why targets for the period after 2012 are already being formulated. Furthermore, the Indian government expects new captive power plants with a capacity of 12 GW of installed output to be built. Up to 2012, new nuclear power plants will account for only around 3% of the additional capacity, but in the long term the use of nuclear energy is to be steadily increased; cooperation with the US on the use of nuclear energy should help.

**Big question mark over financing**

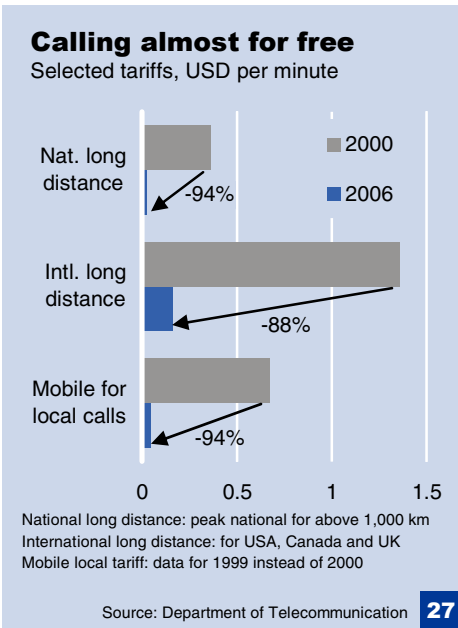
The 11<sup>th</sup> FYP calls for an investment volume of INR 10.3 tr (or about USD 245 bn) in power stations (including captive power plants), power grid and other transmission and distribution capacities, research and development, and other activities surrounding the electricity sector. This is 70% more than the volume planned for the entire transport sector. Undeniably, of course, this investment programme will still not solve all of India's energy-supply problems. Rather, similarly extensive spending will continue to be needed in subsequent years in order to meet the country's electricity requirements, which are growing at a rate of at least 10% per year. In fact, the demand for electricity could increase even faster if the process of industrialisation advances very rapidly. In fact, the states are to pay the bill for about half the investment in the 11<sup>th</sup> FYP, and the central government for close to 30%. Private investors are to have a share of around 20%. Considering the impediments to private investment in India's energy sector, this is a huge task which can probably only be solved if regulatory barriers are dismantled quickly. At the end of the day, the tight public budgets in India leave a big question mark hanging over the financing of such investments.

**Huge investment needs in the power sector**



**4.3 Telecommunications: Success story starts into a new phase**

No other area of infrastructure in India has grown as fast over the past few years as the telecommunications industry. Over 30 m new mobile phone subscribers were registered in the first six months of 2007 alone, and most recently the total actually topped 6 m per month. In fact, with a growth rate of over 75% p.a. the Indian mobile communication market has expanded at a faster rate than its Chinese counterpart over the past five years. Favourable demographic and economic developments, and especially forward-looking

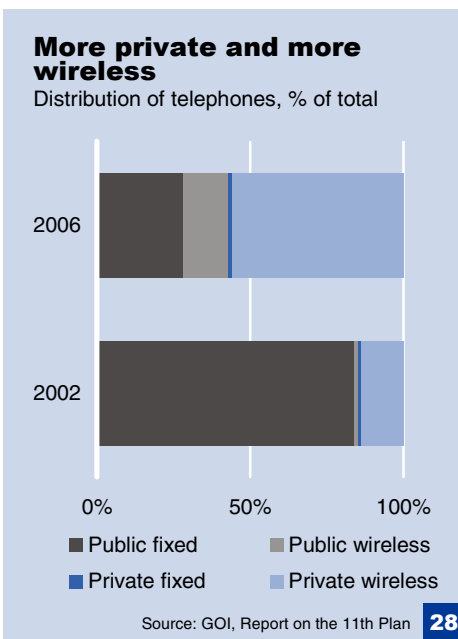


reforms, laid the foundation for this growth. The size of the country alone scarcely suffices to explain the growth story. This is best evidenced by a look back to the past: the number of subscriber lines in India increased by a mere 6 m or so between 1960 and 1992. So during these 32 years the overall customer base expanded by the same amount as it did on average in each month of 2007!

Today a total of 250 m Indians have a landline (fixed-line) or mobile telephone. The teledensity ratio, or market penetration, measured as the number of telephones in relation to the number of inhabitants, thus already exceeds 20%. This means that the target anchored in the New Telecom Policy of 1999 – of raising teledensity to 15% by 2010 – was more than fulfilled much earlier than this date.

Three things must be noted in this regard, though: first, over the past few years the growth was driven solely by the mobile telephony sector, with the number of landline telephones actually starting to fall of late. Second, there are major differences between the dynamic urban agglomerations and the rural areas. While teledensity already far surpasses 50% in the cities, the reading comes to barely 2% in rural areas. Considering that the majority of the Indian population (nearly 800 m persons) still live outside the cities, the achievements are notable; however, huge market potential still remains untapped.

Third, even by international standards, there is still a great deal of pent-up demand: in China, for instance, the teledensity ratio exceeds 50%, while in the US, UK and Australia the ratios far outstrip the 100% threshold.



#### Market liberalisation triggered breakthrough

This growth momentum has been driven mainly by five important steps towards deregulation:<sup>21</sup> first, mobile telephony licences were auctioned to private entities between 1994 and 1998.<sup>22</sup> The two state-owned bidders MTNL (Mahanagar Telephone Nigam Ltd.) and BSNL (Bharat Sanchar Nigam Ltd.) received one additional licence each. Second, the licensing and spectrum fees levied since 1999 have been reduced. In a third step, the authorities licensed “limited mobility services” to encourage operators to offer low-cost communications and thus create additional price pressures. The Telecom Regulatory Authority of India (TRAI) took probably the most important step in 2003: its unified licensing proposal ultimately erased the regulatory boundary between mobile and landline service offers. The Authority thus achieved two effects. One was to allow the price momentum from the mobile networks to spill over to the landline networks. Another was to let the resultant competition establish the technology that is most cost-efficient for a given region. This lowered the access technology costs. Finally, internet telephony has also been permitted since 2002.

These deregulation steps resulted in a steep fall in the charges for telephone service: in a few cases they decreased to less than 10% of the 1999 level. Today, India’s telephone charges are among the lowest in the world. The rapid growth of demand is largely attributable to these developments and, thanks to the demand boost, turnover in the telecommunications industry has increased significantly of late despite the low charges (by roughly 20% p.a. on average over the past ten years).

<sup>21</sup> For further information, see e.g. The Shosteck Group (2004).

<sup>22</sup> Initially, two licences were auctioned for each of the 23 “telecom circle service areas” (regions roughly in line with the state boundaries). In 2001 the authorities granted 17 more licences.

## FDI in Indian telecommunication

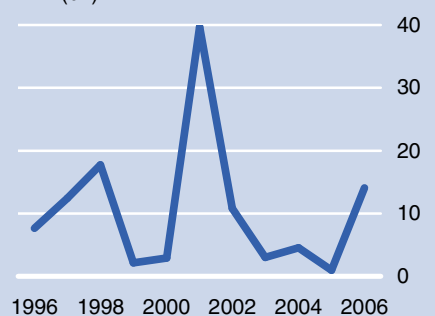
Sector	FDI Cap/Equity
Basic and cellular, Unified Access Services,	74%
National/International Long Distance, and other value added telecom services	Automatic up to 49% FIPB beyond 49%
Internet service provider with gateways, radio-paging, end-to-end bandwidth	74%
a) Internet service provider without gateway	100%
b) Infrastructure provider providing dark fibre, right of way, duct space, tower	Automatic up to 49% FIPB beyond 49%
c) Electronic mail and voice mail	
Manufacture of telecom equipments	100% Automatic up to 49% FIPB beyond 49%

FIPB = Foreign Investment Promotion Board

Source: Dpt. of Telecommunication **29**

## Low flows into telco sector

FDI into Indian telecommunication, INR (bn)

Source: Dpt. of Telecommunication **30**

## Challenges for the years ahead

The working papers for the 11<sup>th</sup> FYP (2007 to 2012) suggest that the focus will be on three fields over the next few years<sup>23</sup>: first, the use of broadband is to be increased in order to widen the scope for communication via the internet. Second, greater significance will be attached to telecom equipment manufacturing. While the tariffs on telecommunication imports have already been slashed, domestic industry is meant to profit from the rise in demand. The third and probably the most demanding target still ahead is to expand the networks to improve telecommunication services for the rural population. By 2012 the number of subscribers outside urban areas is to increase more than tenfold, to 200 m. In order to reduce costs one of the main aims is to enable operators to share infrastructure facilities. However, it is still an ambitious target, even with this measure. It will probably be much easier to increase the subscriber numbers in urban areas – despite the comparatively high starting basis – since incomes are rising steadily in the cities and because the infrastructure can be better utilised there than in the countryside. It holds for both the rural and the urban regions that primarily the mobile segment is likely to see higher new subscriber numbers. While the increased demand for broadband connections will probably boost traditional landline operations, conventional telephones could continue to lose significance in absolute terms.

## Door open for more foreign direct investment

At the end of 2005, the Indian government raised the limit for foreign direct investment in numerous telecommunication services from 49% to 74%. In fact, the limits on foreign investment in some internet service and telecom equipment segments have been lifted altogether. So far, though, relatively little capital has flowed into the Indian telecommunications industry from foreign investors: the amount between 1991 and 2006 totalled merely INR 118 bn (roughly USD 2.8 bn). The bulk of the investment targeted mobile communication services and holding companies. This is set to change, for TRAI estimates that over 200,000 transmission masts, i.e. roughly twice as many as there are in India at present, still have to be erected by 2010.<sup>24</sup> Consequently, the current report for the 11<sup>th</sup> FYP calls for (not yet specified) measures to raise the level of foreign direct investment.

## 4.4 Water supply and sewage disposal

The distribution of precipitation is very uneven in India in both regional and seasonal terms. India's Ministry of Water Resources says that around 75% of total annual rainfall falls during the summer monsoon (June through September). Particularly the north-eastern and western parts of the country as well as the slopes of the Himalayas are hit by very heavy rainfall during this season; extensive flooding is common in many regions. Since the soil is unable to absorb the enormous quantities of precipitation in this short time and since artificial lakes and reservoirs (e.g. dams and cisterns) are insufficient in number and size to handle the deluge, the rainfall generally drains off unutilised as surface water. During the rest of the year, though, much of India suffers from persistent drought and scorching heat. While the monsoon is vital for agriculture in India and for supplying potable water to Indian cities, it is

<sup>23</sup> Government of India (2006). Report of the working group on the telecom sector for the 11<sup>th</sup> Five-year Plan (2007-2012).

<sup>24</sup> Financial Times (2007). Success story faces the rural challenge, May 8, 2007.

**India's "flood-drought-flood-syndrome"**

also the cause of considerable suffering for millions of people every year. This became vividly clear as recently as 2005 during the unusually heavy monsoon rains in the state of Maharashtra, home to the financial centre of Mumbai, when 944 mm of rain fell within 24 hours; Mumbai's drainage system is designed to handle only around 25 mm per day.

**India's public water-supply system suffers from inefficiencies*****Inefficiencies in the water supply system***

Besides this natural peculiarity of the water supply, India's public water-supply system is plagued by inefficiencies. In its report on water resource management in India, the World Bank describes how the country has been caught up for years in a vicious circle of low to non-existent water charges and associated financial bottlenecks for the competent authorities resulting in a shortage of investment in the maintenance and modernisation of the supply infrastructure. This leads to a decline in the security of supply and poor-quality drinking water, which in turn triggers a drop in demand for water from the public supply systems and, consequently, lower revenues.

At the same time, the low charges are an invitation to squander water resources. It stands to reason that a price bordering on zero does nothing to indicate scarcity. In the agricultural sector, in particular, leaky pipes probably lead to over 50% of the water being lost in some cases. Farmers have few incentives to switch to more efficient irrigation systems (e.g. drop irrigation) and/or less water-intensive crops.

**Exploitation of non-renewable groundwater resources**

Given the inefficiencies in the public water system more and more farmers – but also businesses and households – are starting to secure their water supply by drilling their own wells. Some of the users are tapping heavily into non-renewable groundwater resources; therefore, the water table is falling nearly everywhere. Since no money has to be paid for pumping groundwater – not least because there are no laws specifying the ownership rights – and because the variable costs of production are low (e.g. low electricity prices), this is also an area fraught with substantial inefficiencies.

Of course, much of the Indian population cannot afford to drill their own wells. And since people in rural areas in particular often have no access to the public supply networks, they sometimes have to buy water from itinerant sellers at very elevated prices. This is a social tinderbox, since it is precisely the poorest people who are hit hardest by the inadequacies of the water economy.

***Lots to be done – difficulties in integrating the private sector*****Higher harvests on irrigated fields**

The Indian government is aware of the challenges facing it in the water sector. It has symbolically declared 2007 to be "Water Year". Because of the increase in industrialisation and in the population, the demand for water is expected to climb steadily over the coming years. Agriculture, which accounts for roughly 70% of water consumption, will have to continue to rely on irrigation going forward: the harvest yield per hectare is up to three times higher on irrigated fields than on non-irrigated ones. At the same time, the supply side is impaired by a falling water table, poorer quality of the water available and/or a lack of sewage treatment plants. In addition to that, over the long term the expected melting of glaciers in the Himalayas will pose a huge challenge for the country's water supply.

**Small reservoir capacities for rainwater in India**

For the coming years the government plans are focused on boosting efficiency in irrigation farming and raising reservoir capacities for rainwater by means of major projects (dams) and minor ones (cisterns). The aim is to guarantee the security of supply and reduce

the exploitation of groundwater; supply in the rapidly growing cities is also largely based on water from artificial lakes. Reservoir capacities for rainwater in India currently just top 200 cubic metres per inhabitant, while more than five times this amount can be stored in China. The corresponding US number outstrips India's even by a factor of 25. Ultimately, India needs to better utilise this precipitation by developing suitable reservoir capacities.

Furthermore, an increasing number of households are to be hooked up to the drinking water supply. The infrastructure for sewage disposal is to be gradually expanded. This holds for both industrial sewage and sewage from private households. In order to cut back on the amount of water wasted, higher water charges are necessary, even though this is a political hot potato.

### Low water charges hinder private investment in water infrastructure

The total investment proposed for water resource management in the 11<sup>th</sup> FYP runs to about INR 2.3 tr (USD 55 bn). Naturally, India's central and state governments hope to enlist the participation of private investors. However, given the low water charges and the resultant payment streams, this is likely to be an uphill battle. Outside the metropolitan areas, in particular, the population probably has little inclination or ability to pay the bills. However, in future, securing the water supply of the big cities may become an investment area for investors from abroad. Foreign companies might also be able to invest their expertise and capital in the building of sewage disposal plants.

## 5. Regional differences on state-level

### Immense regional differences in India

India is a large country and the regional differences are immense. In this section we will assess the socio-economic drivers of future demand for infrastructure projects and India's ability to finance them. To conduct our assessment we developed a scoring tool that helps us compare the medium-term prospects for infrastructure projects at the state level.

### Scoring methodology

India has 28 states and seven territories (one territory being the National Capital Territory of Delhi, NCT). In this section, we will analyse 27 of the states and the NCT.<sup>25</sup> We had to exclude the state of Mizoram as there was not enough data available for some of our key variables.

### Scoring model factors in:

The scoring tool consists of seven factors in two groups. The first group comprises five socio-economic factors which help to assess the most important demand drivers for infrastructure projects. In detail, these socio-economic factors are:

### ... growth rate of net state domestic product

— Average growth rate of net state domestic product at constant prices for the period 2000 to 2005.<sup>26</sup> This factor is a measure for

<sup>25</sup> There are several reasons for leaving out the six other territories. First, these territories are comparatively small. In the 2001 census none of them had more than 1 million inhabitants. Second, some of the territories are not even connected to the mainland (e.g. Andamanen and Nikobaren or Lakshadweep). Third, Puducherry consists of four non-contiguous districts, while the territory of Daman and Diu consists of two unconnected enclaves. An infrastructure project in Puducherry or Daman and Diu would automatically require a more granular approach. What is more, any infrastructure project that connects the enclaves will tend to lead to projects in the surrounding states and not the territories themselves.

<sup>26</sup> For those states where domestic product data was not yet available for the fiscal year 2005/06, we calculated the average for shorter periods starting with the fiscal year 2000/01.

- both future demand growth and the development of the states' financial room for manoeuvre. Of course this indicator is only a proxy for future demand trends, as federal investment programmes or different investment intensities are not captured by GDP growth.
- ... net state domestic product per capita — Per capita net state domestic product in 2004 at constant prices. This factor captures the states' current development stage. This is an important indicator, since higher income and wealth usually require improvements in infrastructure as, for example, mobility increases (more trips are generated).
  - ... number of inhabitants per state and expected growth of population — Number of inhabitants in 2001 (last census of India). Smaller states promise fewer projects, while the initial investment needed to understand the regional institutions and regulatory peculiarities is likely to be independent of the size of a state. All other things being equal, investors should therefore concentrate on bigger states.  
— Population growth until 2026, as estimated by the census of India.
  - ... share of manufacturing and construction activity — Share of manufacturing and construction activity in GDP. It is plausible that private investors will favour states with a strong industrial base as investment needs are largest in economies with a strong focus on manufacturing compared to economies based on services or agriculture. This holds particularly for demand for investment in transportation and power infrastructure.

All these factors are scored similarly by a relative scoring algorithm. We construct a rectangular distribution over the range of realised values in the 28 regions. The state with the worst value is assigned a score of 1 for the respective factor. The state with the best value is assigned the top score of 5. Between these two extreme values we created five equally-sized intervals.<sup>27</sup>

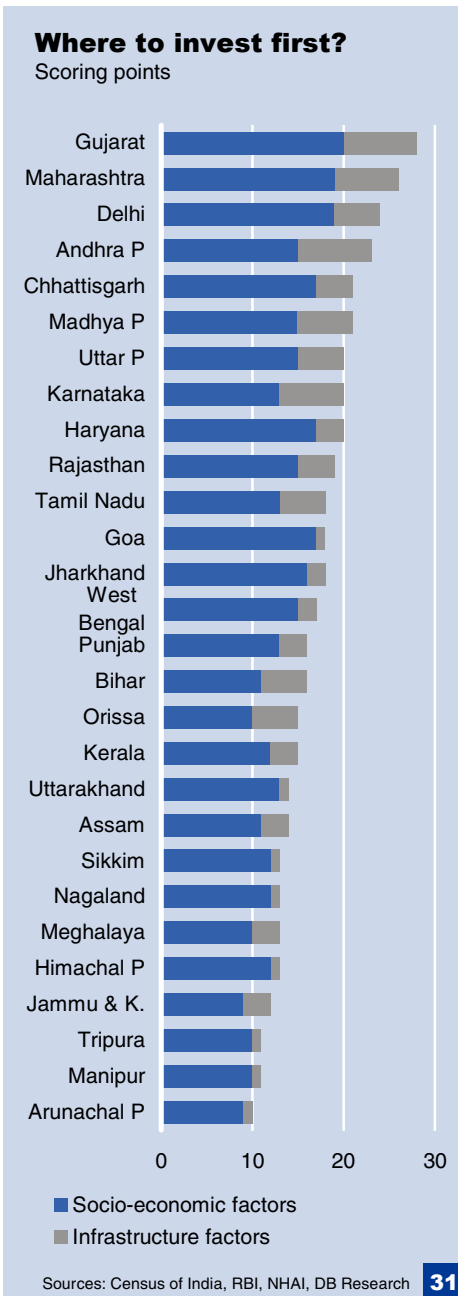
**“Bonus points” for states benefiting from major infrastructure projects**

The second factor group looks at two important infrastructure milestone projects: states that are to be home to one of the new ultra-mega power projects were given three extra points, and we assigned different scores to states benefiting from the National Highways Development Project. The highest score was given to states that significantly benefit from both the extension of the Golden Quadrilateral and the extension of the east-west and north-south corridors (in terms of length of the highways and connected hubs). The lowest score was assigned to states without direct access to these new four-lane highways. Intermediate scores were given to states that benefit to a lesser extent from the extensions.

**Results of the regional scoring tool**

With 25 points stemming from the socio-economic factors and eight points from the infrastructure factors a total of 33 points marks the maximum possible score. The state of Gujarat ranks first with a total of 28. As Gujarat achieved the highest scores in both factor groups the result is also well balanced. The next-ranked states are hardly surprising: India's financial centre, Mumbai, is located in Maharashtra and Delhi is the economically powerful political centre of the country. What is more, the capital seems to impact strongly on the adjacent states Haryana and Uttar Pradesh. Both are listed among the best ten states.

<sup>27</sup> In two cases we corrected for one outlier by assigning the highest score for the second highest value (population growth and number of inhabitants).



Two further aspects are worth noting. First, the top 10 states in our list all border each other. It seems that economic development and geographical proximity belong together, possibly also as a result of connecting infrastructure links.

Second, while four of the leading states are on India's west coast (Gujarat, Maharashtra, Goa and Karnataka), only one state (Andhra Pradesh) is located on the east coast. The historical ties to the west still seem to be closer than those to the east. With Asia catching up rapidly this is likely to change over the next few years, though. These results do not vary significantly when we confine our scoring tool to the socio-economic factors only.

### Shortcomings of the analysis

It is important to highlight three important reasons why the results of our scoring tool do not tell the whole story of an investment opportunity. First, the infrastructure factors only focus on two aspects: roads and ultra-mega power projects. Although transport routes and energy infrastructure are crucial for long-term growth, they are of course only a part of a region's overall infrastructure. However, with the biggest ports and airports being in the top states the results would be unlikely to change significantly with more infrastructure segments. The results of our scoring model are supported by the distribution of the SEZs to the federal states: Over two-thirds of the established, approved and notified SEZs are located in states ranked in the top 10 of our model.<sup>28</sup> Second, many relevant regulatory aspects are dealt with at the state level. The scoring tool does not take account of these regional institutional factors. As we believe most investors will have to focus their investments on a few projects anyway, the tool shows where a deeper institutional analysis makes most sense. A deeper analysis would also have to consider transparency and corruption issues. As we are not aware of any transparency indicator at state level, we had to exclude this important factor from our quantitative model. Third, it is important to bear in mind that our state-level approach is still a very coarse-grained analysis: Note that the four largest states are bigger than the UK, and that more people live in the three biggest states by population than live in Germany. Thus, the state-wise scoring result can only be the starting point for a more detailed analysis at district level.

## 6. Concluding remarks

There is no denying the fact that India's infrastructure has an enormous catch-up potential. Closing the investment gap will also offer opportunities to (foreign) private investors, as it is impossible to imagine that the challenges of adapting India's infrastructure to the requirements of a modern and rapidly growing economy can be funded by the Indian government alone. What is more, the Indian government has evidently understood both the importance of the infrastructure sector and the necessity of attracting foreign capital, as FDI regulations have been relaxed over the past few years.

While the "macro story" of an investment in India's infrastructure is very simple – robust population growth, strong economic growth and significant backlog demand – investors must bear in mind that the returns are not risk-free. Three risks are particularly relevant. First,

**Huge opportunities for foreign private investors...**

**... but risks should not be underestimated**

<sup>28</sup> If we include the number of SEZs per capita as an additional variable in our scoring tool, the ranking changes only marginally. Solely Goa, Haryana and Tamil Nadu would improve slightly.

**Airports, ports and telecommunication offer best opportunities for an investment**

regulatory issues matter and distributional aspects have always been important in the provision of infrastructure in India. The regulatory environment for investing in infrastructure will continue to mirror these distributional goals in future. This might dampen the outlook for price increases on necessities such as power or water and, to a somewhat lesser extent, communication and mobility. Second, India is not a homogeneous entity but rather a large subcontinent. Our scoring tool indicated that, for example, Gujarat, Maharashtra and the states adjacent to Delhi offer a favourable outlook for the growth of demand for infrastructure. Third, infrastructure is an overarching concept, with the different infrastructure classes having distinct features and each class offering a specific risk-return profile. In our view, the most promising areas for international investors are investments in airports, ports and telecommunication facilities. As water is a highly political good it can be expected that political involvement will be significant in this class, and this might limit the pricing power of a provider.

Of course, the point of identifying these risks is not to blind investors to the opportunities, but only to sensitise them to the importance of taking due diligence seriously.

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## Appendix 1

**Policy on Foreign Direct Investment (FDI)**

Sector/Activity	FDI Cap/Equity	Comments
<u>Airports</u>		
a) Greenfield projects	100%	
b) Existing projects	100%	
<u>Airport Transport Service</u>	49% FDI; 100% for NRI investment	
<u>Construction development projects, incl. city and regional level infrastructure</u>	100%	
<u>Investing companies in infra.sector, except telecom sector</u>	49%	Foreign investment in an investing company will not be counted towards sectoral cap in infrastructure/services sector provided the investment is up to 49% and the management of the company is in Indian hands
<u>Petroleum &amp; Natural Gas</u>		
a) Other than refining and including market study and formulation; setting up infrastructure for marketing in Petroleum & Natural Gas sector	100%	Subject to sectoral regulations; and in the case of actual trading and marketing of petroleum products, divestment of 26% equity in favour of Indian partner/public within 5 years
b) Refining	26% for PSUs; 100% for private companies	
<u>Power</u>	100%	
incl. generation (except atomic energy); transmission, distribution and power trading		
<u>Telecommunications</u>		
a) Basic and cellular, Unified Access Services, National/International Long Distance, V-Sat, Public Mobile Radio Trunked Services (PMRTS), Global Mobile Personal Communications Services (GMPCS) and other value added telecom services	74%	
b) ISP with gateways, radiopaging, end-to-end bandwidth	74%	
c) ISP without gateway, infrastructure provider providing dark fibre, electronic mail and voice mail	100%	Subject to the condition that such companies shall divest 26% of their equity in favour of Indian public in 5 years, if these companies are listed in other parts of the world

Sources: Department of Industrial Policy &amp; Promotion, Ministry of Commerce &amp; Industry, Government of India

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## Appendix 2

### Legislative and institutional framework for the different infrastructure sectors

Approach to Regulation: Issues and options

Sector	Relevant Statutes	Regulatory Authority
<u>Transport</u>		
	No holistic regulator	
Roads	<ul style="list-style-type: none"> <li>- National Highways Act of India, 1998</li> <li>- Central Road Fund Act, 2000</li> <li>- The Control of National Highway (Land and Traffic) Act, 2002</li> </ul>	<p>No regulatory authority. NHAI acts as the regulator as well as the operator</p> <p>States have floated their own corporations or agencies</p> <p>Investors have no recourse to an independent regulator</p>
Rail	<ul style="list-style-type: none"> <li>- Indian Railway Board Act 1905</li> <li>- Railways Act 1989</li> </ul>	<p>Railways act as the operator as well as the regulator</p> <p>Investors have no recourse to an independent regulator</p>
Airports	<ul style="list-style-type: none"> <li>- Aircraft Act 1934</li> <li>- Airports Authority of India Act 1994</li> </ul>	<p>AAI is the operator as well as the regulator. Directors General of Civil Aviation regulates safety and technical aspects only</p> <p>Investors have no recourse to an independent regulator</p> <p>Proposal to set up a regulatory authority</p>
Ports	<ul style="list-style-type: none"> <li>- Indian Ports Act 1908</li> <li>- Major Port Trust Act 1963</li> </ul>	<p>Traffic Authority for Major Ports (TAMP) has the sole function of traffic setting</p> <p>Investors and users have no recourse to an independent regulator on other matters than dispute resolution, performance standards, consumer protection and competition</p>
<u>Energy</u>		
	No holistic regulator	
Power	<ul style="list-style-type: none"> <li>- Electricity Act 2003</li> </ul>	<p>Regulatory commissions at centre and states with very extensive functions and powers</p> <p>Track record not yet convincing</p>
Oil & Gas	<ul style="list-style-type: none"> <li>- Petroleum and Natural Gas Regulatory Board Act 2006</li> <li>- Petroleum Act 1934</li> <li>- Petroleum and Minerals Pipelines (Acquisition of Right of User in Land) Act, 1962</li> </ul>	<p>The Petroleum and Natural Gas Regulatory Board will regulate the refining, processing, storage, transportation, distribution and marketing of petroleum products</p> <p>Director General of Hydrocarbons licenses and regulates the optimal exploitation of hydrocarbons</p>
<u>Communication</u>		
	- Communication Convergence Bill 2001	The draft bill proposes a sectoral regulator. It is currently being reviewed in consultation of stakeholders
Post	<ul style="list-style-type: none"> <li>- Indian Post Office Act 1898</li> </ul>	No regulatory authority. Proposal to create a new regulatory body. A draft amendment bill is open for consultation
Broadcasting	<ul style="list-style-type: none"> <li>- Prasar Bharati Act 1990</li> </ul>	Private participation allowed in the FM radio sector through licensing. No regulatory authority exists for radio and TV broadcasts. A draft bill is currently being subjected to consultations with stakeholders
Cable TV	<ul style="list-style-type: none"> <li>- Cable Television Networks Regulation Act 1995</li> </ul>	<p>Provides for the regulation of carriage and content of cable TV broadcasts</p> <p>TRAI has the responsibility of tariff setting and interconnection for cable operators</p>
Telecom and Internet	<ul style="list-style-type: none"> <li>- Telecom Regulatory Authority of India Act 1990</li> </ul>	TRAI has been given the responsibility to regulate telecom and internet service providers

Source: Planning Commission Government of India, August 2006



## Appendix 3

### Important Infrastructure Development Programmes

Sector	Plans	Details	Comments
<u>Roads</u>	National Highway Development Programme (NHDP)	Part I. 4-laning of the Golden Quadrilateral, 5,846 km; Part II. North-South and East-West Corridor, 7,300 km	Programme will be expanded with part III and IV, with substantial resources from PPP based on build, operate and transfer (BOT) model
	Pradhan Mantri Gram Sadak Yojana (PMGSY)	Programme to achieve the Bharat Nirman target of connecting 1000+ habitation with all weather roads by 2008-2009	
	Special Accelerated Road Development Programme for the North Eastern Region (SARDP-NE)	Developing and intergrating these regions with the rest of the country through improving all modes of transport infrastructure, roads, railways, civil aviation and inland water transportation	
<u>Urban Infrastructure</u>	Jawaharlal Nehru National Urban Renewal Mission (JNNURM)	Urban renewal projects for selected cities; one million plus cities, state capitals and places of historical, religious or tourist importance	
	Bharat Nirman	Action proposed in rural infrastructure for irrigation, roads, housing, water supply, electrification and telecommunication connectivity	Time-bound business plan over a four year period (2005-2009)
<u>Energy</u>	Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY)	Key initiative to provide electricity access to all households	

Source: 11<sup>th</sup> FYP

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Appendix 4

<b>Primary Sources of Administrative Responsibility for Urban Infrastructure</b>							
	Mumbai	Delhi	Chennai	Kolkata	Bengaluru	Hyderabad	
<b>Political Jurisdiction</b>	<b>State / provincial</b>	Maharashtra	National Capital Territory (NCT)	Tamil Nadu	West Bengal	Karnataka	Andhra Pradesh
	<b>Regional / metropolitan</b>	Mumbai Metropolitan Region Development Authority (MMRDA)	Delhi Development Authority (DDA)	Chennai Metropolitan Development Authority (CMDA)	Kolkata Metropolitan Development Authority (KMDA)	Bangalore Metropolitan Regional Development Authority (BMRDA) & Bangalore Development Authority (BDA)	Hyderabad Urban Development Authority (HUDA)
	<b>Municipal</b>	Brihanmumbai Municipal Corporation (BMC), also known as the Municipal Corporation of Greater Mumbai	Municipal Corporation of Delhi (MCD)	Corporation of Chennai (COC)	Kolkata Municipal Corporation (KMC)	Bangalore Mahanagara Palike (BMP) is due to be replaced by the much larger Bruhat Bangalore Mahanagara Palike (BBMP) in late 2007	Greater Hyderabad Municipal Corporation (GHMC)
<b>Function</b>	<b>Long-range planning</b>	regional	provincial	varies	regional	varies	regional
	<b>Roads</b>	provincial	varies	varies	regional	regional	provincial
	<b>Commuter rail</b>	national (Indian Railways)	national (Indian Railways)	national (Indian Railways)	national (Indian Railways)	NONE	NONE
	<b>Bus</b>	municipal	provincial	provincial	provincial	regional	provincial
	<b>Subway / light rail</b>	regional & private	provincial	NONE	national (Indian Railways)	provincial	national (Indian Railways)
	<b>Airport</b>	national (Airports Authority of India)	national (Airports Authority of India)	national (Airports Authority of India)	national (Airports Authority of India)	national (Airports Authority of India)	national (Airports Authority of India)
	<b>Seaport</b>	national (Port Trust of India)	NONE	national (Port Trust of India)	national (Port Trust of India)	NONE	NONE
	<b>Electricity</b>	municipal or provincial, depending on location	provincial	provincial	private or provincial, depending on location	regional or provincial, depending on location	provincial
<b>Water &amp; sanitation</b>	municipal	provincial	provincial	mixed municipal & regional	provincial	provincial	

Sources: RREEF Research; Economist Intelligence Unit (EIU); national, state, municipal, and regional agencies; various reference publications; rating agencies

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