SATHYABAMA
INSTITUTE OF SCIENCE AND TECHNOLOGY
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SCHOOL OF BUILDING AND ENVIRONMENT

DEPARTMENT OF ARCHITECTURE

SARA 7304 – INFRASTRUCTURE DEVELOPMENT AND MANAGEMENT

I. Unit 1 – Introduction to Infrastructure

II. Unit 2 – Project finance and Appraisal

III. Unit 3 – Financial Institutions and Policies

IV. Unit 4 – Project structuring and risk

UNIT – I – INTRODUCTION TO INFRASTRUCTURE

A. INTRODUCTION ABOUT INFRASTRUCTURE

I. Introduction

Figure 1. Infrastructure

The underlying foundation or basic framework (as of a system or organization). The system of public works of state, country or region.

The term “Public Works” is applied to facilitates that usually require substantial capital investment; provide services or solve problems perceived to the public's responsibility; and are planned, designed, constructed, and proposed by or under the auspices of government agencies.

Private companies may also construct and /or operate public works, to serve their own manufacturing or other need, or for profit.

“Process of integrating, design, construction, maintenance and rehabilitation to maximize the benefits to the users and minimize the cost to the owners and users”

“Systematic, coordinated, planning and programming of investments or expenditures, design, construction, maintenance, operation and in-service evaluation of physical facilities”

II. Attributes of Infrastructure

Rather than describing infrastructure through a single definition, it might be more helpful to describe infrastructure through a set of characteristics that are attributed to it.

Some of these characteristics that are popularly associated with infrastructure are:

- Infrastructure facilities are generally available to large groups of people.
- Infrastructure helps deliver essential services for the functioning of an organization or society.
- Infrastructure helps achieve economic and social objectives
- Infrastructure is the base upon which society and its activities rest

- Examples of infrastructure are waterways, roads, railway network etc.,

III. Types of Infrastructure

Several systems can be characterized as infrastructure (including Computer Systems that network and serve data and applications). For the purpose of this study, we will narrow down our perception of infrastructure and restrict it to PHYSICAL INFRASTRUCTURE of the following types:

- **Transportation Infrastructure**

Roads, Bridges, Airports, Ports, Waterways, Tunnels, Parking

- **Water and Sanitation Infrastructure**

Water Supply Systems, Sewage treatment systems

- **Energy Infrastructure**

Dams, power plants, power distribution facilities

- **Telecommunication Infrastructure**

Dams, power plants, power distribution facilities

- **Housing and Recreational Infrastructure**

Swimming pools, Sports facilities

IV. Role of Infrastructure

Greater focus needs to be placed on *QUALITY NOT QUANTITY* of Infrastructure services. It is important from mainly following perspective:

1. As a key driver for all round growth with enhancement in the efficiency level
2. Most infrastructure utilities touch the population at all levels.
3. Up keeping of environment for safe living.
4. Poverty alleviation as a consequence of overall development of productive sectors.
5. Easy and cost efficient access to markets both for inputs and outputs is possible out of infrastructure developments.

- The availability of adequate infrastructure is imperative for the overall economic development of the country.
- Infrastructure adequacy helps determine success in diversifying production, expanding trade, coping with population growth, reducing poverty and improving environmental conditions.

V. Categories of Infrastructure Projects

1. Development of new projects (new highways, new water distribution systems) or provision of additional capacity or capability because of increased demand (add additional lanes, expand a water treatment facilities).
2. Rehabilitation and/or reconstruction of existing facility without changing the capacity or capability of the facility
3. Routine maintenance and operation of infrastructure systems (municipal systems for transportation, water supply, sewage and storm water and solid wastes)
4. Improve the system efficiency by modify the operation and management (Improve pumps efficiency by cleaning or/and lubrication)

VI. Typical Infrastructure Planning steps

1. Establishment of goals and objectives
2. Problem identification and analysis
3. Solution identification and impact assessment
4. Formulation of alternatives and analysis
5. Recommendations: including priorities and schedules for implementation
6. Decisions: including financing.
7. Implementation: Final design, construction planning, construction.
8. Operation and management.

VII. Programming and Budgeting process of public work agencies

Programming

It is a process of prioritizing the proposed projects and developing a single year or multiyear program of projects, usually within a constrained monetary amount.

Examples

- An annual preventive maintenance program.
- A five-year capital program (what capital improvements will be designed and constructed over the time period?)

Budgeting

It is procedures that actually produce the funding and authority to incur costs and allocate funds. The budget is usually an annual legislative authorization for expenditures and may follow multiyear authorization guidelines established by the same legislative bodies.

Key elements for analysis the programming and budgeting:

- Setting program goals and objective
- Establishing program performance measures
- Assessing needs and identifying project
- Project evaluation
- Priority setting and program development
- Program trade-offs
- Budgeting
- Program implementation and monitoring

VIII. Relationship between infrastructure and development

A healthy infrastructure is a necessary ingredient of a robust economy. Infrastructure systems are a part of the nation's economy (through expenditures), and infrastructure systems are also necessary to accommodate economic expansion and productivity

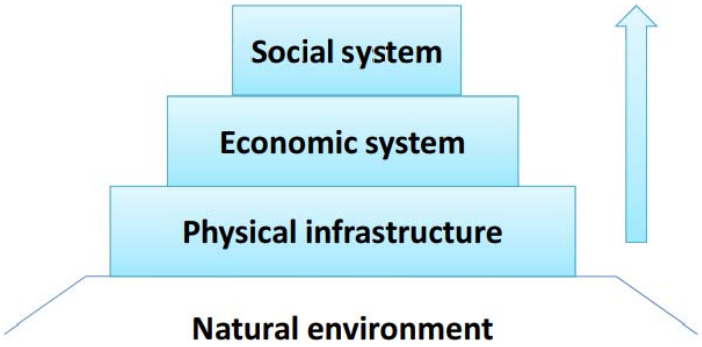

Figure 2. Relationship between Infrastructure and development

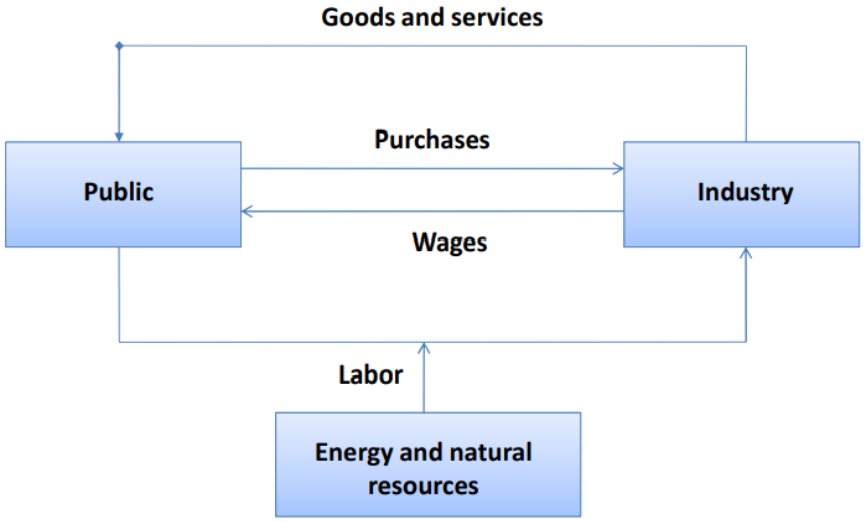

Figure 3. Relationship between Infrastructure and development

IX. INFRASTRUCTURE ECONOMY

Every economy either developing or developed has two kinds of main basic objectives

1. Providing basic needs and facilities to their population
2. Achieving higher growth rates.

Infrastructure impacts growth and development. Infrastructure plays a dynamic role to fulfil their growth targets as well as achieving higher living standards of their mass population.

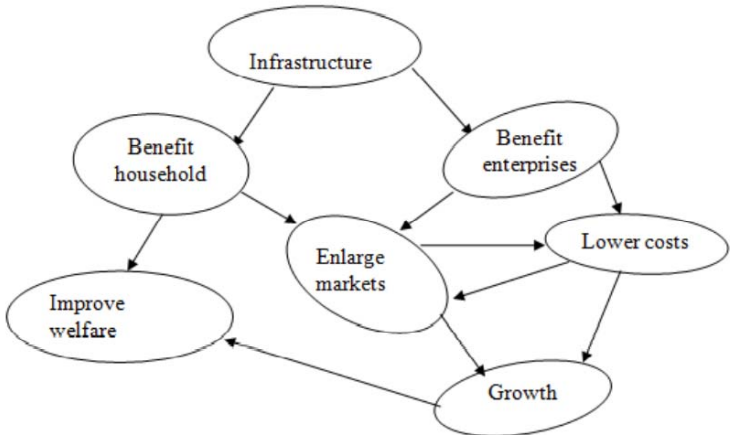

Figure 4. Importance of Infrastructure

X. ADVANTAGES OF INFRASTRUCTURE DEVELOPMENT

People living standard improves

BEFORE **AFTER**

Figure 5. Advantages of Infrastructure development

XI. DIFFICULTIES IN PROMOTING INFRASTRUCTURE

URBAN INFRASTRUCTURE PROBLEMS in India	***RURAL INFRASTRUCTURE PROBLEMS in India***
▪ Urban residence ▪ Business premises ▪ Power ▪ Urban transport ▪ Water ▪ Airports ▪ Railways ▪ Seaports ▪ Roads ▪ Bridges ▪ Solid waste management ▪ Health care ▪ Entertainment ▪ Communications	▪ Power ▪ Irrigation ▪ Drinking Water ▪ Rural housing ▪ Roads ▪ Health care ▪ Education ▪ Telecommunication

XII. INFRASTRUCTURE, ECONOMIC GROWTH AND POVERTY REDUCTION

Development of the infrastructure sector is crucial to the growth of the Indian economy.

Sustainable development can only be attained through a careful analysis of the factors that have mitigated growth in the past, and thereafter, taking the appropriate corrective measures.

Over the last decade, the Indian government has made significant efforts to eliminate bottlenecks in these areas. It has initiated policies and schemes and Model Concession Agreements to increase the inflow of private sector investments and make the bidding process for projects more transparent.

	Economic Growth	Poverty Reduction
Transportation	Faster access to destinations, increase in productivity	More reliable access to markets so that fresher goods can be sold at lower wastage levels
Water and Sanitation	Incentives for construction of facilities, infrastructure and residential infrastructure, which in turn promote economic growth	Improved health, reduction in health related spending, potential increase in income savings
Telecommunications	Improved access and transfer of data, leading to reduced travel times and increases in productivity	Increased access to information leading to improved ability to make decisions on issues like selling price of produce etc.
Energy	Reliable and abundant power enables setting up of industries and residences that create jobs, manufacture products and promote economic growth	24 hour electricity increase the duration of the productive working day, thereby augmenting income, increasing agricultural yields etc.

XIII. THE INFRASTRUCTURE CRISIS

Despite the importance of infrastructure for economic and social well-being, we are faced with several problems. Infrastructure in developed countries is old, unreliable, inefficient and in need of replacement.

In developing countries, infrastructure is often not available. Large portions of urban and rural populations in developing countries have inadequate access to water and sanitation. Power supply is non-existent or unreliable and people are faced with frequent power-cuts.

Quality of road infrastructure is often bad, leading to long travel times and increased vehicle maintenance costs. Width of roads is also often a constraining factor leading to traffic jams and blocks. Several of these problems currently hold true for many areas in India as well. This is therefore a golden opportunity for engineers with technical as well as managerial and policy level knowledge of these issues, since there is a huge demand for such people to enter the workforce and solve the worlds infrastructure inadequacies.

XIV. WHY DO WE HAVE SO MANYY PROBLEMS IN INFRASTRUCTURE?

This particular question and ways in which to solve it will be the focus of this entire study. It is therefore impossible to answer this question right away. Before we conclude this session, we list out a few of the causes for the failure to provide adequate infrastructure.

- ❖ Lack of funds
- ❖ Lack of implementation and managerial capabilities
- ❖ Corruption, bureaucracy and unfair competition
- ❖ Land acquisition issues involving dealing with displaced people and special interest groups.
- ❖ Other factors etc.

XV. DOES INDIA NEED IFRASTRUCTURE

- Urban Population will grow from 26% to 36% of population by 2022, 50% by 2025.
- Growth in GDP is predicted to be 8-9% per annum
- Road Traffic growth will be 15% per year
- Air traffic is growing by 25% per year
- 101,000 MW of new power needed by 2022
- Sanitation Coverage is only 35% currently

The figures in the earlier slide are a few statistics from publicly available documents such as the India Infrastructure Report, 5-year plan documents etc.

They indicate two issues …

- First, in many cases, the current infrastructure is inadequate even for today's needs. E.g. nearly two thirds of the nation do not have access to sanitation facilities. …
- Second, current infrastructure is not likely to meet tomorrow's needs. E.g. With the increase in road traffic at 15% per annum, we will need more, high-quality roads in order to maintain free-flowing traffic.

Both these issues indicate that India needs its infrastructure to be developed. … In addition, this will enable economic growth as we saw in the previous class.

XVI. WHAT IS INDIA DOING ABOUT THIS?

Actions taken in the 11th 5 year plan - 2007- 2012

- The amount of money spent on infrastructure will be raised to 8% of GDP (earlier, infrastructure spending was only 4.6% of GDP)
- One Half of all new investments in the 11th plan will be in infrastructure

- The planning Commission has estimated that a total investment of $450 Billion in infrastructure is required over the next 5 years to meet India's infrastructure needs over 5 years

❖ IIFC - India Infrastructure Finance Corporation

- The Govt. has set up the IIFC to help fund infrastructure projects in India. IIFC will be owned by the government.
- IIFC will lend money at low rates to public and private infrastructure projects. This will help encourage more projects as the cost of financing is very low.
- Since the loans that the IIFC takes are guaranteed by the government of India, IIFC is able to borrow and lend at lower rates.

❖ New schemes to aid infrastructure development

- The Government has initiated the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) to improve Urban infrastructure.
- The Bharat Nirman program has been instituted to improve infrastructure in rural areas.
- These schemes will be dealt with in detail in later classes.

XVII. REFORMS THAT ARE BEING UNDERTAKEN

The Central Government has also committed to enacting a certain set of policy reforms that it hopes will speed up the infrastructure development process and improve the overall quality of infrastructure. These reforms find a place in the documents of the Planning Commission and in various acts. Some of these reforms are:

- Decentralization: One of the bottlenecks to creating infrastructure in the past has been the high amount of centralization in government agencies. As a result, most decisions by high-level officials, who are heavily overloaded and are unable to take decisions on time. By decentralizing and devolving responsibilities to lower levels, the government hopes to improve the response time on infrastructure projects.

- Increasing Accountability, Transparency: The government has initiated procedures to improve the transparency and accountability of departments and processes that influence the development of infrastructure. The aim is once again to enable the development of infrastructure by removing delays and bottlenecks

❖ Improving the efficiency of existing services

- In addition to building new infrastructure, the government is also committed to improving existing infrastructure services and enabling the departments that deliver these services to become more efficient. To this end they have initiated practices such as benchmarking utilities across the country and so on.

❖ Inclusivity

- Infrastructure development must be inclusive rather than exclusive as it affects the lives of many people. The government is therefore committed to practices wherein stakeholders and involved and consulted as part of the infrastructure delivery process.

❖ Introducing and Encouraging Private Sector Participation in almost all sectors

- This issue is discussed in detail in the following slides

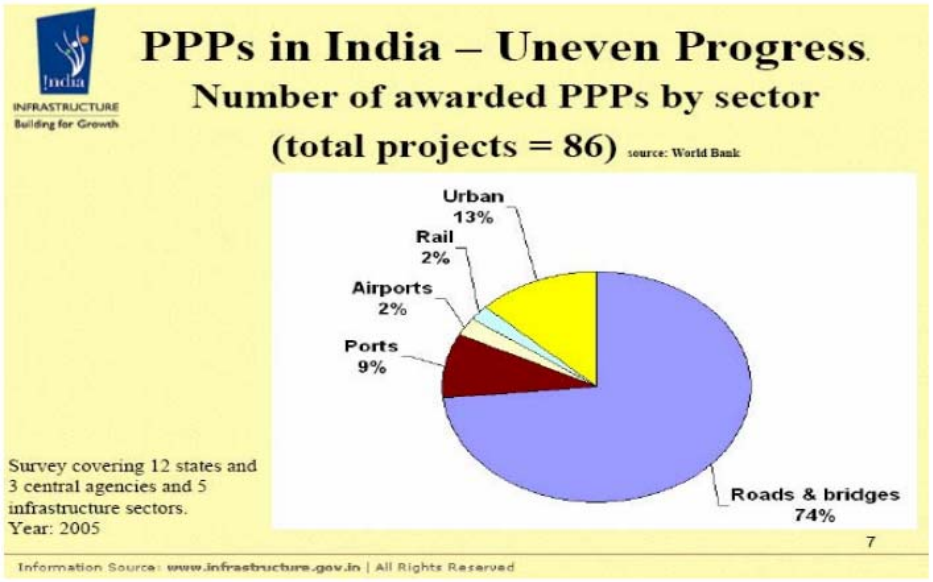

Figure 6. Private Sector is being involved

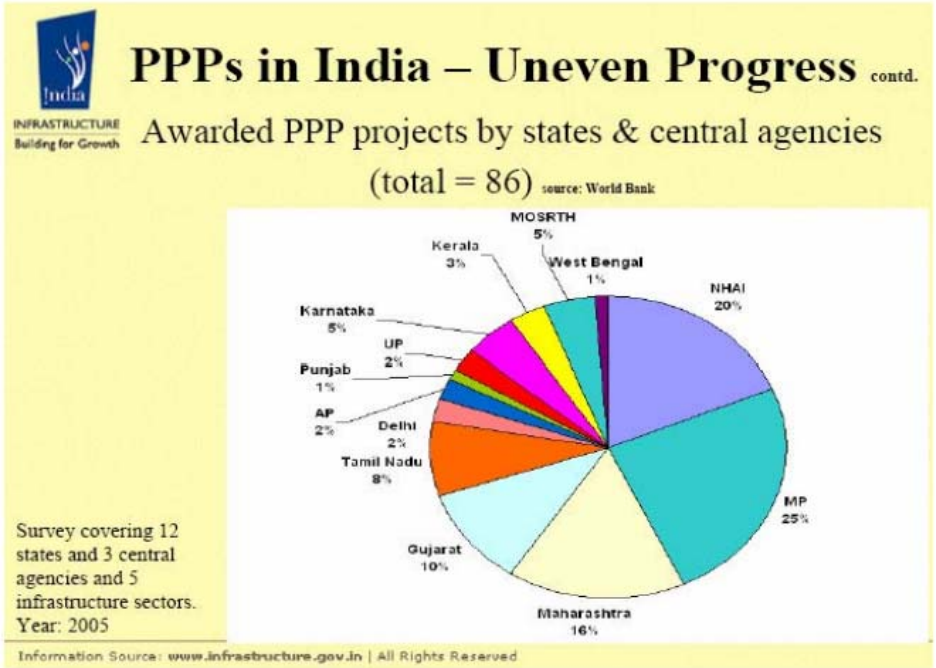

Figure 7. Private Sector in India

XVIII. VERDICT ON THE PRIVATE SECTOR

- Private Public Partnerships (PPPs) bring with themselves several advantages such as
  - The ability to leverage private finance for infrastructure
  - Private sector efficiencies in construction and operations
  - These will be discussed in greater detail in a later class
- As the graphs in the two previous slides show, there has been some PPP activity in Indian infrastructure, but not a whole lot.
- In addition, PPPs in Indian infrastructure have occurred for the most part in the transportation sector, and are concentrated in relative few states in India
- This data indicates that widespread involvement of the private sector in Indian infrastructure has not happened yet.
- Viability Gap funding for transportation projects is one such example
- Urban Local Bodies are encouraged to undertake PPPs as part of JNNURM etc.

XIX. THE VERDICT IN THE MID TERM APPRAISAL

- "Infrastructure inadequacies in both rural and urban areas are a major factor constraining India's growth.

  This is especially so in the increasingly open economy environment in which we must operate, where the quality of domestic infrastructure impacts on our ability to compete with imports, to penetrate export markets and also to attract FDI"

XX. CONCLUSION

India needs a lot more infrastructure to meet its needs. The government is focusing on this and has created a set of programs and reforms aimed at addressing this issue. However, as the previous slide indicates, current infrastructure is still inadequate and many targets have been missed. There is therefore a lot of work that needs to be done. Business as usual, will not suffice.

XXI. TARGET SET FOR FUTURE

- According to the 11th 5 year plan, the following infrastructure targets have been set for the future (2007-2012)
  - Additional 10 million hectares of assured irrigation will be created by 2009 …
  - INR 15,000 Cr to be spent on road maintenance alone …
  - 1000+ rural habitations to be connected with roads by 2009. …
  - Port capacity will be increased from 520MT to 800MT …
  - 575 Million Telecom Subscribers by 2012 …
  - 60000 MW of new power is to be added by 2012

B. POWER SECTOR

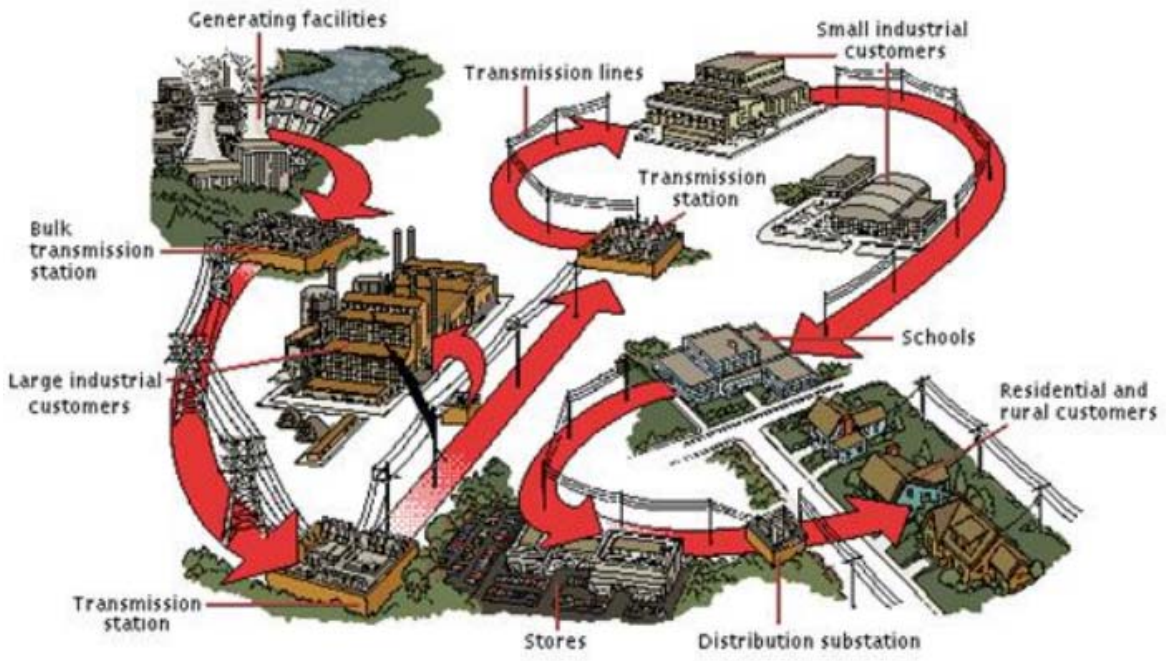

Figure 8. Diagram about power generation and distribution

I. OVERVIEW

As the previous slide indicates, the power sector is normally divided into three sub-systems

- …Power Generation which is done at power plants or stations

Power Transmission which describes the process of transferring the generated power to a distribution system

Power distribution which involves conveying the transmitted power to individual homes, commercial areas etc.

However such a system need not always be followed

Generated power can directly be transmitted to Industries

Industries can themselves have power generation plants

II. POWER GENERATION MODES

Power generation falls into four broad categories

- Thermal power, which is often produced through centralized thermal power plants using coal as a fuel.
- Hydropower that is often produced by trapping river flows via the construction of dams and hydroelectric power stations.

- Nuclear Power.
- Renewable sources of power such as Wind Energy, Solar Energy, Tidal Power etc.

Renewable sources of energy are the most environment-friendly, while thermal energy often causes the greatest amount of pollution.

We will start this discussion from a few years prior to Indian independence.

- Pre-Independence: In this era, 65% of power generation was done by the private sector
- 1975-1991: During this era, the trend of moving away from the private sector towards the public sector continued in the power industry. This phase was characterized by greater involvement from the Central government. Centralized organizations such as the National Thermal Power Corporation (NTPC). The National Hydro Power Corporation (NHPC), the National Power Trading Corporation (NPTC) etc. were set up at the central level „.
- Post 1991: After the liberalization of the Indian Economy, there has once again been greater involvement of the private sector in the power industry, and a rapid growth of this industry as well.

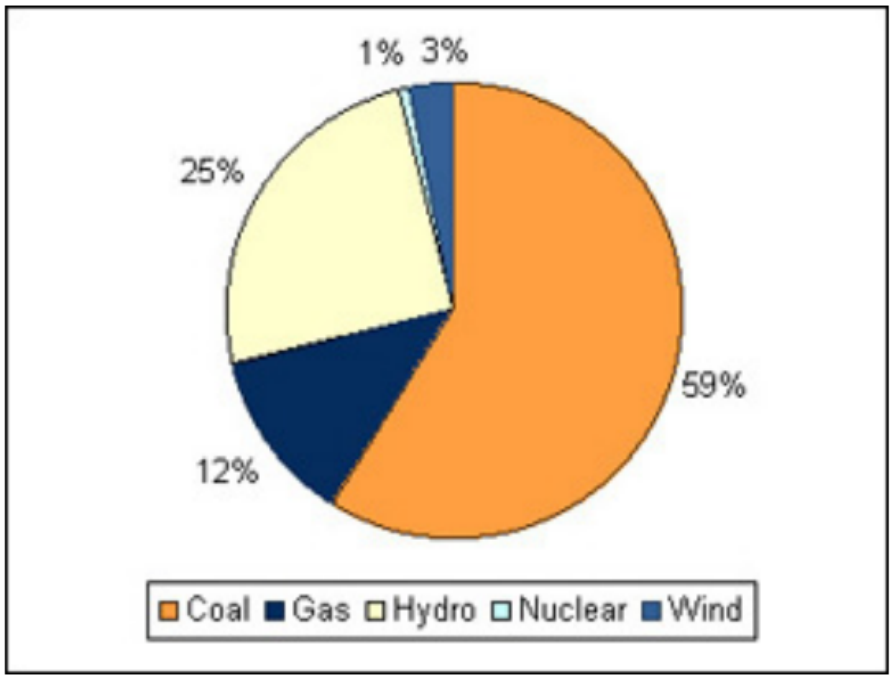

Figure 9. Power in India a brief timeline

III. POWER SOURCES IN INDIA

India currently generates 135,781 MW of power. As Indicated in the previous slide, most of India's power is currently generated through thermal Power Plants that use coal as a fuel. Hydropower sources also account for a non-trivial amount of power generated in India. As per India's current policies, a lot of emphasis is being given to developing hydro, nuclear and renewable sources of power

IV. PERFORMANCE OF POWER SECTOR

The current performance of the power sector leaves much to be desired. Average Return on Investment for State Electricity Boards (SEBs) is -26%, indicating that several SEBs are loss making agencies. Aggregate Transmission and Distribution (AT&D) losses are close to 40% implying that almost half the generated power does not make its way to the intended consumers.

There is a peak power deficit of 12.6% and energy deficit of 7.5% at the All India Level in 2002. As per current 5 year plan estimates, we do not have the generating capacity to meet our current needs if we plan to grow at 8-9% p.a. This implies that there should be more investment in power generation.

V. POWER TARGETS AND SUBSIDIES IN THE POWER SECTOR

60,000 more MW of power generation capacity to be added by 2021. 23% of this should be from Private sources. 50,000 MW of power to be generated through Renewable sources by 2025. AT&D losses to be cut to 15% by 2012.

Costs of power generation are typically higher that the cost at which power is sold. This is partially due to subsidies – for instance, farmers get power at virtually no cost.

Although industry is expected to cross-subsidize the farmers, the costs to industry are so high that many firms prefer to set up their own captive plans that generate power. As a result, SEBs are deprived of potential revenues. This in turn has led to several SEBs making losses.

As a result, they have insufficient funds to invest in capital renewal, upgradation and maintenance, leading to a negative cycle of poor performance, large losses and in turn, a greater loss of revenue.

VI. REFORMS AND POLICIES

The Electricity Act of 2003 is one of the key policy acts in the Power Sector. This act encourages private sector involvement in Generation, Transmission and Distribution. Open Access Provisions are provided in the Act wherein private generators can sell directly to consumers.

Privatization and Corporatization of SEB's is encouraged. State Governments pay off or write-off the debts of the SEB's. Competition is promoted in Generation and Distribution. Unbundling of Generation, Transmission and Distribution is proposed in order to increase the number of players in this sector and thereby promote efficiency, consumer choice and satisfaction. Cross subsidies will be reduced and State governments will pay SEBs the subsidies they mandate. SEBs can also set appropriate tariffs so that they are financially viable.

APDRP – Accelerated Power Development and Reform Program. Some highlights are

- States unbundle Generation, Transmission and Distribution, and take over SEB debts.
- States agree to an audit, use of IT and Metering
- Investment is provided to upgrade infrastructure
- Funding is contingent on whether targets were met for previous projects
- Incentive amount is pegged to reduction in difference between cost of production and revenue

Bottom Line – there were initial improvements in some SEBS like WB, AP. However, now enthusiasm to implement reforms has decreased.

(*Fig. in Rs Crore*)

State	Project Cost	Contribution from APDRP	APDRP Disbursement in 2002-3						Counter part fund tied up by the state	Utilization of funds
			1 (4/4/2002)	2 (28/1/2003)	3 (31/3/2003)	Investment	Incentive	Total		
Andhra Pradesh	1476.50	738.25	39.07	72.75	52.00	163.82		163.82	738.25	69.48
Bihar	717.57	358.79	16.11		50.00	66.11		66.11	76.95	0.48
Chattisgarh	424.58	212.29	10.00			10.00		10.00	10.00	23.90
Delhi	946.46	473.23			105.51	105.51		105.51	473.23	25.20
Goa	176.34	88.17	9.00	6.52	6.52	22.04		22.04	4.45	12.53
Gujarat	1035.80	517.90	21.35	54.07	30.00	105.42	236.37	341.79	291.96	27.44
Haryana	450.66	225.33	18.23	19.05	19.05	56.33	5.01	61.34	163.38	35.93
Jharkhand	444.85	222.43	12.00			12.00		12.00	137.25	9.32
Karnataka	1161.19	580.60	29.77	57.69	57.69	145.15		145.15	580.60	69.00
Kerala	350.35	175.18	17.07	13.36		30.43		30.43	173.18	17.19
Madhya Pradesh	598.98	299.49	27.83	23.52	23.52	74.87		74.87	62.00	11.96
Maharashtra	1107.85	553.93	45.00	46.74	46.74	138.48	137.89	276.37	345.42	65.09
Orissa	592.22	296.11	14.72		39.63	54.35		54.35		
Punjab	667.46	333.73		41.72	12.26	53.98		53.98	333.73	
Rajasthan	1255.05	627.53	28.40	62.24	35.00	125.64		125.64	308.02	71.68
Tamil Nadu	968.17	484.09	32.12	44.45	35.00	111.57		111.57	484.09	77.14
Uttar Pradesh	718.19	359.10	30.12		50.00	80.12		80.12	301.77	
West Bengal	132.71	66.36	19.02			19.02		19.02	66.36	
Assam	365.98	365.98	10.95	86.02		96.97		96.97		0.05
Arunachal Pradesh	67.29	67.29				0.00		0.00		
Himachal Pradesh	105.51	105.51	13.33	19.71	10.00	43.04		43.04		4.69
Jammu and Kashmir	453.48	453.48			20.00	20.00		20.00		
Manipur	10.13	10.13	2.67			2.67		2.67		
Meghalaya	26.29	26.29		6.57		6.57		6.57		
Mizoram	9.77	9.77	2.67	1.11		3.78		3.78		3.78
Nagaland	47.22	47.22	2.67	10.47		13.14		13.14		2.67
Sikkim	63.48	63.48	2.67	14.53		17.20		17.20		2.67
Tripura	13.27	13.27	2.67			2.67		2.67		
Uttaranchal	361.51	361.51	18.50	81.13	75.00	174.63		174.63		56.60
Total	14,748.86	8136.40	425.94	661.65	667.92	1755.51	379.27	2134.78	4550.64	586.80

Source: Ministry of Power (Conference of State Power Ministers, 12 June 2003).

Figure 10. APDRP

Table 1.1
Project Outlays and Incentive Payments under APDRP
as on 31 May 2005

Year	Project outlays (Rs crore)	Incentive payment (Rs crore)
2002–3	14,710.74	379.28
2003–4	1899.43	503.30
2004–5	2878.66	73.00
Total	19,488.83	955.58

Source: MoP (2005a)

Figure 11. Product outlays and Incentive Payments APDRP

The previous tables are from the India Infrastructure Report and indicate the extent to which APDRP funds are being used.

Two trends are visible.

- First, disbursements through the APDRP programs are reducing
- Of the two components of this program – the Investment component has been utilized to a greater extent as compared to the incentive component

Hydropower projects are being encouraged - particularly through the Private Public Partnership mode. Indo-US Nuclear agreement is being explored in order to enhance our fuel security by obtaining power from nuclear fuel

Power Transfer Corporation (PTC) has been set up to increase power trading across states, so as to balance supply and demand mismatches. Rajeev Gandhi Grameen Vidyukranti Yojana has been proposed to generate funds for rural electrification

SEBs and Power departments are being computerized. This will lead to greater transparency and accountability and improved service to citizens. Large emphasis has been placed towards privatization of Generation, Distribution of power.

VII. POWER PRIVATIZATION – A SHORT NOTES

IPP - Independent Power Producers, Private agencies that generate power

PPA - Power purchase agreement, an agreement that an IPP or another private entity might have with a buyer such as the government to buy a certain quantity of power at certain rates

IPPs take on the capital costs of generating power, and recoup these costs by selling to the SEBs in accordance to the PPAs. The SEBs can themselves transmit and distribute the power, or they can privatize this function also

In general, transmission efficiency depends on economies of scale and as a result it is difficult to have more than one transmission agency for a given area. Transmission thus has monopolistic characteristics in contrast to power generation and distribution.

A regulator is often necessary for this sector in order to control power prices from becoming too high, and to foster competition in this sector.

VIII. ULTRA MEGA POWER PROJECTS (UMPP)

Power plants of capacity >= 4000 MW are considered as UMPPs. The government has come up with a separate policy for these plants in order to encourage power generation in the country.

Power Finance Corporation (PFC) will do the groundwork, create a Special Purpose Vehicle (SPV), acquire land, permits etc. This SPV will then be sold to private vendors who will build and operate the power plant, and supply power.

5 plants of 4000 MW have been proposed initially at an outlay of INR 3,20,000 Cr for the Indian government. Details are given in the next slide.

Table 1.5
Status of UMPP Projects

	Sasan, MP	Mundra, Gujarat	Bhasma, Orissa	Krishnapatnam, AP
Status	SPV formed, detailed project report (DPR) ready.	SPV formed, DPR ready.	SPV yet to be formed, Consultant appointed.	SPV yet to be formed, Consultant appointed.
Land	Demarcation of 3,500 acres completed. MP to issue order for land acquisition.	Acquisition of 2,700 acres is expected to be completed soon.	Confirmation on alternative sites is awaited.	Details of 2,300 acres for power plant and 300 acres are filed with the District Collector.
Water	Permission to get 140–150 cusecs from Rihand Reservoir is granted.	Permission from Gujarat Maritime Board to draw sea water from Gulf of Kutch is awaited.	140–150 cusecs from Ib river is given. A barrage is to be built.	Permission to draw sea water is filed with AP Maritime Board.
Fuel Linkages	Coal blocks of Moher-Amlori are allocated by Ministry of Coal.	Imported coal linkages to be established by the investor.	Coal blocks are yet to be allocated by Ministry of Coal.	Imported coal linkages to be established by the investor.
Environmental Clearance	EIA completed	EIA completed and CRZ clearance awaited	Site not yet confirmed	EIA not yet completed

Girye, Maharashtra–SPV formed but site is not yet confirmed.
Tadri, Karnataka–SPV formed. Environmental clearance is a hitch. Project is on hold.
Akaltara, Chattisgarh–SPV formed. Project is on hold as state government wants free power from the project.

Source: Business Standard (August 25, 2006).

Figure 12. Ultra-mega power projects (UMPP)

C. WATER & SANITATION SECTOR

I. CHARACTERISTICS

The W&S sector can be considered in three parts/phases listed below

- Water harvesting/storage
- Water supply (piping and distribution from the reservoir to the consumer)
- Waste management and sanitation

This sector also has monopoly and economies of scale characteristics. As a result, it is not feasible for several W&S firms to co-exist in the same area.

Social issues play a very important role in guiding the policies and the performance of this sector. There is a perception that water is a basic human right. This puts pressure on public agencies to ensure good quality of service in this sector.

Pricing of water is also a very contentious issue since it is considered a basic human right from some quarters. This makes it very difficult to privatize water supply services.

II. HOW IS INDIA DOING?

50% urban households do not have a piped connection. 44% of households have no sanitation at all.

Unaccounted For Water (UFW) - water that is lost or stolen during transmission is as height as 25-50% of stored water. Water is not available all day in most places. 2, 80,000 rural people are partially or fully not covered. Another 2, 17,000 face severe quality problems. Another 60,000 are exposed to arsenic etc.

The price of water is artificially low due to the social issues mentioned in the previous slide. This affects the profitability of local water boards and therefore the quality of service.

Very often, the urban and rural poor are not connected to the municipal water supply systems. As a result, they often purchase water from water tankers at rates that are higher than what the average, connected citizen pays. The poor therefore pay more for water.

The W&S scenario in India is in need of considerable improvement.

III. POLICIES IN THE W&S SECTOR (REFORMS AND POLICIES)

a. Water Harvesting

- NWP (National Water Policy) in 1987 has laid down groundwater recharge guidelines.
- NWP 2002 has laid down guidelines on rainwater harvesting, watershed management etc. These policies should help augment our water storage.

b. Water Supply

- 11th 5 year plan discusses improving distribution and efficiency of water. The plan indicates that an initially outlay of INR 80,000 Cr is required and that all rivers are to be “bathing class”
- RGNWDM (Rajiv Gandhi National Water Development Mission) and the ARWSP (Accelerated Rural Water Supply Program) are two centrally funded schemes set up to improve the efficiency of water supply.

As per the ARWSP, the State provides matching grant funds for rural infrastructure upgradation. In addition, capacity building and community participation is also given importance. Reduction in subsidies, shifting of government role from direct service delivery to planning, policy formulation, partial financing etc, ensuring community participation and management, and school sanitation are other thrust areas of this program.

- 10th 5 year plan and Urban Reforms Incentive Fund (URIF)
  - The URIF encourages urban bodies to reform, increase operational efficiency and reduce subsidies. The plan mandates providing water access to the urban poor, setting tariffs to discourage overuse, introducing water efficient flushes etc, providing drinking water to all, increasing community participation and NGO

participation and so on. In return, funding and financial incentives are given to urban bodies.

- AUWSP (Accelerated Urban Water Supply Program)
  - This program is promoted by the Ministry of Urban Development (MoUD) and provides funds for providing water connections to smaller urban cities. Launched in 93-94, INR 2000 crore was spent by 2001.

Central support for sanitation has also been increased since many people die due to water-borne diseases.

D. WATER & SANITATION SECTOR

I. VARIOUS TRANSPORTATION SUBSECTORS

- *Roads and Ground Transportation*
- *Airports*
- *Ports*
- *Railways*

II. NATIONAL ROAD SECTOR

India has 3.3 million kms of roads. Roads carry 61% of freight and 85% of passenger traffic

We have spent Rs 18,000 Cr annually on roads.

Flagship projects

- Golden Quadrilateral (GQ) - National Highways Development Program (NHDP) Phase 1
- North South East West Corridor (NSEW) - NHDP Phase 2
- Both these projects are behind schedule due to Finance and Implementation Issues
- Both projects are nearing completion

III. NATIONAL HIGHWAYS

- **Key players**
  - NHAI (National Highways Authority of India - a Government backed organization)
  - MoSRTH (Ministry of Surface Road Transportation and Highways - a Government ministry)

- Key Programs
  - NHDP (National Highways Development Program - conducted in seven stages)
  - Central Road Fund

IV. NHDP AT A GLANCE (www.nhai.org)

Phase	Particulars	Length	Indicative Cost (Crores)
NHDP-I & II	Balance work of GQ and EW-NS corridors	13,000	42,000
NHDP-III	4-laning	10,000	55,000
NHDP-IV	2-laning	20,000	25,000
NHDP-V	6-laning of selected stretches	5,000	17,500
NHDP-VI	Development of expressways	1,000	15,000
NHDP-VII	Ring Roads, Bypasses, Grade Separators, Service Roads etc.	N.A.	15,000
	Total	45,000	1,69,500

Table 01. NHDP at a glance

V. NATIONAL ROADS – WHAT IS PROPOSED?

A lot of work is going on and will go on. For instance,

- 4-laning of 7900 km of NSEW corridor
- Two laning of 20,000 km (NHDP Phase IV) of highways with only one lane
- Six-laning of 6,500 kms of 4 lane GQ

A lot of money is to be spent

- NHDP plans to invest 2,20,000 crore by 2012
- 10th plan – 60,000 Crore invested
- 11th plan – 180,000 Crore proposed

VI. SOME GOVERNMENT REFORMS

- NHAI given more independence to select and implement projects in order to aid speedy development of infrastructure
- 100% Foreign Direct Investment permitted
- 100% income tax exemption for a period of 10 years
- Automatic tolling proposed to reduce operational costs on toll-roads
- Planning for Expressways undertaken in 11th plan

VII. PRIVATE PUBLIC PARTNERSHIPS (PPP) IN ROADS

NHDP Phase I and II were publicly financed through fuel cess and federal grants. NHDP Phase III to VII will be undertaken in PPP mode. Toll collections will be used to finance the project.

a. Viability Gap Funding (VGF)

- If the project is not commercially viable through collection of tolls and other revenue generation mechanisms, VGF funding will be provided as a grant to bridge the gap between revenue generated and outlay.
- Total value of VGF can be 40% of the total project cost.
- Contracts will be awarded to the firm/consortium that requires the least amount of viability gap funding.

b. Negative Grants

- This is the opposite of VGF
- If a project is expected to be very profitable, the firm/consortium that is planning to bid for the project might offer a portion of the profits to the government, thereby providing revenue to the government. This is the negative grant.
- There is no limit to the negative grant. Firms/consortia will be awarded the contract based on the highest negative grant that is proposed
- E.G. 504 Cr -ve grant for the Bharuch-Surat Highway project costing 492Cr.

VIII. PRIVATE SECTOR PARTICIPATION IN ROADS

- **Model Concession Agreement (MCA)**
  - MCA has evolved over several iterations and is now used as a standardized contract.
  - Private and Public partners share risks.
  - Standardized agreement increases the speed of awarding the contract.
- **Government subsidies and alternate arrangements in India**
  - Shadow tolls where users do not pay toll directly, but the government pays the sponsor an amount equivalent to the toll collected from vehicles using a designated stretch of roadway.

- Annuity payments where the government pays a fixed annual or semi-annual amount to the project developer so that costs can be recouped. Toll is not charged to users directly.

IX. STATE ROADS

Often receive less attention as compared to National or Rural roads.

- Multilateral funding has been provided for some states
  - WB is giving $348 million to TN govt. to improve the quality of 750 km of road, maintain 2000km and construct 14 bypasses. Govt. will provide $102 mill
  - In MP, ADB is investing 180 million, State Govt. $160 million to upgrade 1900km worth of roads.
- Central Road Fund (CRF) was set up to finance state roads
  - CRF is not working well - funds are not being used

X. RURAL ROADS

A large part of Rural India (40%) are not yet connected by roads

Several Plans afoot to do so.

- 1000 habitations to be connected to all weather roads in 11th 5 year plan
- 1.72 lakh unconnected habitations will be connected in the 11th plan
- Pradhan Mantri Gram Sadhak Yojana (PMGSY) has been set as a centre-funded scheme to provide funds for rural roads
- Rural Infrastructure Development Fund (RIDF) has also been set up to provide funds for rural road development

XI. ISSUES / CHALLENGES WITH ROADS

- Land Acquisition for road alignment
  - This involves the political will to acquire tracts of land, compensate the existing landholders adequately and handover the land to the project developers. Very often this process is time-consuming and leads to delays.
- Environmental and Societal Concerns regarding displacement of people, deforestation etc.
  - NGOs and Special Interest Groups often raise these issues, (e.g. in the NICE corridor project in Karnataka) and this leads to delays if these concerns are not effectively mitigated.
- Ridership concerns, Tariffs
  - The exact tariff that should be charged according to varying categories of consumers is a difficult decision that must be made. In addition, there are always risks that by adding a toll- charge the ridership on the road might decrease leading to an infeasible project.

E. AIRPORT SECTOR

I. AIRPORT SECTOR

❑ New Airport

- 2 Greenfield airports in Bangalore and Hyderabad (1300 Cr each) are being built and are in operation
- 35 new non metro airports are to be developed.

❑ Privatization in airports

Greenfield airports are to be developed in the PPP mode. Hyderabad is being developed by a consortium headed by GMR and Bangalore by a consortium headed by L&T. Modernization of Delhi (lead by GMR) and Mumbai (lead by GVK) airports are already completed.

Modernization of Chennai and Kolkatta airports are also completed, however PPP might not be the answer. 10 non-metro airports including Trichy, Trivandrum and Shimoga will be modernized by with (Rs 1500 Cr) through PPP.

II. ISSUES IN THE AIRPORT SECTOR

Huge Growth of 24% in this sector and lots of delays and bottlenecks in air travel due to inadequate infrastructure

Airports authority of India is the key governmental agency in charge of developing this sector

- Bangalore airport faced some problems initially
  - ❑ Airport PPP policies had not been evolved and AAI policies indicated that private ownership was not possible in this sector
  - ❑ These policies have since been modified and the route has been cleared for private investment in this sector
- In terms of PPP
  - ❑ Major portion of the revenue accrues from leasing airport space to retail outlets as compared to revenues from airlines
  - ❑ Landside and airside operations can be privatized, but air traffic control cannot be privatized

A new regulator is being mooted for this sector to oversee the interactions between AAI, the private airport operator and the airlines

F. PORT SECTOR

A Large Increase in Port Handling Capacity is planned

- More ports have been and are to be added
- Increase in Container terminals to the tune of INR 10,000 Crore is planned
- JNPT (Jawaharlal Nehru Port Trust) alone is planning to spend 3000 Cr in expanding capacity.

Since the plan is to attract a larger volume of maritime traffic, the objectives in the port sector are to increase capacity of existing ports and to add new ports in order to decrease turnaround time of ships berthed and to increase productivity

Focus is on increasing Private Sector Participation

- ❑ Model Concession Agreement is being prepared
- ❑ Fees will be collected on a licensing and revenue-sharing model

TAMP (Tariff Authority for Major Ports) is the regulator in this sector and does a good job specifying fair tariffs. Plans are afoot to improve Road and Rail connectivity to ports thereby reducing transportation costs on goods and making the port sector more attractive. Plans are being made to Corporatize Ports to increase operational efficiency

- ❑ Will lead to independence from a Central Authority like Port Trust of India.
- ❑ Finds favor with port operators.

G. RAILWAYS

Until very recently this sector made huge losses, suffered from gross inefficiencies and was not the preferred mode of choice for freight or passengers. After Laloo Prasad Yadav took over as Railway Minister, this sector recorded an INR 2000 Crore surplus in revenues in 06- 07.

I. SOME KEY INTERVENTIONS

- Increasing the utilization of existing capacity (bogeys) by cutting costs/fares
- Tying up with private players to run trains, depots to improve quality and operational efficiency
- Offering Volume based discounts to boost sales
- Developing owned land and generating profits through these developments
- Computerizing operations to improve transparency and efficiency
- Lower passenger prices

II. RAIL REFORMS ON THE ANVIL

A New Investment (60,000 Cr in current plan) for a dedicated Mumbai-Delhi freight corridor is in the works

- Other dedicated corridors may come up soon

Private participation is being sought in track laying, freight, maintenance etc. (through the National Rail Vikas Yojana scheme). Plans are being formulated to bring in world class trains, and stations are to be built to standards that will compete with air-travel.

H. TELECOMMUNICATION SECTOR

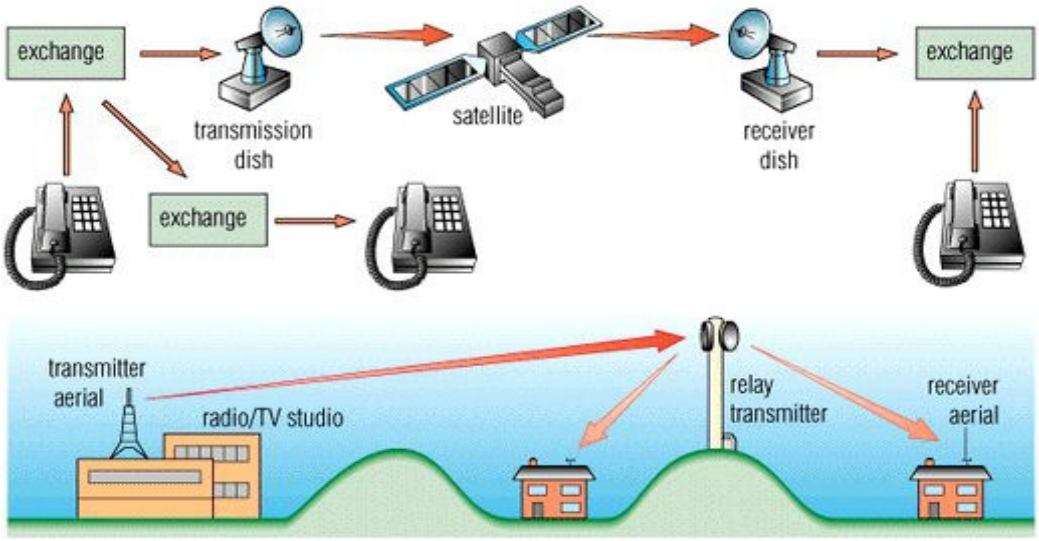

Figure 13. Telecommunication Sector

I. TIME LINE

- **Prior to 1980s**

  State owned players and infrastructure dominated this sector. In many cases the equipment used was outdated and the reach of telecommunications services was poor. Tele-density – the number of telephone connections per 1000 people was very low as was connectivity in rural areas.

- **1980s**

  Private sector was allowed to enter this sector. However, in the initial stages they were only allowed to manufacture equipment.

- **1990s**

  After the liberalization of the Indian economy, the Private sector was also allowed to provide services. This led to a sharp decrease in prices, improvement in service quality and increased access to telephony services

II. NATIONAL TELECOM POLICY (NTP) - 1994

This policy paved the way for the entry of the private sector and opened up both the Cellular market and the landline market for competition. Another defining feature of this plan was the concept of a Universal Service Obligation (USO) designed at providing infrastructure and telephony services to rural areas

However this policy had some problems

- An Auction system was used to select players and to allocate spectrum. However, the fixed license fees bid by the bidders were too high and uneconomic, leading to requests for renegotiations
- Competition was also inadequate

III. NATIONAL TELECOM POLICY (NTP) - 1999

The shortcomings of NTP 1994 were addressed issues in NTP 1999. A Revenue sharing model was introduced as opposed to a fixed license fee approach. More competition was introduced which in turn led to falling prices. Rs 500 Billion of Investment was slated for this sector.

National and International Long Distance were opened up to private players in 2001.

BSNL, the state owned telecom provider was Corporatized in 2001 and now competes with other private firms for revenues and market share. USO fund was set up for rural connectivity. As opposed to having private players directly provide connectivity in rural areas, an alternate approach was adopted whereby private operators contributed a portion of the revenues to a USO fund, which would then be used by BSNL to provide rural connectivity.

IV. TELECOMMUNICATIONS REGULATORY AUTHORITY OF INDIA (TRAI)

TRAI was set up in 1997 as a Regulator. Due to a large number of private players entering this industry, an independent regulator was necessary to ensure that consumers were treated fairly.

Initially TRAI was set up with few powers but was subsequently given more power to

- Manage spectrum licenses
- Regulate prices

Most experts feel that TRAI can be given more independence

- For instance, the regulator can be given a decision making role on issues such as the convergence of technologies, allocation of spectrum etc.

V. KEY PLAYERS IN THE TELECOMMUNICATIONS SECTOR

- BSNL – a public sector player in the local, long distance, cellular, and internet communications space
- MTNL – a public sector player active in Delhi and Mumbai as regards local telephony, and active across India in the cellular space
- VSNL – a public sector player in the Internet and long distance space
- Private providers
    - Bharti, Reliance, TATA, Vodafone, Aircel etc.

- They provide landline, cellular and internet services, they

The graph below, adapted from the Indian Infrastructure Report 2006, clearly shows the effects of reforms in the Indian telecommunications sector, particularly on the usage of mobile telephones. Prices for consumers have decreased dramatically and have been accompanied by an equally dramatic rise in the number of subscribers or users of mobile telephones.

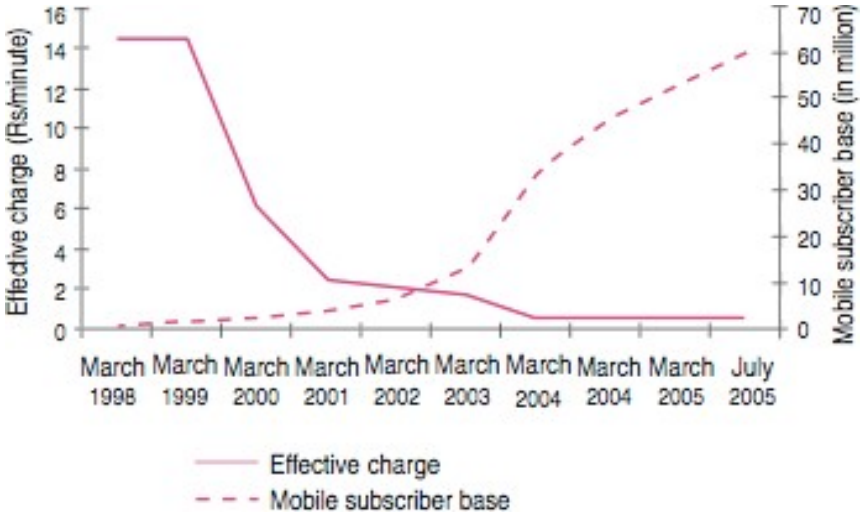

Figure 14. Effect of reforms in the Indian telecommunication sector

VI. CURRENT STATUS OF THE TELECOM SECTOR IN INDIA

We have 165 million subscribers (this includes mobile as well as landline users)

- Target is to achieve 1.4 billion subscribers by 2022
- Currently there is a 50-50 split between BSNL and Private Operators in terms of the number of subscribers
- In the landline segment private players account for 15% of the market, with BSNL accounting for the rest
- In the mobile telephony market on the other hand, private players account for nearly 80% of the subscribers. Growth in this market has been fuelled by the availability of cheap and affordable handsets

Currently Tele-density is greater than 10

- It is currently 2 in rural areas, the target is to increase this to 10

In terms of Internet usage, there are more than 762 million Broadband customers. A rapid increase is envisaged in this sector.

VII. CURRENT STATUS OF THE TELECOM SECTOR IN INDIA

Policy Decisions on 3G

- Currently the government plans to auction spectrum for 3G technologies on a first-come-first-served basis
- Policy decisions must also be taken on allocating extra spectrum. Currently a controversy exists on the rationale for allocating this extra spectrum, with protests by CDMA and GSM operators
- Decisions need to be taken on the mode of licensing spectrum and fees
  - Should it be based on the number of existing customers or on fresh bids?
  - Should a revenue sharing approach be followed or a license fee approach

VIII. OTHER DECISIONS FACING THE TELECOMMUNICATION SECTOR

New Policies need to be crafted for convergence of technologies that can lead to a unified medium that delivers voice, data and images. Policies needed on decreasing in interconnect charges to bring down call costs. Decisions to be made on merging of Access Deficit Charges (paid to BSNL to subsidize some of their non-profitable operations such as rural access) and USO, since they both fulfill similar obligations

New Policies are needed regarding rural Telecom

- Particularly on using Wi-Fi for last mile connectivity, and releasing spectrum appropriately
- Incentivizing private players to provide rural connectivity.

IX. CONCLUSIONS

The telecommunications sector features a large amount of competition between firms, particularly in the cellular telephony space. This is partly due to the reforms enacted by the government. This competition has led to an enormous increase in phone usage (there are more mobile phones than landlines currently)

Telecommunications drives information flow and thereby the knowledge and service sectors. This in turn drives economic growth. Favorable policies in this space, and successful implementation have made the “Telecommunications Story” one of the big successes in Indian Infrastructure so far. This in turn has the potential to fuel inclusive economic growth in India in the years to come.

UNIT – 2 – PROJECT FINANCE AND APPRAISAL

A. INFRASTRUCTURE PLANNING – KEY ISSUES

I. DEFINITION

"PROCESS OF INTEGRATING, DESIGN, CONSTRUCTION, MAINTENANCE AND REHABILITATION TO MAXIMIZE THE BENEFITS TO THE USERS AND MINIMIZE THE COST TO THE OWNERS AND USERS"

"INFRASTRUCTURE PLANNING – KEY ISSUES "SYSTEMATIC, CO-ORDINATED, PLANNING AND PROGRAMMING OF INVESTMENTS OR EXPENDITURES, DESIGN, CONSTRUCTION, MAINTENANCE, OPERATION AND IN-SERVICE EVALUATION OF PHYSICAL FACILITIES"

II. PROBLEMS

- Under investment in public works programme
- Lack of good management system
- Failure to recognize importance of future economy by maintaining sound infrastructure
- Failure to recognize the impact of poor infrastructure on society
- Failure to replace the infrastructure as fast as it worns out
- Tendency by the national, state and local officials to defer the maintenance of public infrastructure
- Increased cost of tax payers to repair and rebuild the obsolescent public infrastructure

Others

- Political considerations in setting user charges
- Social obligations
- Over staffing
- Lack of competition

III. OBJECTS OF INFRASTRUCTURE

- Facilitate economic development
- Alleviate poverty
- Protect natural environment

IV. KEY ISSUES

- Huge Costs
- Lack of funds to maintain and improve the infrastructure
- High cost + lack of comprehensive approach to managing infrastructure
- Condition of infrastructure and level of service has deteriorated through aging and usage
- Some infrastructure components have failed due to normal disaster
- Design process has not given adequate consideration to loads, material variability, climate, environment etc. – Past designs produced physical systems that would last a given life with no consideration of maintenance
- Maintenance management strategies
- Adhoc- Based on rules of thumb
- Not adequate to sustain a healthy infrastructure
- Effect of maintenance action not considered
- Life cycle cost not considered in the design process
- Inadequate models to predict traffic, performance, service requirements
- Scarcity of Financial Resources
- Innovations needed to identify financial resources
- Cost-Effective solutions
- Better management of funds
- Better analytical tools for priority programming

V. KEY ISSUES – ROAD SECTOR

Present condition and status of development of SH and MDR (major district roads) varies from state to state. States of MDRs worrisome – Funds for development grossly inadequate; NHs and Rural roads receive lion's share. AP, Rajastan, Karnataka, Maharashtra have set up road development corporations - can issue bonds for financing road project.

Risks in road development is high

- Govt. action at every step
- Land acquisition – delay, litigation
- Rehabilitation, resettlement concerns
- Post construction traffic risks
- Design for the capacity in future – over capacity design in initial years – unlikely profit in the initial years; losses in the initial year – deter private investment

- Fix toll rate initially and then award contract on the lowest bid for subsidy.
- Economic toll that provide adequate returns to private investment in highways would be too high; leveraging private investment would involve provision of some level of subsidy from the Govt.
- Payment of annuity to developer to cover the full cost over the project period - lower risks – no traffic risk to investor; risk – miscalculation of annuity.

VI. KEY ISSUES – TELECOM SECTOR

- Rural market of India is very large as 70% of the population lives there
- Need to create a competitive market for rural telecom
- Need to explore the incentives to mobile operators

VII. KEY ISSUES – PORT SECTOR

- Need for alternatives to decongest major ports
- Greater potential for private sector investment for the development of minor/intermediate ports
- Gujarat – Most active state to attract private participation
- Necessary to set up a mechanism for setting tariffs on a transparent and fair basis; earlier – ad hoc basis by each port trust
- Tariff Authority for Major Ports (TAMP) was set up in 1997; TAMP worked out the cost on a cost plus basis - transparent and consultative basis with stakeholders before approving or setting any tariff.

- TAMP needs:
  - Promote competitive tariff
  - Users of cargo services should not end paying for port or labour inefficiencies
  - Tariff policy to prescribe standards of service – contribute to productivity and efficiency
  - Competition between ports to be encouraged through flexibility in pricing
  - Tariff policy can be used for rationing port capacity – high tariff for ports that are congested {consider land transportation also}
  - Indian port tariff higher than other ports
  - Comparison of port tariff : http://unescap.org/publications
  - Need to convert existing port trusts as limited companies – need to design appropriate governance structure, raise funds from capital market.

VIII. KEY ISSUES – POWER SECTOR

Poor financial condition of State Electricity Boards – inefficiency, low agricultural and domestic tariff. Provide payment security to private investors – govt. guarantee, escrow arrangements – provide priority in payment

Escrow: A written agreement between two or more parties providing that certain instruments or property be placed with a third party to be delivered to a designated person upon the fulfillment or performance of some act or condition

Temporary measures – many assumptions on Power Purchase Agreements (PPAs). Reluctance of the govt., to tackle the basic issue of power theft and inadequate tariff – bankruptcy of SEBs; commercial loss during 2001-02 was Rs.240 billion (estimated) – default in payment to power generation / transmission PSUs

Root of the problem – Gap between user charges and cost of supply. Gap between cost of supply and av. Tariff/unit of electricity produced – Rs.0.23 (1992-93) to Rs.1.10 in 2001-02. Gap between cost of supply and av. Tariff accentuated owing to losses in Transmission and Distribution (T&D) – electricity produced but NOT paid for!!!

T&D Losses – 24.8% (1996-97) to 26.5% (1998-99) to 30.9% (1999-00). T&D Losses – Electricity sold at low voltage, sparingly distributed loads across large rural networks, inadequate investments in distribution, improper billing and outright theft.

IX. KEY ISSUES – RAILWAYS

- *Tariff Rebalancing :* To correct the imbalance between passenger and freight tariff; further increase in freight tariff – loss of freight share; Within passenger tariff, ratio of lower class fare to highest I class AC fare ratio 1:14 to about 1:9, in a period of five years.
- *Major Investment Programme:* Expansion of revenue – significant increase in traffic (both freight and passenger) to about 7-7.5% per year; involves, modernization, introduction of high speed modern passenger services, commodity specific freight strategies, introduction of new technology – signaling and communications
- *Organizational Restructuring and Corporatization:* Traffic growth and strategic investment programme cannot be done in a 'business – as – usual' basis; IR has to be restructured to a corporate framework from the current departmental form of organization.
- *Separation of Functions:* Separate policy setting – Govt., regulatory (Indian Railways Regulatory Authority) and operational functions (Indian Railway Corporation- Commercial operations)

X. KEY ISSUES – AIRPORT INFRASTRUCTURE

- Improvement of air traffic control services
- Improvement of ground facilities
- Improvement of cargo handling facilities
- Commercial activities
- Airport security
- Financing airport infrastructure
- Private sector participation

- Environmental issues
- Regulatory Mechanism
- Legal Framework

XI. KEY ISSUES – URBAN INFRASTRUCTURE

ULBs are autonomous in theory, but guided by Govt. regulations. Poor financial position of ULBs (urban local bodies). Political interference in operations, managerial decision making and tariff setting.

Tariff fixing should be based on incremental cost including operation and maintenance charges, depreciation charges, debt. dues. Current institutional arrangements do not create proper structures and incentives for improvement of operational efficiency and quality of service

Issues concerning International Water Operators: Inadequate information about current financial and physical condition of existing service provider and assets, tariff well below cost recovery levels

ULBs do not have the institutional capacity to manage complexities and tasks involved in operating infrastructural services. Need to explore pooled financing of identified projects – Pool water and sanitation projects to float bonds (14 ULBs in TN); 50 ULBs are experimenting with private sector participation in Solid Waste Management

XII. KEY ISSUES – URBAN INFRASTRUCTURE

- Population density is much lower than urban areas
- Rural density > 500/sq.km only in Delhi, West Bengal, Kerala; lower than 300 in other states
- Cheaper to have generators than wired networks connected to the main grid
- Telecom- Mobile may be cheaper than landlines
- Av. population size 2000 (approx.)
- Setting of large water treatment plants, modern piped water supply, sewerage networks are ruled out.
- Per capita income of rural India is lower than Urban India
- Pricing of infrastructure services (recovery of capital and operating costs during the life time of the asset) cannot be structured
- Subsidy needs to be provided to the consume

XIII. NEED FOR REFORM IN INFRASTRUCTURE

- Private sector participation
- Incentives for companies to strive for efficiency savings which can be passes on consumers
- Faster roll -out of infrastructure
- Innovative solutions

XIV. TYPES OF REFORM IN INFRASTRUCTURE

- Industry Structure – Concerned with the introduction of competition, removal of barriers, so that contestability is the real option.
- Operation – Monopoly is constrained by rules covering areas such as quality, pricing, access – Effective regulatory system – Establishment of an independent agency.
- Ownership – Change of ownership from state owned enterprises to some form of private ownership.
- Decentralization in allocation mechanism – Enhances influence of economic forces and participation of stake holders.
- Changes in regulation – to control pricing and entry into market
- Choice of regulation should be based on cost benefit analysis
- Any regulatory policy should have a clear economic rationale
- Evaluation of the regulation should be by an independent agency that considers economic wide impact and not by a sector specific agency
- Regulations should be simple and subject to careful scrutiny, Transparent; not to be captured by the political group

XV. TYPES OF REFORM IN INFRASTRUCTURE

- Objectives of regulation
  - To attract higher private sector investment
  - To assure reasonable rate of return to the producers
  - Improvements in customer satisfaction

- Common regulatory rules
  - Pricing rules – rate of return pricing, bench mark pricing, price cap regulation
  - Degree of competition allowed
- Conflict resolution mechanism

XVI. CONCLUSIONS

- Inadequate state funds
- Maintenance of existing infrastructure neglected
- Need to allow private sector in rural infrastructure projects
- Public-private participation in which the public sector controls the direction of the private sector investment through appropriate incentives/policies is superior
- Concept of universal access to infrastructure needs change from time to time – e.g., universal access to communication involves community access first, followed by institutional access and later household

B. PLAYERS IN INFRASTRUCTURE PROJECTS

I. ORGANIZATIONS INVOLVED IN INFRASTRUCTURE PROJECTS

- Governments and Government Agencies
- …EPC Contractors
- …Financiers …
- Project Affected Communities and NGOs
- …Insurance and Guarantee Providers …
- Project Sponsors …
- Regulator

II. PLAYERS IN AN INFRASTRUCTURE PROJECT

Infrastructure Projects are often more complex than conventional civil engineering projects such as residential and commercial structures and as a result involve a multitude of players. „

The figure on the next slide describes the various players and the relationships between them.

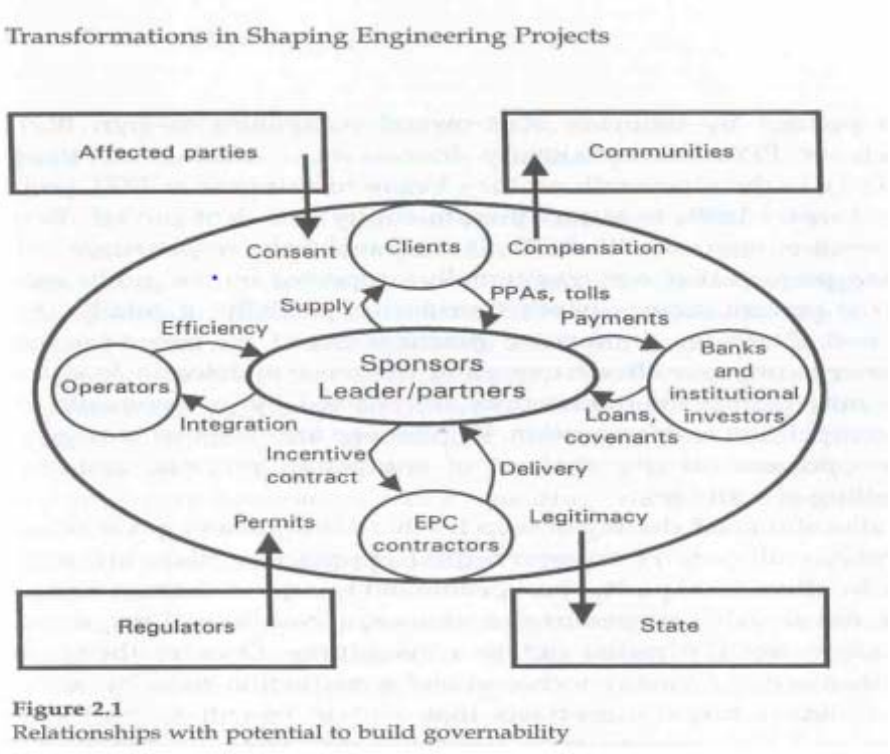

Figure 15. Infrastructure Projects

III. GOVERNMENT AGENCIES

Government Agencies are often key players in infrastructure projects. They can be involved directly in procuring the infrastructure, or they can act as concession granting authorities that authorize private sector players to procure and maintain infrastructure

Government agencies involved in infrastructure could be at the national level – e.g. the NHAI (National Highways Authority of India), at the state level (e.g State Government and Line Agencies) or at the Urban level (e.g. Water and Sewerage Boards, municipalities).

Government agencies sign various agreements with other organizations for the procurement of infrastructure such as

- Engineer-Procure-Construct Contracts with construction firms …
- Concession Agreements, Power Purchase Agreements, Annuity Agreements with private sponsors
- Loan and Equity agreements with financiers

IV. ENGINEER-PROCURE-CONSTRUCT (EPC) FIRM

EPC firms are typically engineering and construction firms that help design and/or construct the infrastructure facility. They may be contracted by the government agency, or by private parties in charge of providing the infrastructure „

Typically they take on completion, construction delay and construction cost-overrun risks. Leading construction firms such as Larsen & Toubro, HCC etc perform EPC contracts in India

V. FINANCIERS

Infrastructure projects are often financed through a mixture of grants, debt (loans), equity (investments) and user charges. Debt lines of credit are often raised through the regular banking system. Debt is often also provided by multilateral agencies such as the World Bank, the Asian Development Bank, the Japanese Bank for International Cooperation etc. Equity is often provided through a variety of sources including large organizations in the infrastructure space, Foreign Institutional Investors, Private Equity houses etc. Grants for infrastructure projects are often provided through programs such as the Jawaharlal Nehru National Urban renewal mission.

VI. PROJECT AFFECTED COMMUNITIES AND NGOS

Any infrastructure project affects the surrounding community in multiple ways …

- It promises to yield benefits to these communities (e.g. improving the water supply or the transportation infrastructure) …
- It might need to displacement of some families (e.g. in cases of widening of roads and highways).

Sustainable Infrastructure Development must be equitable and must yield benefits to the community. As a result the impact of infrastructure on these communities must be carefully assessed. Very often NGOs are the "voice" of these communities to ensure that their needs are met.

Stakeholder consultations and socio-economic analysis of infrastructure must therefore be conducted to ensure that infrastructure development is equitable.

VII. INSURANCE AND GUARANTEE PROVIDERS

Several kinds of insurance and guarantees are taken on infrastructure projects. Insurance relating to the construction phase, force Majeure events, and insurance during the operation of the facility are often provided „

In the case of Private participation in infrastructure, government guarantees are often given to private players. Third party Political Risk Insurance is also taken to insure against government reneging on a contract with a private sector. MIGA and OPIC are two organizations that provide PRI, subject to meeting certain criteria

VIII. PROJECT SPONSORS AND CONSULTANTS

Project Sponsors are private organizations that take on the responsibility of providing infrastructure. Project sponsors sign "concession agreements" with government agencies that describe the term for which they will operate the infrastructure, quality standards that they will need to maintain, revenue generation opportunities and so on „

Project sponsors may either develop the projects themselves or may sign contracts (such as EPC contracts) with other companies. Both project sponsors and government agencies hire consultants to perform feasibility analysis, structure projects and to manage the process of selecting sponsors and contractors.

IX. REGULATORS

Regulators are present when private firms are allowed to function in an infrastructure sector – e.g. in the case of Telecom in India, TRAI acts as a regulator. Regulators are intended to be independent bodies that can potentially impartially assess the performance of private firms. „

Regulators regulate tariffs set by private firms, the quality of service that they provide to ensure that they are performing as prescribed in the terms of their respective contracts, to the collective benefit of society.

X. INDIAN PLAYERS

- Government – Planning Commission, Ruling parties, NHAI etc.
- Consultants – Feedback Ventures, PwC, KPMG „
- Financiers – IDFC, IL&FS, ICICI, IIFC „
- Sponsors – TNRDC „

- EPC Firms – L&T ECC, HCC „
- Regulators - TRAI

C. PLAYERS IN INFRASTRUCTURE PROJECTS

I. INTRODUCTION TO THE INFRASTRUCTURE PROCESS

Infrastructure Planning can be conceived as a multistage process. The infrastructure Planning Process must take into account the local context

- ❑ Local needs should be satisfied …
- ❑ The project should comply with the existing institutional and legal frameworks …
- ❑ The project should align with political objectives and ideology …
- ❑ The project should be technically and economically feasible

II. VARIOUS STAGES OF PROJECT

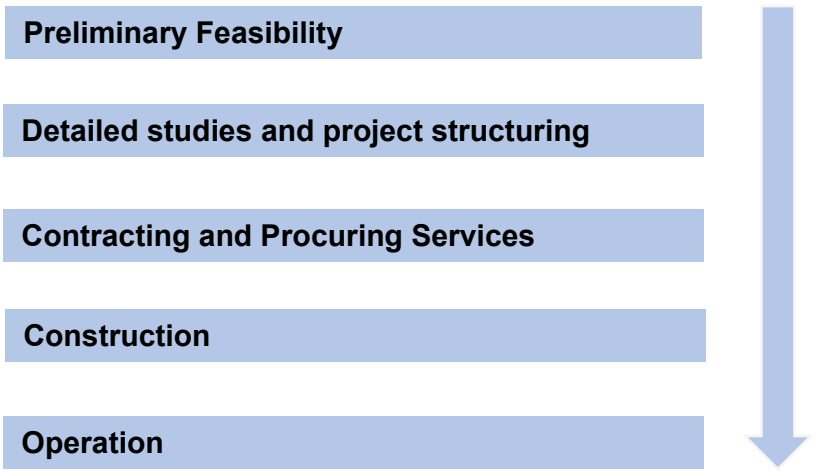

Figure 16. Stages of Infrastructure Projects

III. DESCRIPTION OF STAGES

The preliminary feasibility stage of the project establishes the need for the project. Existing information as well as field visits are conducted to substantiate the need for a project. This phase also determines the kinds of detailed studies that need to be undertaken

The Detailed Studies and Project Structuring stage is often the most time-consuming

Technical Studies (e.g. geotechnical studies, land surveys) need to be undertaken to help design the infrastructure. …

Economic and Market studies (e.g. Willingness to Pay studies) must also be undertaken.

Other studies that are undertaken are …

- Environmental Compatibility and Environmental Impact Assessment …
- Socio Economic Cost Benefit Analysis …
- Financial Analysis

At the conclusion of this stage, a Detailed Project Report (DPR) is also prepared with detailed technical specifications

Financial Engineering and Structuring must also be done during this stage …

- Lenders, Terms of Loan (Tenors and Rates of Interest), mix of debt and equity, and user charges can all be modeled to determine the financial viability of the project

For Private participation in infrastructure, the private sector may be tasked with many of these studies

Once the DPR is prepared, the project can be contracted out.

- Expressions of Interest are sought …
- Requests for Proposals are sought …
- Pre-bid conferences are held to clarify terms of the project …
- Proposals are evaluated and a successful bidder is selected

The successful bidder then proceeds with the construction of the project. Material, manpower and productivity risks must be managed in this phase. Once the project has been built and commissioned, operations can commence and the infrastructure service can be availed by the citizens.

An Operations and Maintenance Contract can be given to a separate party. Maintenance Parameters can be fixed well in advance

- ❑ Technical Maintenance and quality issues, Revenue generation issues and Administrative risks must be considered in this phase…

In the case of Private Provision of Infrastructure, a winning bidder is selected based on their ability to build and operate the infrastructure. Each of these stages varies in duration as described in the figure on the next slide.

The greater the time spent on project preparation and structuring, the more likely it is that the project can be implemented smoothly and in a cost-effective manner. Hasty project preparation often leads to rework of documents, leads to false or missing information, and leads to project delays.

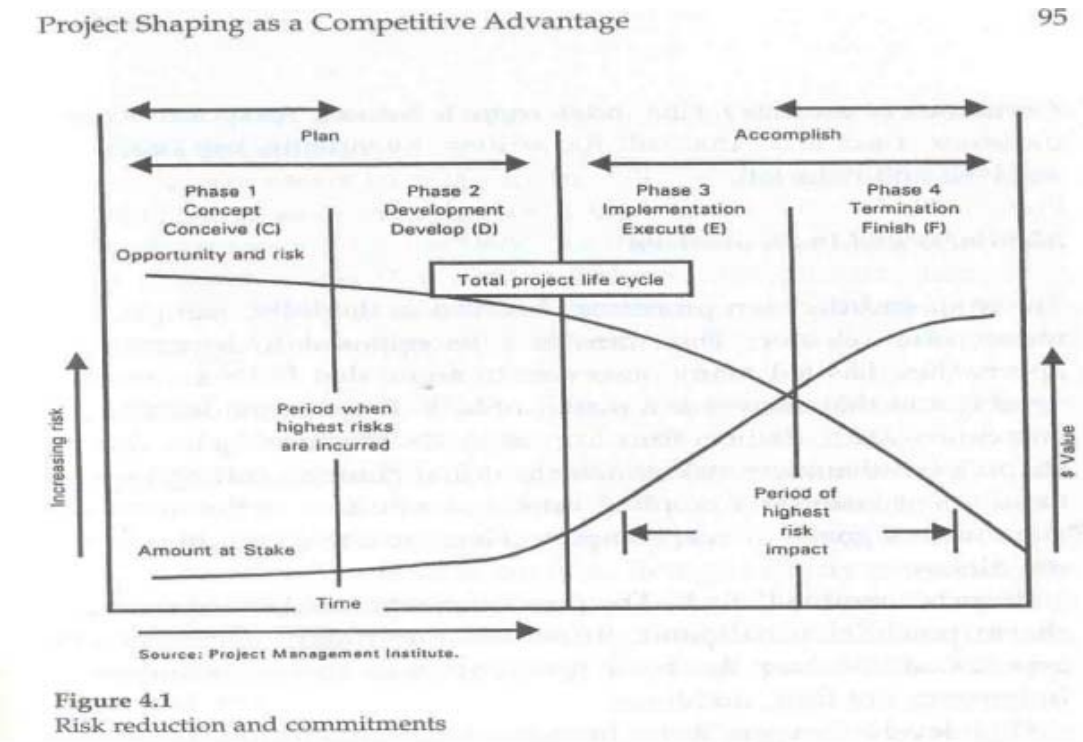

Figure 17. Risk Reduction and Commitments

IV. NATURE OF PROJECT PROCESS

Infrastructure project development is seldom a linear or a deterministic process. „

At all stages, the developing agency must work in partnership with several stakeholders.

- For successful projects, this partnership is vital „

The figure on the next slide indicates some of the “fuzzy” aspects of infrastructure planning. These will be revisited in more detail in a later class.

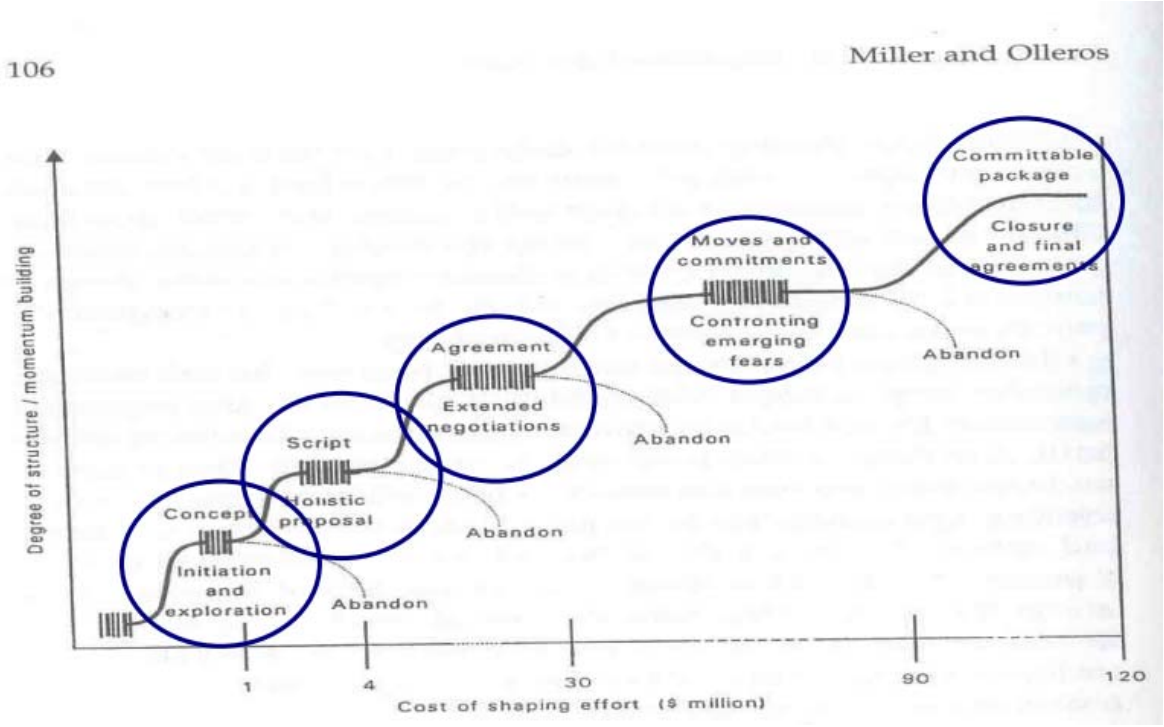

Figure 18. Stages in planning process

V. STEPS IN PLANNING PROCESS

Upon identifying a need and performing economic analysis, the sponsoring agency might feel the need to build a coalition and seek external expertise to successfully complete a project. A process of coalition building might then be put into place.

Government and Political buy-in must be secured at all levels, and the project can be modified in order to ensure this. “Emerging Fears” from residents of the local communities, including environmental and social groups can then be confronted and alleviated both by transparent consultations and further modifications to the project

Project Financing can be obtained and the project can proceed to completion.

D. PUBLIC PRIVATE PARTNERSHIP

I. THE INFRASTRUCTURE STORY

Who managed infrastructure in the 17th, 18th and 19th centuries? …

- Private players
- E.g. Railroads and power networks in the US „

Why? …

Governments did not have much money, especially pre Industrial Revolution.

II. THE SUEZ CANAL IN 1860 WAS A PPP

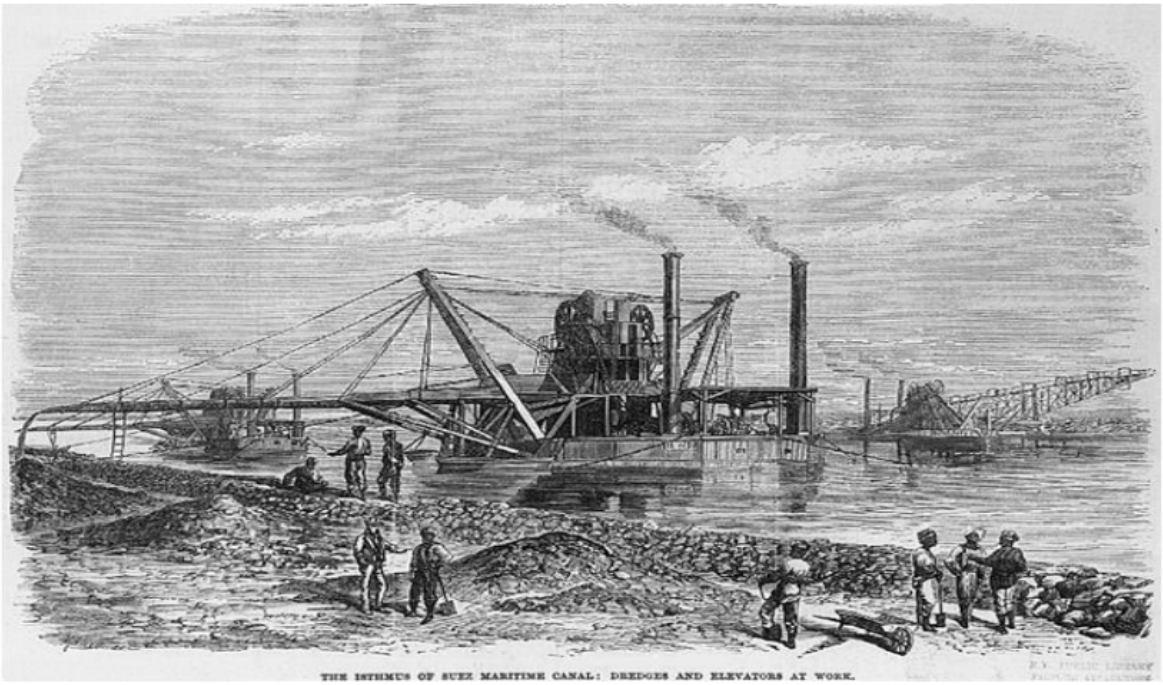

Figure 19. Suez Canal

III. THE HISTORY OF CANAL

Circa 1854: The French consul in Caire, Ferdinand Marie de Lesseps, créâtes the "Compagnie Universelle du Canal Maritime de Suez.

25 Apr 1859: The French are officially allowed to begin the canal construction (Said Pacha acquires 22% of the Suez Canal Company, the rest of the shares are controlled by French private holders)

16 Nov 1869: The Suez Canal opens; operated and owned by Suez Canal Company

IV. IN 20TH CENTURY

Shift in infrastructure provision in the early part …

- Communist ideology, wars, depression, changing social sentiments led to public sector being in charge of infrastructure „

Towards the 1970's… …

- Private sector was again involved in infrastructure – especially in the developing world …
- Fall of Communism ushers rapid rise in private participation

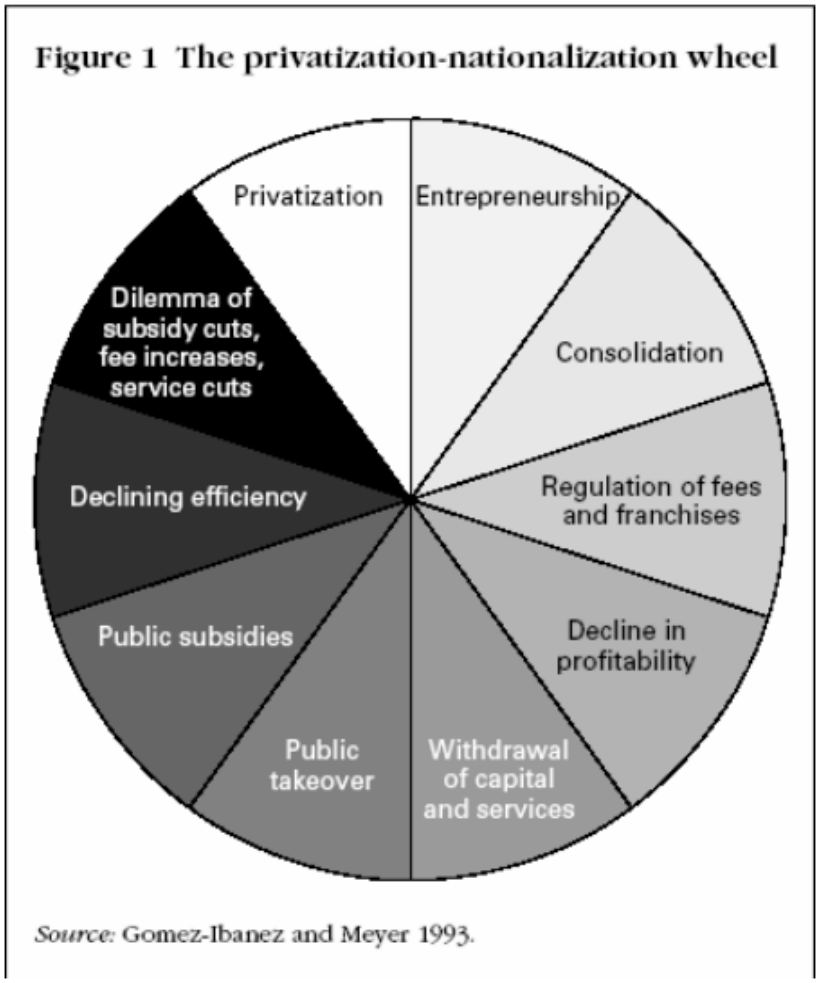

Figure 20. Privatization – Nationalization cycle

The previous figure indicates that in many countries the responsibility for infrastructure provision has been cyclic in nature. Private entrepreneurs have undertaken infrastructure provision, but there has been a decline in services and the state has then taken over the provision of infrastructure „

This public takeover has once again resulted in inefficiencies that have then called far the re-takeover of the private sector and so forth.

V. THE EVOLUTIONARY MODEL

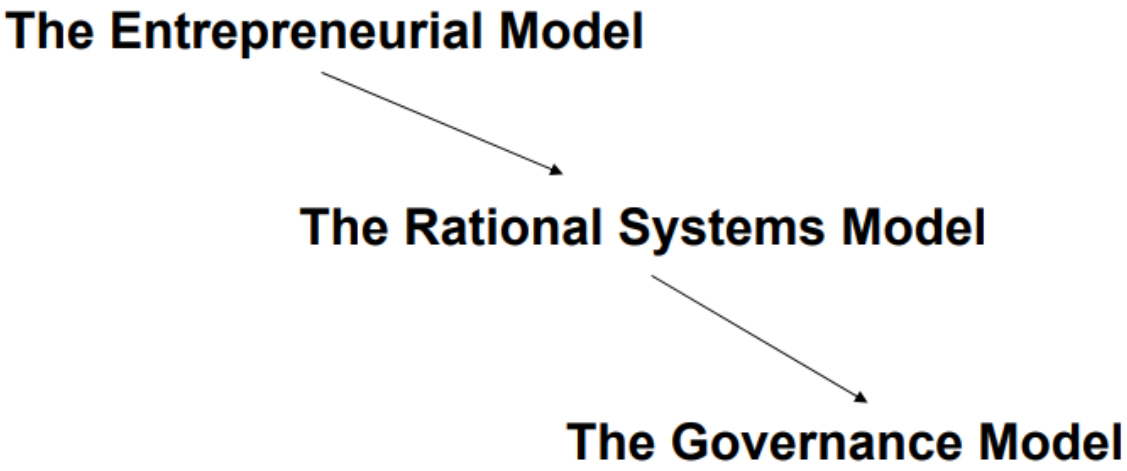

Figure 21. The evolutionary model

The evolutionary model is an alternate view of the evolution of PPPs in infrastructure. „ In this view, a large amount of initial private activity in infrastructure was in the form of wholly owned private entrepreneurial enterprise (e.g. railroads in the US). This was then succeeded by a large scale nationalization of infrastructure around the world, based on rational, scale models. Starting from the 1970s there has been yet another gradual change to Private-Public Partnerships with mixed responsibilities and adequate contractual governance, for the provision of infrastructure

VI. PRIVATE PUBLIC PARTNERSHIP (PPP) / PRIVATIZATION OPTION

In the PPP mode, the private sector takes some, but not necessarily all, of the risk and ownership of an infrastructure project „

The following slide shows some of the options for PPPs

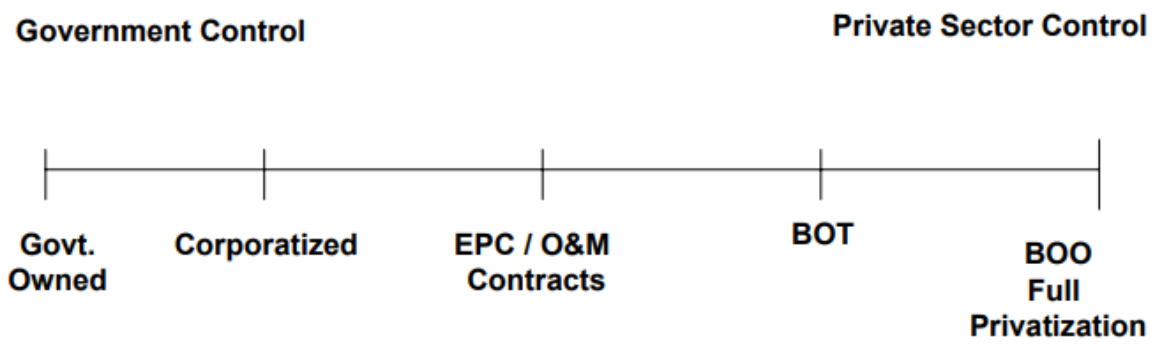

Figure 22 Spectrum of PPP options

VII. THE SPECTRUM OF PPP

As indicated in the previous slide there is a spectrum of PPP options. The government can start by corporatizing a public sector entity so that it acts as an autonomous corporation „

The next stage is for the government to give out Operations and Maintenance Contracts to the private sector on a performance based contracting model. Further down the spectrum is the popular BOT or Build-operate-transfer approach where the private sector entity (known as the concessionaire) builds and operates infrastructure for a specified period of time (known as a concession period) , and then transfers the infrastructure back to the government. During this period the private sector can recoup its investment either through user charges or through payments made by the government. Finally, the government could turn over the ownership of the asset to the private sector and allow the private sector to build, operate and maintain the infrastructure

VIII. PRIVATE PUBLIC PARTNERSHIPS (PPP)

First the government needs to decide whether the situation merits privatization

- Are there public sector ills and private sector benefits that can be identified

Second the government should determine the kind of PPP arrangement to be used

- One factor is the potential revenue that can be generated
- Social issues and the voice of society can also be considered

The government can then ask private players to bid to own and operate a project.

- The project should not be over-engineered - the private sector should be allowed to bring its creativity to the table.
- The private players should bid on a “bid variable” such as the amount of tariff they will charge

The government can then monitor to ensure that the private operator meets societal needs

IX. ROLE OF PRIVATE PLAYERS IN BOT

1. Procure financing
2. Plan, design, construct the facility
3. Operate and Maintain the facility
4. Manage the infrastructure throughout the concession period
5. Ensure service to people

X. ROLE OF PRIVATE PLAYERS IN BOT

E. THE SPV STRUCTURE IN INFRASTRUCTURE FINANCE

The Special Purpose Vehicle (SPV) or Special Purpose Entity (SPE) is one of the most used tools in infrastructure financing. It doesn't matter whether the project is being constructed by a private company, a public entity, or in a public-private partnership. In most cases, special purpose vehicles are created for every infrastructure project.

We will understand what a Special Purpose Vehicle (SPV) is and also how a web of contracts is created in order to operate a business through the Special Purpose Vehicle (SPV) structure.

I. WHAT IS A SPECIAL PURPOSE VEHICLE (SPV)?

A Special Purpose Vehicle (SPV) is an entity created only for the purpose of execution of the project. This means that for legal purposes, the Special Purpose Vehicle (SPV) is different from the private company or the government body, which may be sponsoring it.

A Special Purpose Vehicle (SPV) has its own balance sheet and profit and loss statement. Lenders are supposed to lend to these Special Purpose Vehicles (SPV) based on their assets and liabilities and not the assets and liabilities of the parent firm. In most cases, the Special Purpose Vehicle (SPV) company takes non-recourse financing. This means that in the event of a default, investors can only seize the assets of the project and not the assets of the parent firm, which may be involved in the project.

As can be seen from the definition, the Special Purpose Vehicle (SPV) is a good mechanism to segregate the risks. The SPV mechanism makes it possible for each project to obtain finance based on its own risk. The existing debt of the company backing the project does not make financing more expensive for a project since the company's finances are usually not that relevant.

The Different Parties Involved In a Special Purpose Vehicle Structure?

1. **Equity Investors:** For the Special Purpose Vehicle (SPV) to come into existence, it has to receive some capital. This capital is provided by the equity investors. Generally, equity investors include private parties and the government. In the case of public-private partnerships, it could be both. This is the primary party that will gain or lose depending upon the performance of the contract. Since they own the equity of the SPV, they control its actions and who it gets into a contract with.

The fact that the investors have to put in money in the Special Purpose Vehicle (SPV) does not make the Special Purpose Vehicle (SPV) structure redundant. The benefit of using the structure is that the equity investors have limited exposure to the downside. The maximum loss that they could face is limited to the amount they apportioned as an equity investment to the Special Purpose Vehicle (SPV).

2. **Debt Investors:** Infrastructure projects usually require a huge amount of money. As a result, equity investors are not able to fund the entire project. Also, since the cash flows of the project are somewhat stable, and the returns provided are low, equity investors use a lot of leverage in order to magnify their returns. It is common for infrastructure projects to use a leverage ratio of 10 to 1. Debt investors include banks, investment banks, private equity firms, and even pension funds. Infrastructure companies have been providing a wide variety of financial instruments that the debt investors are using to invest their money in these Special Purpose Vehicles (SPV).

3. **External Agencies:** Since Special Purpose Vehicles (SPV) use a lot of borrowed money, they frequently require the help of third-party companies. The Special Purpose Vehicles (SPV) have to engage rating agencies to rate their debt instruments. This is important since many mutual funds and pension funds cannot invest their money in assets that are not above a certain investment grade. Also, the Special Purpose Vehicles (SPV) have to engage financial institutions like banks or insurance companies that provide bank guarantees to investors.

4. **Construction Contractor:** Finally, in most cases, the Special Purpose Vehicles (SPV) appoints its parent company as the chief construction contractor. Using this mechanism, the equity investors are able to plow back most of the funds that they had invested in as equity capital. However, they are only able to do so once they execute the projects. Debt covenants usually do not allow the SPV to give out money to the contractor until certain milestones have been met. However, using the SPV structure, the company is able to execute the projects without taking any undue risks.

5. **Maintenance Contractor:** Lastly, once the project is constructed, it is usually given out to a maintenance contractor. This contractor is generally another SPV which has the same set of stakeholders and follows more or less the same process. Even if the same parent company plans to maintain the project, they generally create a different SPV. In this case, the SPV is done to safeguard the revenues. The idea is to protect these risk-free revenues by segregating them from other risky investments which the company may be undertaking.

The bottom line is that the Special Purpose Vehicle (SPV) structure is at the heart of infrastructure financing. It allows the equity investors to segregate revenues and protect them from risks that may be arising in other projects.

F. VIABILITY GAP FUND

The main constraint in India's infrastructure sector is the lack of source for finance. More than the overall difficulty of securing funds, some projects may not be financially viable though they are economically justified and necessary. This is the nature of several infrastructural projects which are long term and development oriented.

For the successful completion of such projects, the government has designed Viability Gap Funding (VGF). Viability Gap Finance means a grant to support projects that are economically justified but not financially viable.

The scheme is designed as a Plan Scheme to be administered by the Ministry of Finance and amount in the budget are made on a year-to- year basis.

Such a grant under VGF is provided as a capital subsidy to attract the private sector players to participate in PPP projects that are otherwise financially unviable. Projects may not be commercially viable because of long gestation period and small revenue flows in future.

The VGF scheme was launched in 2004 to support projects that comes under Public Private Partnerships.

VGF grants will be available only for infrastructure projects where private sector sponsors are selected through a process of competitive bidding. The VGF grant will be disbursed at the construction stage itself but only after the private sector developer makes the equity contribution required for the project.

The usual grant amount is upto 20% of the total capital cost of the project. Funds for VGF will be provided from the government's budgetary allocation. Sometimes it is also provided by the statutory authority who owns the project asset. If the sponsoring Ministry/State Government/ statutory entity aims to provide assistance over and above the stipulated amount under VGF, it will be restricted to a further 20% of the total project cost.

The project agreements must also follow the best practices that would secure value for public money. Regular monitoring and evaluation should be done by the lead financial institutions for the disbursal of the grants.

The lead financial institution for the project is responsible for regular monitoring and periodic evaluation of project compliance with agreed milestones and performance levels, particularly for the purpose of grant disbursement.

G. Investment decisions - Capital budgeting (NPV vs IRR)

What is Capital Budgeting?

Capital budgeting is the process of allocating capital after determining project feasibility.

Determining project feasibility is a 3 step process:-

Step 1] Qualitative Analysis – Relationship/Branding feasibility, Socio-Cultural & Political feasibility

Step 2] Forecasting Performance – Financial Modelling & Structural analysis

Step 3] Quantitative Analysis –IRR (or MIRR), NPV, Payback period and other quantitative analysis

In capital budgeting, there are a number of different approaches that can be used to evaluate any given project, and each approach has its own distinct advantages and disadvantages.

I. WHAT IS NPV METHOD?

The NPV method aims to capture the amount available after meeting the cost of all capital contributors (all claim holders).This method 'discounts' operating cash flows at a rate that captures the cost of capital (i.e. the capital used/contributed to generate cash flows). In fact, **the NPV method is what leads to the concept of value creation through Economic Profit.**

- Net Present Value (NPV) = Total PV of future CF's - Initial Investment

Estimating NPV:

1. Estimate future cash flows: how much? and when?
2. Estimate discount rate
3. Estimate initial costs

- Minimum Acceptance Criteria: Accept if NPV > 0
- Ranking Criteria: Choose the highest NPV

In Short: A positive NPV is a must and the higher the better.

II. WHAT IS IRR METHOD?

Internal Rate of Return measures the return generated by an asset assuming that the reinvestment rate of cash flows thus generated, is the same as the IRR itself.

Limitation of IRR method - Major shortfall associated with the IRR method is the fact that it cannot be conclusively used in circumstances where the cash flow is inconsistent. While working out figures in such fluctuating circumstances may prove tricky for the IRR method, it would pose no challenge for the NPV method since all that it would take is the collection of all the inflows-outflows and finding an average over the entire period in focus.

IRR may not exist or there may be multiple IRR

The **relationship between NPV and IRR** is that "IRR is the rate at which NPV = Zero"

When Cost of Capital is more than IRR the NPV will be Negative

If we graph NPV versus discount rate, we can see the IRR as the x-axis intercept.

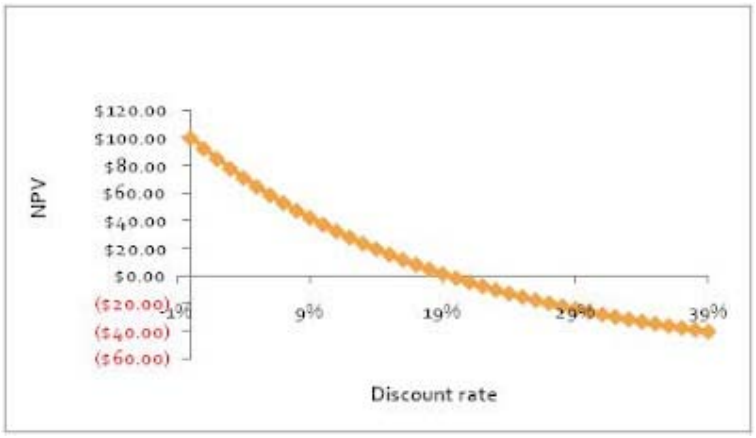

Figure 23 Differences between NPV vs. IRR

1. NPV is calculated in cash, the IRR is a percentage value expected in return from a capital project.
2. There may be **conflicting results under NPV and IRR**

NPV and IRR methods may give conflicting results in case of mutually exclusive projects, i.e., projects where acceptance of one would result in non-acceptance of the other. Such conflict of result may be due to any one or more of the following reasons:

1. The projects require different cash outlays.
2. The projects have unequal lives.
3. The projects have different patterns of cash flows.

In such a situation, the result given by the NPV method should be relied upon. This is because the objective of a company is to maximize its shareholders' wealth. IRR method is concerned with the rate of return on investment rather than total yield on investment hence it is not compatible with the goal of wealth maximization. NPV method considers the total yield on investment. Hence, in case of mutually exclusive projects, each having a positive NPV, the one, with the largest NPV will have the most beneficial effect on shareholders'

III. WHY NPV IS BETTER

Both the Net Present Value Method and Internal Rate of Return Method proceed on this presumption that cash inflows can be reinvested at the discounting rate in the new projects. However, reinvestment of funds at the cut-off rate i.e cost of capita is more possible than at the internal rate of return. Hence, Net Present Value Method is more reliable than the Internal Rate of Return Method for ranking two or more capital investment projects.

Similarities in results under NPV and IRR

Both NPV and IRR will give up the same result (i.e., acceptance or rejection) regarding an investment proposal in following cases:

i. **Projects involving conventional cash flows**, i.e., when an initial outflow is followed by a series of inflows.

ii**.** **Independent investment proposals**, i.e., proposals the acceptance of which does not preclude the acceptance of others.

The reason for similarity in results in the above cases is simple**. In case of NPV method, a proposal is acceptable if its NPV is positive**. NPV will be positive only when the actual return on investment is more than the cut-off rate. **In case of IRR method a proposal is acceptable only when the IRR is higher than the cut-off rate.** Thus, both methods will give consistent results since the acceptance or rejection of this proposal under both of them is based on the actual return being higher than the cut-off rate.

In case of projects requiring different cash outlays, the problem can also be resolved by adopting incremental approach, a modified form of IRR method. According to this approach in case of two mutually exclusive projects requiring different cash outlays, the IRR of incremental outlay of the project requiring a higher investment is calculated. In case this IRR is higher than the required rate of return, the project having greater non-discounted cash flows should be accepted otherwise it should be rejected.

Pay Back Period rule

- How long does it take the project to "pay back" its initial investment?
- Payback Period = number of years to recover initial costs

- Disadvantages:

o Ignores the time value of money

o Ignores cash flows after the payback period

o Biased against long-term projects

· Advantages:

o Easy to understand

o Biased toward liquidity

Profitability Index

PI =Total PV of future cash flows/Initial Investment or 1 +(NPV/Initial Investment)

- Minimum Acceptance Criteria:
  - Accept if PI > 1
- Ranking Criteria:
  - Select alternative with highest PI
- Disadvantages:
  - Problems with mutually exclusive investments
- Advantages:
  - May be useful when available investment funds are limited
  - Easy to understand and communicate

UNIT – 3 – FINANCIAL INSTITUTIONS AND POLICIES

A. INFRASTRUCTURE DEVELOPMENT AND GOVERNMENT POLICY SINCE 1950

INFRASTRUCTURE DEVELOPMENT AND GOVERNMENT POLICY SINCE 1950 India's infrastructure services are slowly but steadily moving away from the realm of government control to that of the private sector. Across sectors ranging from telecommunications and roads to power and ports, state-owned agencies are giving way to private sector entities operating in a competitive environment and subjected to economic regulation where necessary. Governments at both central and state levels are actively engaged in managing this transition, devising appropriate policy frameworks and establishing suitable institutions such as the central road fund and independent regulatory authorities in power and telecommunication sectors.

I. TELECOMMUNICATIONS

Since India's independence, its telecommunications sector has continued to be governed by the Indian Telegraph Act of 1885, which placed all telecommunications within the government domain. Telecommunications services were the exclusive monopoly of the Department of Posts and Telegraphs, which had the mandate to regulate and provide these services. Public ownership over the next several decades hampered growth of the sector, leaving India's tele density (defined as main lines per 100 inhabitants) among the lowest in the world: 0.4 in 1980 and 0.7 in 1990. The extremely high level of unfulfilled demand was evident from the long waiting lists and the willingness of Indian subscribers to pay large up-front payments for telephone connections.

The government initiated partial reforms in 1985, when the Department of Posts and Telegraphs was divided into separate entities, the Department of Posts and the Department of Telecommunications. In 1986 the government spun off basic telephone services in the two metropolitan cities of Delhi and Mumbai into a new public sector entity, the Mahanagar Telephone Nigam Limited. Overseas communication services were transferred to Videsh Sanchar Nigam Limited. Subsequently, the government ushered in the National Telecom Policy of 1994, which allowed private participation in both basic and cellular services. In 1997 the government enacted legislation to establish the Telecom Regulatory Authority of India.

The process of liberalization received further fillip in 1999 with the adoption of the New Telecom Policy of 1999, which permitted the entry of multiple players into all segments, including fixed line, cellular, and long distance telecommunications. Furthermore, the policy-making and service-providing functions of the Department of Telecommunications were separated; the latter were transferred to a new company, Bharat Sanchar Nigam Limited. In addition, the Telecom Regulatory Authority of India Act was amended in 2000, to bring clarity to the authority's functions and powers, and a separate Telecom Disputes Settlement and Appellate Tribunal was established to adjudicate disputes.

In November 2003 the government issued guidelines for converging the hitherto disparate basic and cellular licenses into Unified Access Services Licenses. This process of license unification is likely to be extended to other service segments. Today, most major telecommunications operators are aggressively seeking to expand their operations. These expansion plans will, however, require substantial additional investment, and will prove to be a considerable challenge for private players due to the steep decline in tariffs.

The spectacular progress of India's telecommunications sector has been largely due to the entry of private players. Private participation has resulted in greater competition, better service, increased penetration, and lower prices. By 2002 the average cellular tariffs were reduced by 53 percent, and national long distance and international subscriber dialing tariffs declined, respectively, by 56 percent and 47 percent. Cellular tariffs in India are now among the lowest in the world, and tariffs for cellular-to-cellular calls fell by almost 70 percent. This steep decline, coupled with a significant growth in wireless telephony, resulted in an unprecedented increase in tele density, from 1.9 in March 1998 to 7 in March 2004. The cellular subscriber base nearly doubled in 2002–2003 to reach 12.7 million, and again in 2003–2004, to 26 million.

Though tele density has grown at so rapid a pace, much of this growth occurred in urban areas and telephone connectivity in rural areas still remains a cause of concern. In rural areas, where two-thirds of India's population lives, about 14 percent of the villages are still without any telephone service. While the costs of rolling out village public telephones are undoubtedly high, it is also widely acknowledged that the absence of credible penalties for nonfulfillment of rural rollout obligations by the licensees has not helped in this regard. The government is, however, committed to expanding the rural telephone network through a universal service fund.

II. POWER

Private sector participation in the power sector is not new to India. In fact, at the time of independence in 1947, private sector utilities and licenses accounted for over 80 percent of all electricity supplied in India. Immediately after independence, the Electricity Supply Act of 1948 vested responsibility for the generation, transmission, and distribution of electricity to State Electricity Boards (SEBs), marking the first shift toward public ownership in the power sector. Within the next decade, the state electricity boards took over almost all private sector power licenses.

By the mid-1970s it had become apparent that SEBs alone would not be able to meet the rapidly increasing demand for power, and the central government established the National Thermal Power Corporation Limited and the National Hydroelectric Power Corporation Limited to enhance generation capacity. To mitigate regional imbalances, the government established the Power Grid Corporation of India Limited to manage the transmission of power between states and regions. By the mid-1980s it was clear that the power sector would not be able to meet India's growing demand without considerable restructuring. In 1991 the government amended the Electricity Supply Act of 1948 to encourage private investment by providing a legal basis for facilitating investment in generation and distribution. This policy was to provide additional generation capacity to complement the rapidly declining public sector resources.

The responsibility for the power sector is currently shared between the central government and the states. At the central level, policy and planning is under the purview of the Ministry of Power and its arm, the Central Electricity Authority. The Central Electricity Regulatory Commission was

established in 1998 and deals with inter alia regulation pertaining to the tariffs of generating companies owned or controlled by the central government and those who sell electricity in more than one state, interstate transmission of energy including tariff of transmission utilities, and oversight of the India's Electricity Grid Code. At the state level, there are State Electricity Regulatory Commissions, whose functions include determining the tariff for generation, supply, transmission and wheeling of electricity within the state, issuing transmission, distribution and trading licenses, and facilitating intrastate transmission of electricity. The energy departments of each state address policy and planning issues.

Although the sector was liberalized in 1992, private participation has remained far below expectations. Out of nearly 120 expressions of interest registered to add 69,000 megawatts of capacity amounting to about U.S.$55.5 billion of investment, only a handful of private projects have been implemented.

One of the main factors impeding private participation in generation is the precarious financial condition of the SEBs, which, in turn, is attributable to nonremunerative tariff structures, poor operational and collection practices (which facilitates theft), and dilapidated networks. Despite some improvement over the previous year, the operating losses of state power utilities in 2002–2003 continued to remain high, at an estimated U.S.$4 billion. Aggregate technical and commercial losses are reported to be as high as 40 percent, and, of these, about two-thirds are said to be commercial losses, a euphemism for theft. As a result, private investors and lenders are wary of supporting power projects that have to sell exclusively to financially weak SEBs.

India's per capita electricity consumption is still among the lowest globally (for example, half that of China). It is estimated that over 100,000 megawatts of capacity need to be installed by 2012, which will require additional investments of U.S.$178 billion in the next decade. To meet these requirements, the power sector will have to rely on sizable private sector participation and investment, which in turn is intrinsically linked to reform of the sector.

In order to spur reforms, the central government has undertaken a few key initiatives. Parliament passed the Electricity Act of 2003, which consolidates the existing electricity laws and attempts to usher in a market-based competitive regime and institutionalize appropriate regulatory safeguards. Following the recommendations of an Expert Committee, the Ministry of Power is now providing incentives to the states that manage to reduce the gap between the cost of supply and revenue realization, through the Accelerated Power Development and Reform Programme. The Expert Committee also delineated a reform framework and financial restructuring principles that could potentially form the basis for devising state-specific reform programs. Central Electricity Regulatory Commission has notified and implemented an Availability Based Tariff regime, with a view to make the incentives of the utilities compatible with the merit order requirements of the entire network and thereby improve grid discipline.

At state level too, reforms are progressing, albeit at a varying pace. While Orissa and Delhi have moved furthest by privitizing power distribution in their respective states, quite a few other states have unbundled generation, transmission and distribution functions into separate entities. Twenty one states have constituted State Electricity Regulatory Commissions.

III. PORTS

India has over 3,728 miles (6,000 km) of natural coastline and is strategically well-positioned on global trade routes. India has 13 major ports and over 181 minor ports (of which 139 are operational), which together handle the bulk of India's foreign trade. Most of the major ports in India were established after independence, except for Kolkata (Calcutta) and Mumbai (Bombay), which were built in the nineteenth century by the British. Responsibility for all major ports has mainly been, and still is, in the domain of the central government. The thirteen major ports handled over 280 million metric tons of cargo in 2001–2002, mostly petroleum, iron ore, and coal; they operate under the jurisdiction of the Ministry of Shipping. The Tariff Authority for Major Ports regulates prices at the major ports, while the remaining ports fall under the jurisdiction of their respective state governments.

While overall cargo traffic grew at approximately 7 percent per annum during the 1990s, most Indian ports are already operating at full capacity and there is a critical need for augmentation of capacity. Globally, increased trade, coupled with enhanced efficiency levels and improved processes, have made it difficult for traditional ports with outdated facilities and systems to compete effectively. Indian ports are plagued by widespread inefficiencies in cargo handling, poor connectivity, a mismatch of facilities and type of cargo traffic, and outdated labor practices. In the last few years, although there has been some improvement in operational performance, with the average turnaround time falling from 8.1 days in 1990–1991 to 3.7 days in 2001–2002, there is still a long way to go to attain international efficiency levels. Indian ports also face growing competition from nearby transshipment ports, such as Colombo, Singapore, Dubai, and Salalah, which offer world-class facilities and quick turnaround times. The mismatch of cargo facilities is further likely to impede future viability of the sector, as global trade is moving increasingly toward containerized cargo, which has been growing at over 10 percent per annum; only 13 percent of India's port capacity is dedicated to container traffic.

In due recognition of the aforementioned deficiencies, the government has sought to usher in market oriented reforms in the sector. As part of this, port trusts have been given the authority to spend up to 1 billion rupees (U.S. $22.2 million) without prior permission of the central government. Ports trusts are also now required to follow a new commercial "profit and loss" accounting system. More significantly, the central governments as well as states have initiated measures to attract private participation in the sector. Major port trusts have awarded concessions for container terminals to global port majors such as P&O (Jawaharlal Nehru Port Trust [JNPT] and Chennai) and PSA (Tuticorin) and new international players are entering, viz., Dubai Port Authority in Cochin and Maersk in JNPT and Pipavav. Amidst poor efficiency gains in the port sector as a whole, the performance of some private port terminals has been impressive. The Nhava Sheva International Container Terminal developed by P&O Australia at JNPT initially expected to handle 500,000 TEUs (twenty feet equivalent units) by 2005, had already exceeded 900,000 TEUs by 2002.

It is imperative that Indian ports improve efficiency levels to match international standards. This cannot be achieved in an environment in which state-owned monopoly operators provide port services, since there is little incentive for them to improve efficiency. The experience of the private container terminal at JNPT clearly indicates the benefits that can be achieved through private sector involvement and competition. Accordingly, the government should curtail its involvement in this sector and instead devolve more power to port authorities, and embrace privatisation of various port services. In addition, the government should ensure good connectivity to ports with the rest of India's transportation network, so as to facilitate and enhance interport competition. As intraport and interport competition increases, the government should phase out economic regulation.

IV. AIRPORTS

Airports play a critical role in promoting trade, tourism, and the economic development of a country. The Airports Authority of India was constituted in 1995 to bring about integrated development and the expansion and modernization of operational, terminal, and cargo facilities at India's airports. Out of a total of 400 airports/airfields/airstrips in the country, the authority manages 94 civil airports (of which 11 are international airports) and 28 civil enclaves at defense airfields. These airports handled over 44 million passengers in 2002–2003 (15 million international and 29 million domestic). The authority is responsible for providing air traffic services over the Indian airspace and adjoining oceanic areas.

Although it may appear that India has considerable airport capacity, it has for the most part lost out in aviation; it missed the global travel boom of the 1990s, ceding its natural geographic and economic advantages as a cargo and courier hub to other countries. Air travel still remains confined to a tiny section of the domestic population. The share of India in total world aviation traffic remains minuscule. India accounted for a mere 2.4 million tourist arrivals in 2002, compared to 715 million worldwide and 130 million in the Asia Pacific region. Worldwide, tourism accounts for about 10 percent of gross domestic product; in India it is less than 5 percent.

There is considerable underutilization of existing capacity, as only 62 of India's airports are in use, with the rest remaining inactive. Moreover, there are a large number of airports where full infrastructure is available, but which operate only a few flights a day. Over 40 percent of the passenger traffic is concentrated in the two main international airports in Delhi and Mumbai, and the limited terminal capacity at these airports has led to increased congestion, bunching of flights, and delays in passenger clearance. This situation is exacerbated by outdated infrastructure, inadequate ground-handling systems and night-landing facilities, and poor passenger amenities. Grossly inadequate cargo-handling procedures at airports result in delays of days in transit from one terminal to another. Only ten airports in the country are profitable, despite airport charges in India being considerably higher than the international average.

India's airports urgently need to improve efficiency and undertake investments for capacity addition. There is an increasing recognition that private participation is the key for achieving both these two objectives. The government has recently taken a long-awaited decision on the privatization of the New Delhi and Mumbai airports, approving the proposal to set up joint ventures with 74 percent private ownership and a cap of 49 percent on foreign direct investment. The government has also approved plans for two new airports near Hyderabad and Bangalore, with majority private sector participation.

V. RAILWAYS

The Indian Railways (IR) is over 150 years old. Since independence, the IR has remained a government enterprise and it currently operates the world's second-largest rail network under single management, with a route length of over 39,500 miles (63,000 km). The railways carry over one million metric tons of freight and transport over 10 million passengers a day (of which over 5 million are in Mumbai's suburban network). The annual revenue of the IR is approximately U.S.$5.5 billion, of which freight transport accounts for 70 percent and the balance is passenger traffic.

IR is now facing strong competition from road transport, pipelines, and air transport. Arbitrary pricing policies by the government, especially after 1985, prevented IR from raising passenger fares

in line with rising costs, and led to heavy cross-subsidization by overcharging freight customers. Greater customer orientation, more flexibility, and the lower costs of road transport, contrasted with the slow movement and poor service quality of the railways, induced many freight customers to move to relatively cheaper road transport. IR is also plagued by very high operational expenses. In 2000–2001, operating ratio—that is, ratio of total working expenses to gross traffic receipts—reached 98.5 percent. Even as IR is unable to generate enough internal resources to contribute to investment plans, the government too reduced its level of financial support to the railways in the last decade.

A combination of the aforementioned factors has placed the IR on the verge of a financial crisis and led to substantial whittling down of fresh investments. The Railway Safety Committee's recommendation to invest U.S.$2.2 billion over the next five years to improve the safety of the aging network through better track maintenance and general improvements has been inordinately delayed. The need to increase investment in rail infrastructure led to a policy decision in 2000 to allow private capital in the railways sector, covering rolling as well as fixed infrastructure. In December 2002, the government announced a scheme—the National Rail Vikas Yojana—aimed at increasing the capacity of the rail golden quadrilateral connecting the four largest cities, providing better connectivity to major ports and building a few critically needed bridges over the Ganges and Brahmaputra rivers. Funds required for this scheme, estimated at U.S. $3 billion, are planned to be raised through an innovative mix of budgetary and nonbudgetary resources, including market borrowings and multilateral funding agencies.

The early 2000s have seen some initiatives involving private sector participation in the railways, one in Gujarat, completed in May 2003, entailing an investment of U.S.$119 million. The project, which aims at providing rail connectivity to Pipavav port, has been developed by Pipavav Rail Corporation, a joint venture between Gujarat Pipavav port and the IR. A similar structure is now planned to connect Krishnapatnam port in Andhra Pradesh. In the southern region, the IR is encouraging private entrepreneurs to set up private goods terminals, which will comprise multi-modal facilities for rail-cum-road links, warehousing facilities, storage facilities, and information technology backup for logistics services.

B. INFRASTRUCTURE FINANCE: AN INTRODUCTION

Traditional economists are of the opinion that infrastructure is the heart of the economy. Empirical data clearly shows that given a choice, investors prefer to invest their money in countries whose infrastructure is more developed. Hence, it can be said that rapid infrastructure development is one of the most basic ways in which a country can take advantage of economic opportunities. It is, therefore, no surprise that countries around the world focus heavily on building infrastructure.

Donald Trump i.e., the President of the United States, has openly announced that his government is planning to spend $1 trillion in order to develop infrastructure within the country.

Developing countries like India have also echoed this sentiment as they have also announced plans to spend billions of dollars in order to build and upgrade their infrastructure. Hence, it can be said that infrastructure and its financing is an important issue all across the world regardless of whether the nation is developing or developed.

Since infrastructure is such a high priority issue in the world, the financing of infrastructure projects is also considered to be very important. As a result, an entire subject called infrastructure financing

has been developed. We will study infrastructure financing in greater detail in this module. However, before that, we need to understand what infrastructure definition really is.

I. DEFINITION OF INFRASTRUCTURE FINANCING

The formal definitions of infrastructure financing are not very clear. Generally, in most countries around the world, the government issues a list of industries that are to be given infrastructure status. The financing of projects or companies involved in these sectors is called infrastructure financing.

However, this definition is more for the government's internal operations. This definition is used in order to provide tax breaks or subsidies that have been promised to the infrastructure sector.

However, there are certain shared characteristics amongst industries that are classified as infrastructure all over the world. Some of these characteristics have been mentioned below:

1. Firstly, industries which are given infrastructure status are considered to be central to the economy. This means that these industries provide the impetus for the rapid growth and development of other industries as well. For instance, industries such as roadways and railways enable faster movements of goods and services throughout the country. This helps the manufacturers in the country become more competitive as compared to other countries. The final result is an increase in exports. Other important sectors such as telecommunications and electricity are also considered to be central to the economy and hence have been provided infrastructure finance all over the world.
2. Secondly, since these industries are considered to be of strategic importance, too many private sector players are not allowed to operate in them. This creates a monopolistic market with very few players. As a result, investors are generally very keen on investing in infrastructure opportunities. However, it also needs to be understood that since these markets can be considered to be monopolistic, they are also highly regulated. Since there is only a handful of suppliers, the government fixes the prices that can be charged
3. Lastly, infrastructure assets are characterized by low risk and stable cash flows. These projects are generally built in areas where there is high demand. As a result, either the consumers or the government are willing to pay a relatively stable cash outflow for a long period of time.

The bottom line is that the defining feature of infrastructure financing is the sectors to which money is being lent. The different types of loans such as overdraft, term loan, working capital loan, etc. are generally included in the definition of infrastructure financing

II. TYPES OF INFRASTRUCTURE FINANCING

Infrastructure financing has various sub-divisions. These divisions are generally based on the type of industry that the funds will actually be utilized in. The different types of infrastructure financing have been listed below;

- **Economic:** infrastructure financing can be for purely economic reasons. For instance, when a new port is built in a country, it enables more foreign trade. These projects are generally funded using a public-private partnership. This is because these projects have net positive value. Hence, the value created can be shared between the government and the private parties. Economic infrastructure projects provide benefits to the larger economy of a region instead of providing benefits only to specific industries or people.

- **Social:** Infrastructure funding is also given to many institutions for a social cause. For instance, several projects are undertaken to provide clean water to the people. Similarly, projects are undertaken to provide healthcare and education services to the people of a region. These projects are different because they have to be undertaken regardless of the fact that they might have a negative net present value. Hence, under other modes of financing, these projects would be left out. However, when it comes to infrastructure financing, the government does spend funds on these projects even though there may not be any immediate returns. Since these projects may have a negative net present value, they are undertaken mostly by the government.
- **Commercial:** Commercial projects are just like economic projects. Except, these projects provide benefits to a set of people that can be directly identified. For example, toll roads and metro rail projects are considered to be commercial infrastructure projects. They are funded by charging the people who utilize the services.

The bottom line is that infrastructure financing is a vast field that encompasses many industries. Also, the funding models used here are slightly different since projects with negative NPV are also undertaken many times.

C. INFRASTRUCTURE AS AN ASSET CLASS

As asset class is a group of assets that have similar investment characteristics amongst themselves. At the same time, their investment characteristics are different from other asset classes. For instance, all stocks share certain characteristics amongst themselves, which they do not share with bonds. Similarly, there are certain characteristics that infrastructure also has as an asset class. These are the characteristics that make infrastructure financing an attractive investment option for investors.

I. INFRASTRUCTURE AS AN ASSET CLASS

All financial instruments related to infrastructure financing have come common characteristics regardless of whether they are debt-based, equity-based, or even options. An investor needs to understand some of these characteristics before deciding whether to put their hard-earned money in infrastructure financing.

The defining characteristics of infrastructure as an asset class have been listed down in this article.

1. **High Barriers to Entry:**

   Infrastructure projects generally comprise of public works projects. As a result, companies that bid for such projects are required to have a good amount of technical expertise in the relevant field as well as deep pockets. In many parts of the world, political connections are also required in order to land such projects. Hence, it would be fair to say that there are high barriers to entry in this field. As a result, if a company already has the approvals in place to implement an infrastructure project, investors are generally keen on investing their money. This is because of the fact that such projects have very little competition and hence provide stable, predictable cash flows.

2. **Inelastic Demand:**

Infrastructure projects are usually in industries where demand is very stable and does not change drastically in relation to small changes in price. For instance, people who pay for toll roads derive a lot of utility from their usage. They are unlikely to stop using the facility because of a minor increase in price. Also, in many cases, toll roads are the only option. Hence, demand is totally inelastic. Other infrastructure projects such as dams, power plants, ports, etc. also have an inelastic demand. This characteristic makes infrastructure financing an attractive investment class.

3. **Economies of Scale:**

Infrastructure projects are generally undertaken on a large scale. As a result, the company undertaking the project stands to benefit from economies of scale. For instance, when a company lays down a telecom network, it pays a fixed cost. The marginal cost of adding another subscriber to the network is almost negligible. This factor, along with economies of scale, means that investors stand to make hefty profits from infrastructure projects. In most cases, infrastructure projects only face limitations from the supply side. There is a significant amount of demand for such projects. This makes infrastructure financing a preferred asset class.

4. **Tax Benefits:**

Infrastructure financing is a priority for many countries worldwide. As a result, governments try to make it easier for infra companies to raise money. Hence, many tax breaks are provided to infrastructure companies all over the world. So much so, that tax breaks have become a synonym for infrastructure financing. These tax breaks are the reason that infrastructure-related investments provide a higher yield to individuals as well as to businesses.

5. **Long Gestation Period:**

Infrastructure projects are supposed to have a very long life. Roads, bridges, dams, and railway lines last for several decades. In fact, in many cases, infrastructure projects may take a decade or so to build. During the build phase, the project does not generate any revenue. However, the project still survives because of the long life of the debt which has been floated. Infrastructure finance bonds generally have a very long duration. A lot of times, perpetuities are used to finance such projects. Infrastructure projects have a long life, stable cash flows, and limited ability to generate returns. It is for this reason that many infrastructure companies use a lot of leverage in order to accentuate the return on their investment.

6. **Low Sensitivity To Economic Swings:**

Lastly, one of the most important characteristics of infrastructure financing is that it has a very low sensitivity to economic swings. In simple words, this means that even if there is a recession, the number of people using infrastructure projects, as well as the revenue generated from such projects, remains more or less unchanged. This characteristic is very important for many investors since it allows them to use infrastructure to diversify their portfolio. Infrastructure financing can be accommodated in a portfolio where equity and debt are already present. When equity rise, debt falls, and vice versa. However, infrastructure-related instruments tend to remain stable regardless of the rise and fall in

other investments. As a result, it can be used as a defensive financial instrument in a portfolio.

The bottom line is that infrastructure financing has some very attractive characteristics, which has helped it emerge as an important alternative investment asset class. Most funds across the world have some amount of money invested in infrastructure assets.

D. INFRASTRUCTURE FINANCE PROJECTS: MAJOR SOURCES OF FUNDING

It is a known fact that the world is in great need of infrastructure projects and, therefore, infrastructure finance. Developing countries need to build their infrastructure for the first time. This needs to be done in order to attract more investments. However, even developed countries need to build more infrastructure projects. This is because the population in the developed countries is growing steadily. As a result, the infrastructure which was adequate a few years earlier is no longer adequate. Also, normal wear and tear make it necessary to build infrastructure projects.

The bottom line is that infrastructure projects all over the world need a lot of funding. It is estimated that more than $96 trillion is required to fund infrastructure projects by the year 2030. **At present, the annual budget available for infrastructure funding worldwide is close to $2.5 trillion to $3 trillion**. However, the actual amount of funds needed is more than double the available amount. Also, the problem is that most of this shortfall of funds exists in low and middle-income countries.

Funding of this magnitude cannot be provided by anyone's source alone. This is the reason that infrastructure needs to be funded by several sources having deep pockets. Some of the most common sources of infrastructure finance have been listed below:

a. Public Finance

Government funding is one of the biggest sources of funding for infrastructure finance. Tax dollars collected all over the world are spent in huge numbers on creating infrastructure. In general, countries spend anywhere between 5% to 14% of their GDP on developing as well as maintaining infrastructure. A lot of this money is spent on financially unviable projects which have social value for the community.

In many cases, the government does engage the private sector to execute the project on its behalf. However, this may be done to increase the efficiency of the project. The private sector only brings in the necessary expertise to deliver the project on time. In return, the government provides all the funding when developmental milestones are completed. In essence, governments worldwide use the services of the private sector as subcontractors.

However, it needs to be understood that infrastructure finance projects funded by the government are notorious for corruption. Since the taxpayer is paying the bill, a lot of the time, the development charges are highly inflated, and all the money spent on these projects ends up in the hands of mafia controlled by corrupt politicians.

b. Supra National Financial Institutions

Supranational bodies such as World Bank, International Monetary Fund, Asian Development Bank, etc. are also important sources of finance for infrastructure projects. However, such organizations tend to only fund projects which are financially viable. As a result, urban projects like metro rails, bridges, flyovers, etc. tend to get funded by these institutions. The internal rate of return (IRR)

required by these financial institutions is generally lower as compared to other private sector institutions.

Institutions like the World Bank and the Asian Development Bank also provide other services to enable the better execution of infrastructure projects. This means that even if they do not directly fund a project, they try to add value by providing advisory services such as loan guarantees, advisory services for the creation of suitable policies, etc. In many cases, these institutions also provide treasury services to infrastructure projects. This is done to enable optimal utilization of funds.

c. Private Finance

Governments all over the world are desperately seeking the intervention of private money to help fill the funding gap being faced for infrastructure projects. As a result, many private mutual funds have been set up for this purpose. Governments try to make these investments more attractive by providing tax breaks to individuals who invest their money in such projects. A wide variety of financial instruments (both debt as well as equity) are being used to help channelize the savings of the general public towards infrastructure projects. Attempts are also being made to woo institutional investors such as insurance companies and pension funds to increase the amount of funding available.

d. Public-Private Partnership

The public-private partnership model is also widely used in infrastructure funding. This model works differently than public funding. Here, instead of the government using its money for the initial outlay, the private sector does so. The idea is to create a partnership, where the government brings in land and other resources, wherein the private party brings in technical expertise. The private party then has certain rights over the asset it has helped developed. For some years, the government allows the private party to collect money in order to generate revenue and payback its investment plus a reasonable amount of profit. Then the asset is finally given back to the government, which can decide whether or not they want to continue collecting revenue for the upkeep of the project. The only problem with this model is that it can only be used to raise funds when the underlying project is extremely viable i.e., provides an IRR that is sought after by private investors. Otherwise, private investors will simply give it a pass.

The simple fact is that extremely large sums of money are required for infrastructure projects. One source of funding cannot really help fulfill the gap. In fact, all the sources of funding, together, may also not be adequate. **There are many governments in the world who are trying to set aside as much money as they can for infrastructure projects**.

UNIT – 4 – PROJECT STRUCTURING AND RISK

Infrastructure projects are vital for every country around the world. It's what allows us to commute on a daily basis or to have power in the buildings we are living and working. Schools, motorways, new metro stations are only a few examples of why infrastructure construction projects are so important for a nation.

Entering the digital era, the development of infrastructure projects is increasing at a high pace. That is the result of a number of factors such as the boost of the global population and the serious lack of affordable housing.

On top of that, the need for smart and data-driven infrastructure is more imminent than ever before. Without exaggeration, it can pave the way for the emergence of cities that are better connected with each other and have effective and intelligent structures.

I. WHAT IS INFRASTRUCTURE PROJECT MANAGEMENT?

It is already clear that infrastructure construction projects can improve both the economic production of society and the quality of life of its members. In that sense, the value of up-to-speed infrastructure project management is immense. Infrastructure project management could simply be defined as the management of infrastructure construction projects. From a general point of view, it follows the same processes and principles as other categories of project management in construction.

The slightest delay in one aspect of an infrastructure project may lead to serious delays in the entire project resulting in budget overruns and costly disputes between the different stakeholders.

II. TYPES OF INFRASTRUCTURE CONSTRUCTION PROJECTS

Of course, not all infrastructure construction projects are the same. Despite the similar pains they have to battle against, there are a number of different types of such projects. In a nutshell, here are the main categories of infrastructure construction projects:

- Roads and highways: One of the most common types of infrastructure construction projects. When it comes to roads, these projects mainly focus on repair and maintenance as the reconstruction of an entire road can be pricey. In the case of a highway, things might differ a bit with the reconstruction or expansion to be considered as one of the main options.
- Airports: Airports are in need of continuous improvements and expansions. In an effort to provide services of high quality and resolve the air traffic congestion, airports invest both in constructing new runways and creating more utility areas for the passengers.

- Energy network: Electricity is the largest subsector of infrastructure projects in Indian construction and it is expected to grow exponentially. Such projects may focus on power generation or transmission. In addition, maintaining and/or repairing a power plant can also be a part of this process.
- Rail: The development and maintenance of rail depots and infrastructure is another area of great activity in infrastructure projects. Their main goal is to reduce congestion for passengers, support the regeneration of different neighborhoods and connect cities and areas in a quick and efficient manner.
- Telecommunications infrastructure: Telecommunications cover a wide spectrum of technologies and services that connect the entire world. Depending on the geographic location the quality of telecommunications might vary.
- Water infrastructure: Water infrastructure projects ensure that all citizens can have access to the most precious good on Earth. Projects that fight water scarcity and projects that facilitate its distribution are two of the most characteristic examples of water infrastructure projects. It goes without saying that the nature of such projects may differ from country to country depending on the local climate.
- Bridges: Another common yet very important infrastructure project has to do with the construction or repair of bridges. They can provide great service with regard to alleviating traffic but they come with huge admin burden. One of the biggest challenges is the maintenance/repair of bridges as they continuously accommodate a large number of people.
- Waste management: Regardless of the type of waste, waste management projects hold a significant role in the effort to keep both the people and the environment safe. This could translate to projects that focus on the removal and transportation of waste and dangerous materials out of the cities.
- Social infrastructure: Schools and hospitals are two of the most classic examples of social infrastructure. Simply put, it's the infrastructure that is targeting to provide a service of societal value to the public.

III. WHAT IS THE DIFFERENCE IN INFRASTRUCTURE MANAGEMENT AND CONSTRUCTION MANAGEMENT?

Infrastructure management and construction management might cross paths at some project stages but they have one major difference. Infrastructure management covers a wider spectrum of project phases from design to construction, legal, finances, and operations.

In other words, infrastructure management focuses on managing the infrastructure over its entire lifecycle. What is more, infrastructure management projects are usually addressed to a bigger part of the society and involve the State as the Client or at least one of their main stakeholders.

IV. THE BIGGEST CHALLENGES OF INFRASTRUCTURE PROJECT MANAGEMENT

Managing an infrastructure project isn't easy. There are a plethora of parameters that should be taken into account for a project to start and complete on time and on budget. Stakeholders and tasks are inextricably connected to each other so every alteration to the agreed plan matters.

That being said, it is of paramount importance that the programme is followed with precision and that all stakeholders have access to a centralized hub where all information is stored. In that way, nobody is working on an outdated version of the programme and costly misunderstandings are avoided.

All in all, here are some of the biggest challenges that emerge on a typical infrastructure project in construction:

- Finding a way to increase work efficiency across many stakeholders
- Facilitating better communication on and off-site
- Tracking project performance effectively
- Collaborating and communicating efficiently with all project stakeholders
- Having traceable contractual requirements
- Checking project status in real time

It becomes easily evident that a unified digital platform could help industry stakeholders increase efficiency and improve communication while ensuring adherence to contractual obligations.

V. HOW INFRASTRUCTURE PROJECT MANAGEMENT SOFTWARE CAN BOOST EFFICIENCY

Increasing the efficiency of the planning system, while also driving an effective long-term strategy for the sector should be seen as a priority. However, becoming better in delivering projects on time and on budget is no child's play.
There are certain steps that should be followed in order to ensure a successful result. In short, here are five ways infrastructure project management software can help you boost the efficiency of your projects:

1. Benchmarking for better performance

That's the first step to the standardisation of the sector. Introduce the tools and processes that will allow you to establish accurate benchmarks so that you can identify the design, budget and operational needs of a project before it begins.

In that way, you can mitigate risk and pave the way for an open and highly collaborative data ecosystem where all stakeholders can receive and submit updates in real time. It goes without saying that precise data collection and analysis is an integral part of this process.

Lastly, defining the desired results and outcomes from this infrastructure investment is also vital and will add more clarity in your effort to introduce best practices and benchmarks of performance.

2. Alignment and integration

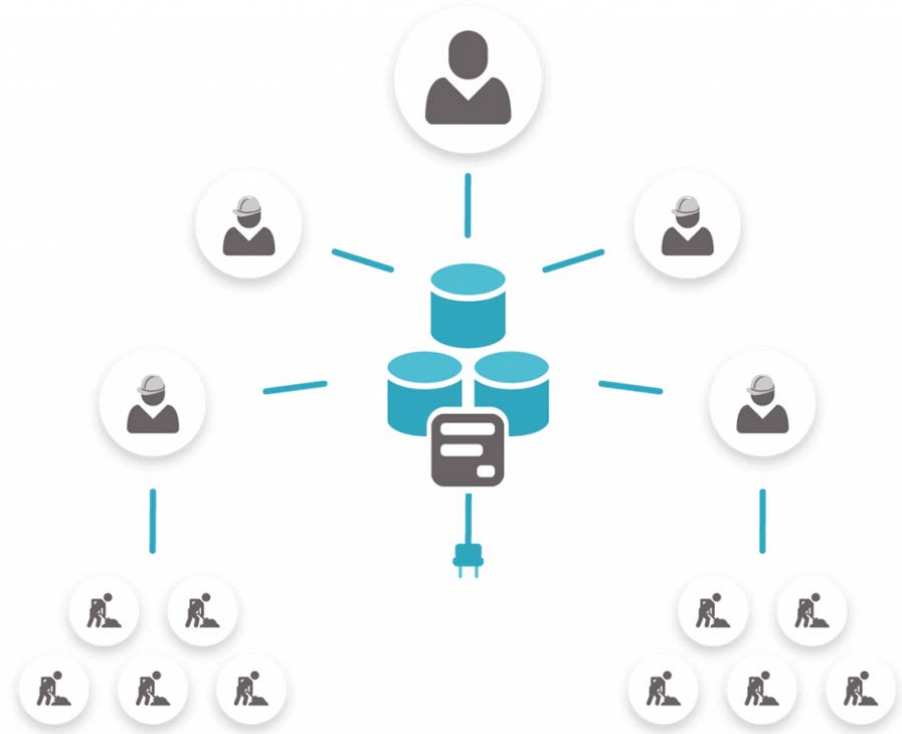

Figure 24 Alignment and Integration

Working with a range of software tools for different disciplines and functions is a given on most infrastructure projects. Integrating these tools and processes on one platform ensures optimal and efficient use of data.

Through software integrations you can enhance the utilisation of your existing systems and combine factors such as time, cost, quality, safety, and resources.

In LetsBuild, for instance, you can bring the data from your existing systems into the platform and work with a live plan. This will allow you to have LetsBuild as your digital backbone to manage your projects across all tools.

3. Better connection between the client and the supply chain

Creating a better communication flow across the supply chain is substantial for the success of every infrastructure project. Adding also the client to the equation can guarantee that a project will proceed with fewer delays and misunderstandings.

By using a reliable digital tool all project sides can have the transparency and overview they need to take control of their projects. This will allow for more proactive and effective meetings and help the different stakeholders to learn through data from past projects.

4. Smart reporting

Reports take a lot of time and effort in the course of any infrastructure project. With a digital tool, like LetsBuild, you can combine with 1 click all your data into valuable and detailed construction reports.

Like that, you can easily distribute field reports periodically and communicate overall process. In addition, you can record all the necessary information for your site diary and daily logs without having to deal with the enormous admin and mental burden that come with it.

Finally, by keeping a detailed record of every action around the project you will never have to wonder what actually happened and you can easily retrieve any information that you might need at any time.

VI. EVERYTHING STARTS FROM USER ADOPTION ON SITE

From this corner, we have many times referred to the importance of digital adoption on site. The sector tends to focus a lot on the value that a 3D model or a digital twin can bring to the building process failing to consider the key component of it. That is data and, by extension, digital adoption.

A BIM model is only as precise and useful as the bits of information fed to it. In that aspect, on-site adoption should be perceived as one of the most decisive factors for your success when it comes to infrastructure project management. This is why the simplicity of the tools that your organisation uses matters so much.

People on site should be able to report progress and submit their latest updates from the field just by using their mobile or tablet device. The easier the data capturing progress is the simpler it will be for the on-site personnel to use the new technologies and join the digital revolution that you want to initiate.

This doesn’t mean that you should ignore the value that a 3D model can offer. However, there are different levels of transparency depending on someone’s role in a project.

A. LARGE INFRASTRUCTURE PROJECTS SUFFER FROM SIGNIFICANT UNDERMANAGEMENT OF RISK THROUGHOUT THE LIFE CYCLE OF A PROJECT, AS THE MANAGEMENT OF RISK ISN’T PROPERLY ACCOUNTED FOR IN THEIR PLANNING.

The World Bank estimates that a 10 percent rise in infrastructure assets directly increases GDP by up to 1 percentage point.1 Insufficient or underdeveloped infrastructure presents one of the biggest obstacles for economic growth and social development worldwide. In Brazil, for example, development is constrained by narrow roads, a lack of railways in the new agricultural frontiers, and bottlenecked ports, all of which are unable to meet the transport needs of a newly wealthy consumer mass.

Infrastructure projects are high on governments' agendas, and the infrastructure-development and investment pipeline is huge. The current global project pipeline is estimated at $9 trillion, one-third of it in Asia. India is expected to spend some $550 billion on large-scale projects over the next five years, half of which will be in the energy and utility sectors (Exhibit 1). Developed economies also have significant infrastructure plans. The United Kingdom, for example, has identified an infrastructure pipeline of over 500 projects that is worth more than £250 billion.

The current global pipeline for infrastructure projects is estimated at $9 trillion.

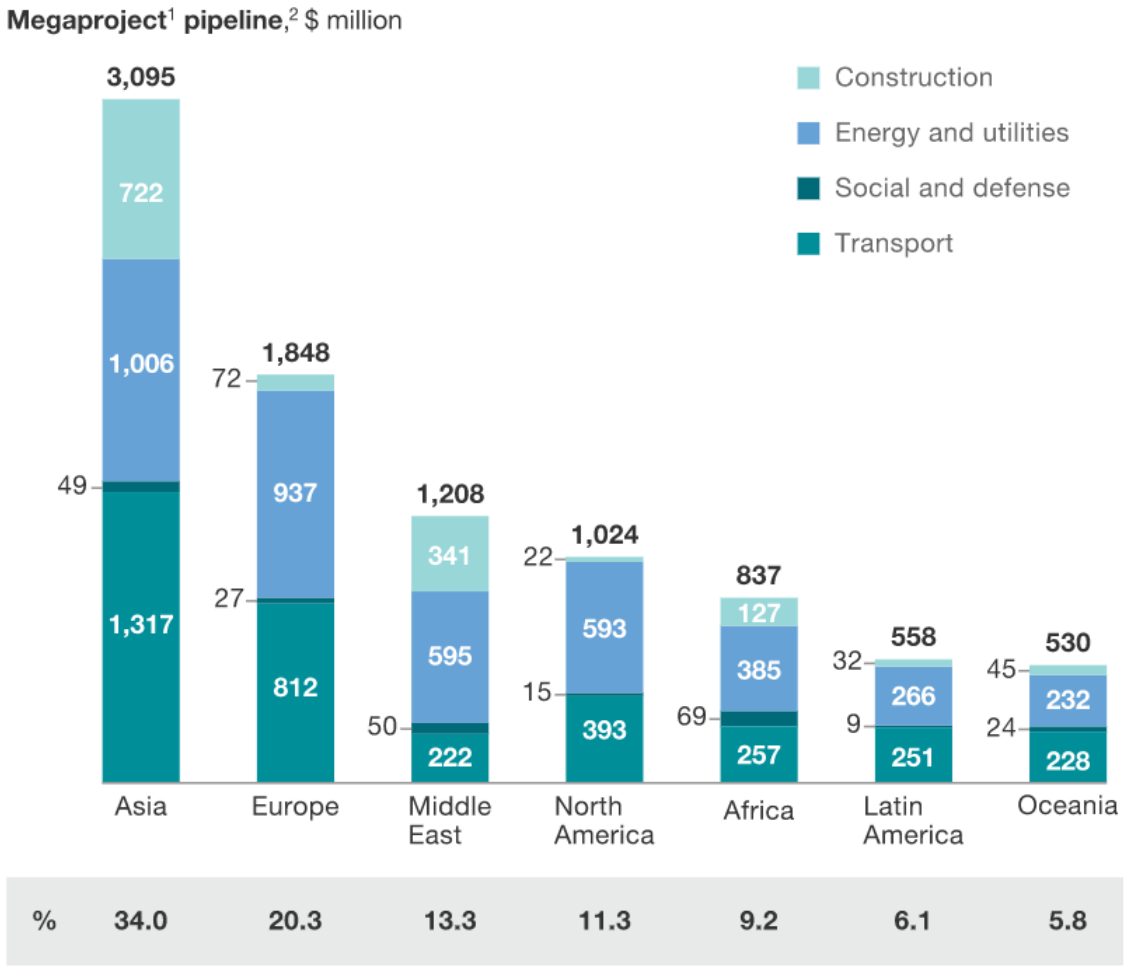

Figure 25 Mega Projects in pipeline

However, major infrastructure projects have a history of problems. Cost overruns, delays, failed procurement, or unavailability of private financing are common (Exhibit 2). The final cost of the much-anticipated Eurotunnel between the United Kingdom and France, for example, was significantly higher than originally planned, while the Betuwe cargo railway linking the Netherlands and Germany came in at twice the original €2.3 billion budget and more than four times the original estimate. Nor are these problems confined to the past. Today, the construction of Kuala Lumpur's new airport terminal, for example, is facing huge cost overruns and significant delays following frequent design changes.

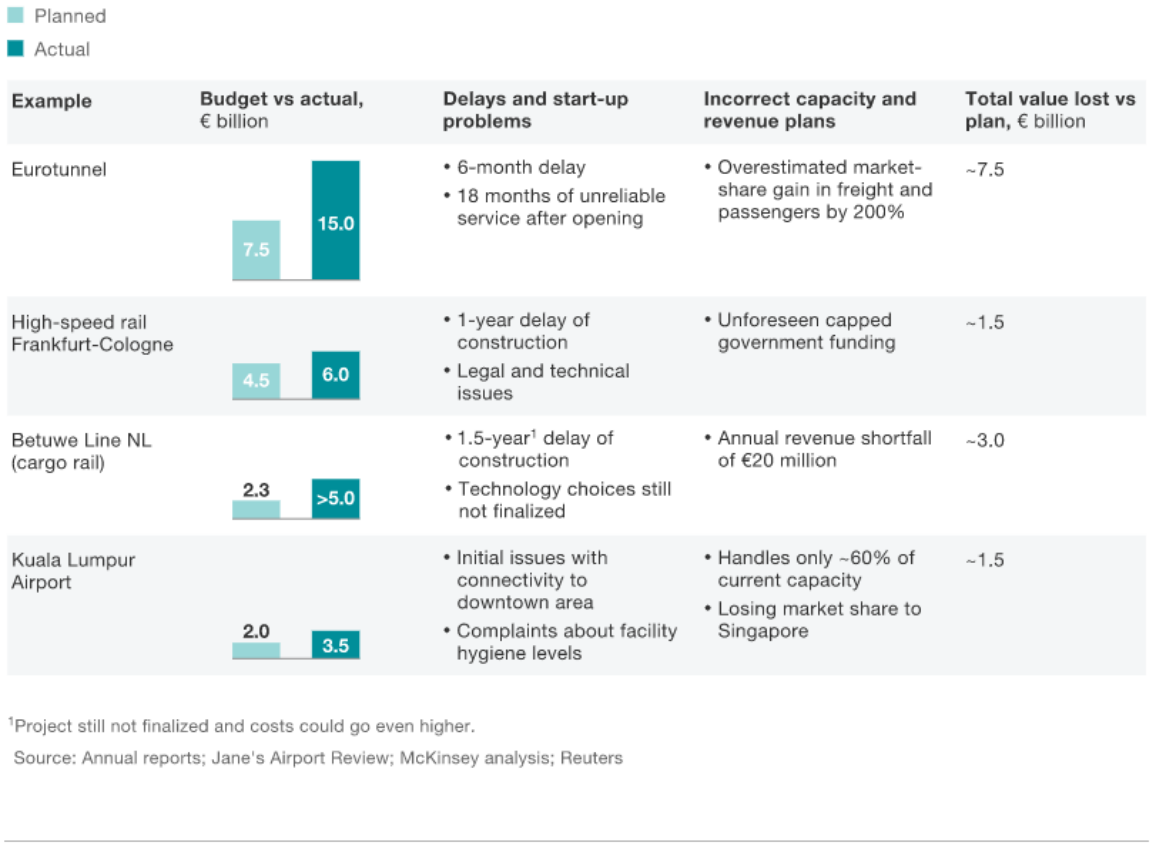

Figure 26 Challenges of large projects

In our view, most overruns are foreseeable and avoidable. Many of the problems we observe are due to a lack of professional, forward-looking risk management. Direct value losses due to undermanagement of risks for today's pipeline of large-scale projects may exceed $1.5 trillion in the next five years, not to mention the loss in GDP growth, as well as reputational and societal effects.

Large infrastructure projects suffer from significant undermanagement of risk in practically all stages of the value chain and throughout the life cycle of a project. In particular, poor risk assessment and risk allocation, for example, through contracts with the builders and financiers, early on in the concept and design phase lead to higher materialized risks and private-financing shortages later on.

Risk is also undermanaged in the later stages of infrastructure projects, destroying a significant share of their value. Crucially, project owners often fail to see that risks generated in one stage of the project can have a significant knock-on impact throughout its later stages.

The structuring and delivery of modern infrastructure projects is extremely complex. The long-term character of such projects requires a strategy that appropriately reflects the uncertainty and huge

variety of risks they are exposed to over their life cycles. Infrastructure projects also involve a large number of different stakeholders entering the project life cycle at different stages with different roles, responsibilities, risk-management capabilities and risk-bearing capacities, and often conflicting interests. While the complexity of these projects requires division of roles and responsibilities among highly specialized players (such as contractors and operators), this leads to significant interface risks among the various stakeholders that materialize throughout the life cycle of the project, and these must be anticipated and managed from the outset.

And because infrastructure projects have become and will continue to become significantly larger and more complex, losses due to the cost of undermanaged risks will continue to increase. This will be exacerbated by an ongoing shortage of talent and experience—not only are projects more complex, but there are also more of them, which will create demand for more effective and more systematic approaches and solutions.

Surprisingly, the risks of large infrastructure projects often do not get properly allocated to the parties that are the best "risk owners"—those that have a superior capability to absorb these risks. This can result from a misunderstanding or disregard on the part of governments of the risk appetite, for instance, of private investors who are sensitive to the kinds of risks they accept and under what terms. Providers of finance will often be the immediate losers from poorly allocated or undermanaged risks. Even in public-private-partnership (PPP) structures, private-risk takers and their management techniques are introduced too late to the process to influence risk management and allocation, and therefore they cannot undo the mistakes already embedded in the projects. One crucial consequence is an increase in the cost of financing PPP projects and a greater need for sovereign guarantees or multilateral-agency support. In the end, however, society at large bears the costs of failures or overruns, not least in the form of missed or slowed growth.

Private sources of investment are becoming increasingly scarce. Banks have weak balance sheets and are under severe regulatory pressure to avoid or limit long-term structured finance. Many are either reducing or exiting their infrastructure-financing businesses. Other potential "natural owners," such as pension funds and insurance companies, either have regulatory constraints or are still in the early stages of considering direct investments and building up the necessary expertise.

This helps to explain why the dominant financing solution to deliver infrastructure projects is through budget-financed public-procurement processes. It is striking to see that—in the absence of private-sector management techniques and private-sector risk takers—public-infrastructure sponsors seldom apply stateof-the-art risk- and project-management tools and techniques, despite the knock-on consequences of being seen to "lose" public money during a time of increasingly constrained public budgets.

In effect, a larger volume of riskier infrastructure projects, managed by public servants who lack of risk- and project-management skills and resources, seeks funding from a market with lower financial supply and a significantly lower risk appetite among providers of both public and private financing.

This is not to argue that the public sector lacks any risk-management capabilities. In fact, many public-sector processes are very sophisticated, but they are geared toward ensuring transparency itself and avoiding the reality or appearance of misconduct and do so at the expense of effectiveness, efficiency of the process itself, and operational and execution risk-management objectives. As a result, the seeds of many project failures are sown in the early stages of

development, when a poorly designed project-delivery approach or ill-considered procurement decision can lead to delays, higher costs, and ultimately diminished returns.

A more comprehensive approach to risk management would address the key issues facing all parties and stakeholders involved in a project throughout its life cycle, including project originators and sponsors, that is, governments and public entities, tackling both perceived risk, and financing gaps. In the remainder of this paper, we set out how good practices in project structuring and risk management can radically improve outcomes in big infrastructure projects. We explain what a comprehensive "through the life cycle" risk-management approach requires.2 We also outline the benefits of, and processes involved in, effectively implementing a risk-management capability.

Good risk-informed project management requires the following:

- a comprehensive conceptual framework that introduces risk management across the value chain and highlights the most critical issues and design choices to be made
- a strong set of practical approaches and tools that help governments and companies make these design choices and manage risks more proactively and thus more effectively
- an implementation framework that effectively introduces and ensures the application and execution of discipline in day-to-day business, starting in the beginning of the design phase all the way through the life cycle of a project

I. PROJECT RISK ACROSS THE INFRASTRUCTURE LIFE CYCLE

Proper front-end project planning is all about shaping the project's risk profile so it can be managed during execution, and execution is all about aggressively mitigating the risks that emerge. The key is to know what risks are inherent to a project and what degree of freedom you have to shape the risk profile before you commit the bulk of your funds; you must also have skills in place to prevent the remaining risks from getting out of control. Then you can discuss what skills and processes are needed during front-end planning versus execution. In practice, they are quite different.

There is an inherent conflict between the aspiration to limit the number and volatility of potential future (interface) risks and the need to maintain flexibility to respond to unforeseen changes over the life cycle of a project. The fact that risks can materialize in later stages, but have actually been caused in earlier stages under different responsibilities, requires an end-to-end risk-management view, as opposed to a siloed, individualized process-step responsibility. There is a clear need for strong risk-management processes from the outset and for these to be applied and continuously developed throughout the life of the project.

A state-of-the-art risk-management approach for infrastructure projects needs to reflect the peculiarities of the business. A good starting point is to undertake a forward-looking, life-cycle-oriented risk assessment and to generate insights into the root causes of identified and potential risks at the beginning of the project—in the project-origination and design phase. A true understanding of stakeholders' capabilities and willingness to take on and actively manage certain risks—the risk-ownership structure—and the respective allocation and pricing of these risks would be a logical next step. In addition, strategy and risk-related processes need to be strengthened, and the governance and organization—as well as the risk cultures—of all stakeholders need to be enhanced.

The involvement of risk-taking private-financing perspectives early on, for example, as applied in a PPP, can ensure a more professional and disciplined approach to strategy, risk and project management, and deal structuring.

To improve the successful provision of infrastructure projects, whether through PPPs or public procurement, all stakeholders across the value chain of an infrastructure project need to be subjected to rigorous private-sector risk-management, risk-allocation, and financing due diligence. They should also be required to contribute to the effective implementation of risk-management and mitigation capabilities across the life cycle of the project.

Assessing risks across a project's life cycle can be a powerful way of making it more resilient and ultimately more profitable for all of the participants across the value chain. This approach shares many elements with enterprise-risk-management (ERM) processes that are common in other sectors. Exhibit 3 provides an example of a generalized ERM framework.

Figure 27: Integrated enterprise risk management

Several concepts derived from ERM are applicable for infrastructure:

- Forward-looking, through-the-life-cycle risk assessment: management focus on a proactive, forward-looking business-oriented performance dialogue on risk and return
- Risk ownership and strategy: a conscious optimization effort to protect and create value by allocating risks to the best risk owners across the life cycle, including an explicit reflection of the respective risk appetite of these risk owners, for example, private financiers
- Risk-adjusted processes: risk management as an institutionalized capability, integrated into important processes such as business-case planning, as well as through explicit risk processes like monitoring, control, and mitigation, with all stakeholder parties involved across the life cycle of the project
- Risk governance: risk management as a priority on top management's agenda, reflected in responsibilities and organizational design, for example, through an independent view on risk
- An explicit and effective "risk-return culture" within the control functions, but especially with project managers and in the project-execution force

Importantly, ERM is not a purely administrative "checking the box" exercise that aims only to create regulatory or board compliance. ERM is meant to connect the boardroom, where important risk-relevant decisions are made, to the engine room of risk managers, where a lot of relevant information and insight needs to get produced.

II. EFFECTIVE RISK MANAGEMENT IN INFRASTRUCTURE PROJECTS

Typically, as noted earlier, many projects fail because of choices made in the early stages of development. A poorly designed project-delivery approach or the wrong decisions about procurement can also lead to delays, higher costs, and diminished returns. Project risk management has to be a core element of project selection, planning, and design, and it has to be continuous across the entire life cycle of the project. For each stage of a project, there are some common questions:

Forward-looking risk assessment: which risks is the project facing? What is the potential cost of each of these risks? What are the potential consequences for the project's later stages as a result of design choices made now?

Risk ownership: which stakeholders are involved and which risks should the different stakeholders own? What risk-management issues do each of the stakeholders face, and what contribution to risk mitigation can each of them make?

Risk-adjusted processes: what are the root causes of potential consequences, and through which risk adjustments or new risk processes might they be mitigated by applying life-cycle risk-management principles?

Risk governance: how can individual accountability and responsibility for risk assessment and management be established and strengthened across all lines of defense?

Risk culture: what are the specific desired mind-sets and behaviors of all stakeholders across the life cycle and how can these be ensured?

PHASE 1: SELECTING, PLANNING, AND DESIGNING PROJECTS

Governments initiate the vast majority of infrastructure projects. This creates natural tension because delivery times for projects typically run beyond the election cycle, meaning that any future payoff might accrue to political opponents. In addition, governments are often reluctant to spend money at the outset, preferring to appear thrifty even if there will be far higher costs later on. Often efforts are hampered by the lack of an overarching infrastructure strategy, but many other factors can lead to individual projects being plagued with problems. These include incorrect forecasts and assumptions (for example, on demographics, demand, prices, revenues, capital expenditure, or operating expenditure), a limited understanding of market dynamics, and lack of willingness to plan for volatility and adverse scenarios. Overestimating revenue and growth potential while underestimating risk results in badly designed projects that deliver lower-than-expected returns or, in the worst case, a project that must be canceled or abandoned after significant up-front investment. The Oedo subway line in Tokyo, for example, earned revenues much more slowly than anticipated due to massive delays in delivery and overly optimistic forecasts.

Other challenges include poor planning and management of future interface risks, caused by early-stage decisions regarding project structures and design. For example, the highly praised HSL-Zuid high-speed rail-line PPP in Netherlands (which was named PPP Deal of the Year in 2001) later incurred a 43 percent cost overrun as the original "particularly appetizing risk profile" of the deal included the breakup of the project into three separate subprojects, causing significant interface risks that were only identified, and were then poorly managed, after the deal was closed.3 Crucially, the risk appetite of developers, contractors, and private investors, who are essential in later stages of the project life cycle, is often not taken into account.

A life-cycle risk-management approach involves making decisions using a risk-based perspective. Specifically in the earliest design and planning phases of a project, this may require a conscious effort to identify, assess, and, ideally, quantify the risks the project will be exposed to across its life cycle. This includes reflection on potential adverse circumstances and scenarios (for example, stress testing). In large subway constructions, for instance, the risks of geological obstacles, environmental challenges, and future customer numbers and behaviors can and should be explicitly taken into account as drivers of volatility of project construction and future cash flows. A life-cycle approach demands the alignment of people and management toward a more risk-conscious set of processes.

Each individual project should use a stage-gate approach to ensure that projects do not progress without key deliverables being completed. Using predefined risk-register templates enables this to progress smoothly. Private financial discipline should be used in planning, designing, and structuring projects even before private investors are involved, helping to adjust incentives and penalties so that they are matched appropriately—and applied—to each relevant party.

The primary objective is to create a transparent and flawless decision-making process to select the investment that best achieves assigned targets under the global mandate of the sponsor. This is a major challenge. Too often projects are "gold plated" or overdesigned for the commercial opportunity, resulting in too much complexity and a lack of economic viability. Sponsors need to adopt a realistic commercial approach from the outset, making sure the project can meet its defined

needs and is designed so that it also meets its target costs. Potential future interface risks would be identified early on in the process, and the required resources and skill set to manage those risks would be factored into any decision taken with respect to alternative project structures. It should be clear from the outset how any new project fits in to a wider strategy. For example, a project for a new airport should form part of an overall national strategy for transport.

State-of-the-art forecasting techniques should be applied, helping to avoid common problems such as overdesign, mismatched capacity and demand, or misjudgment of interdependencies with other projects.

The project can be evaluated using adverse scenarios, stress tested, and set up with the appropriate monitoring and reporting processes. An economic model that integrates time risk, cost risk, and uncertainties can be deployed to produce a clear business case and range of expected financial returns. In this regard, it is crucial to consider potential private-sector requirements early on (both technical and financial).

During front-end planning, there are several key risk levers to pull:

- conceptual design (what you'll ask the contractors to design and build)
- the procurement model (how you select contractors)
- contracting model (under what terms the contractors work)
- the project-management model (how you will manage the contractors to deliver the project)

All of the business-case evaluation falls under conceptual design, but success in the end is all about the interface between the owner and the contractor. Projects can go wrong for lots of other reasons (for example, a road is being built over contested ground or a natural disaster occurs), but most are addressed through force majeure. Escalation in the cost of labor or materials is something that good planning should account for and falls under the procurement and contracting models.

PHASE 2: PROCUREMENT AND CONTRACTUAL DESIGN CHOICES

Public procurers, such as governments and their respective ministries, as well as public-private collaborations such as PPP units, developers, and contractors are the main stakeholders for this stage of an infrastructure project. They often fail to select the optimal risk-return ownership structure ahead of the procurement stage, making it difficult to adjust or reassign risk or responsibility once the project has commenced. The risk appetite of private players is frequently neglected or poorly understood and there is limited transparency of risk cost,risk ownership, and risk-return trade-offs.

Procurers frequently select the wrong strategy, disregarding or misjudging the ability of private-sector players to control certain risks. It is extremely complex and costly to reverse a tender process once launched, as the United Kingdom found to its cost over the tender of a contract to run one of its main train routes in 2013.

A failure to allocate risk to the right parties and to anticipate potential problems—such as sourcing bottlenecks—causes cost overrun and significant time delays. For example, the London Jubilee line extension incurred a 42 percent cost overrun in part through a failure to anticipate future risks.

Again, a life-cycle risk-management approach can help to mitigate these significant risks. There should be an early focus on optimal risk-ownership allocation, including a clear knowledge of alternatives, and early application of risk management before any procurement decision is taken. Funding and financing sources should be aligned early on so that future means of funding support, such as tolls, taxes, or fares, are matched with the proposed financing, such as bank loans, bond proceeds, or equity investments. The risk profile of the funding source needs to be appropriate for the proposed finance.

Stakeholders are advised to identify risks and value drivers, such as delays or increases in material prices, from the outset and decide who will be responsible for each of these. This provides a mechanism to drive contractor behavior and ensure ongoing accountability.

It is vital to ensure that required expertise in planning, structuring, and so on is brought in early on, and that due diligence is conducted on contractors before selection. The project owner's ability to manage the contract must be assessed and strengthened if necessary.

The life-cycle risk-management approach and early focus on optimal risk-ownership allocation are as important for budget-financed public-procurement projects as they are for PPPs involving private investors. Because governments take financial risks in public-procurement structures, they should structure their investment and manage their risks as private investors do. This could clarify their knowledge and application of available alternative risk-allocation models (for example, outsourcing of operations and maintenance activities), but could also result in a changed approach to how public funds are "allocated" within the government. For example, the ministry of finance or another relevant ministry could consider acting as a lender and charging a risk premium for public funds to discipline those using the funds, such as other ministries or public authorities.

PHASE 3: CONSTRUCTION DELIVERY

Asset owners and financiers are the stakeholders in the construction delivery phase insofar as this relates to engineering and construction (E&C) contractor monitoring. E&C contractors are responsible for on-time, on-budget, and on-quality delivery and financing.

Problems often arise because E&C contractors either fail to meet their contracts, resulting in cost overruns, delays, and defects, or are only able to perform their contractual obligations at the cost of significantly reduced profitability of their business. Poor original planning and performance management of resources and cost is one of the key drivers of this failure, and this is compounded in many cases by a failure to identify potential issues early in the process. Moreover, there is often a focus on the management of individual contracts, which means that the portfolio effects of multiple contracts at the enterprise level are overlooked.

Further, there is often a disconnect between contractual obligations and transparency about a contractor's ability to deliver. Management of the relationships between clients, suppliers, and subcontractors can be haphazard, and often this comes back to poor contractor selection and management in the early phases. A consequence can be cost and budget overruns, and these can have a significant impact on a broader economy. Delays to the opening of Hong Kong airport, for example, resulted in a loss of more than $600 million to the economy.

A life-cycle approach can alleviate many of these issues. Owners need to design appropriate metrics and processes to measure contractor performance. This should be translated into a proper documentation and log system for tracking progress that allows the owner to get the information

they need to manage the contractor effectively. This could include a detailed monthly schedule, with measureable key performance indicators (KPIs) linked to the contract. Financial risk should be managed and an incentive system established through milestone payments and daily contractor-compliance monitoring. Professional standards of information storage and flow should be ensured through clear rules on how information should be handled and the interaction required and expected between owner and supplier. Any slippage from contractual obligations can be planned for within an overall portfolio of obligations and contracts. Often it is helpful to designate a dedicated project risk manager and team with overarching risk responsibility. For each package or area of a project, clear risk owners need to be identified, and daily site meetings should be held to assess progress against targets, slippage, and potential problems.

In summary, during project execution, the key risks for the sponsor or developer are related to contractual default, claims, keeping public political stakeholders aligned, and monitoring for any mismanagement by the contractor. The interface with the contractor is therefore the critical element. However, this phase is all about mitigating risks, and the ability to influence the magnitude of these risks is smaller than during planning.

PHASE 4: ASSET OPERATION

Finally, operation is the least complicated phase because you have a steady-state system where good operational practices can address many of the issues. In this phase of a project, asset owners and financiers are the stakeholders insofar as this relates to operation and maintenance (O&M) contractor monitoring, while O&M contractors are responsible for ensuring on-time, on-budget, and on-quality service delivery and financing. In reality, they often fail to meet contractually agreed-upon KPIs for service quality or availability, resulting in delays and increased costs. This can be because incorrect design specifications do not meet contractors' requirements or because of poor forecasting around service load, maintenance cycles, or operating expenses. An inability to adjust to a changed commercial environment through changes in contract terms can also be a factor.

As a first step, project owners can reduce and better manage these risks by outsourcing O&M monitoring to avoid in-house restructuring and to allow for the replacement of poorly performing contractors. A design or construction interface with the O&M contractor should be planned and managed early on and the long-term implications of today's design choices evaluated. State-of-the-art forecasting techniques should be applied and KPIs planned under adverse scenarios, including stress testing. Ongoing monitoring and reporting should be established, and the project should allow for operational flexibility by focusing on KPIs rather than operational structure.

III. THE BENEFITS OF LIFE-CYCLE INFRASTRUCTURE-RISK MANAGEMENT: A CASE STUDY

In 2011, a major transportation-asset operator and developer embraced a life-cycle approach to managing its large project pipeline (Exhibit 4). Top management committed to reduce its risk-related provisions by one-third; better risk management was identified as a core driver of profit and loss, value creation, and competitiveness.

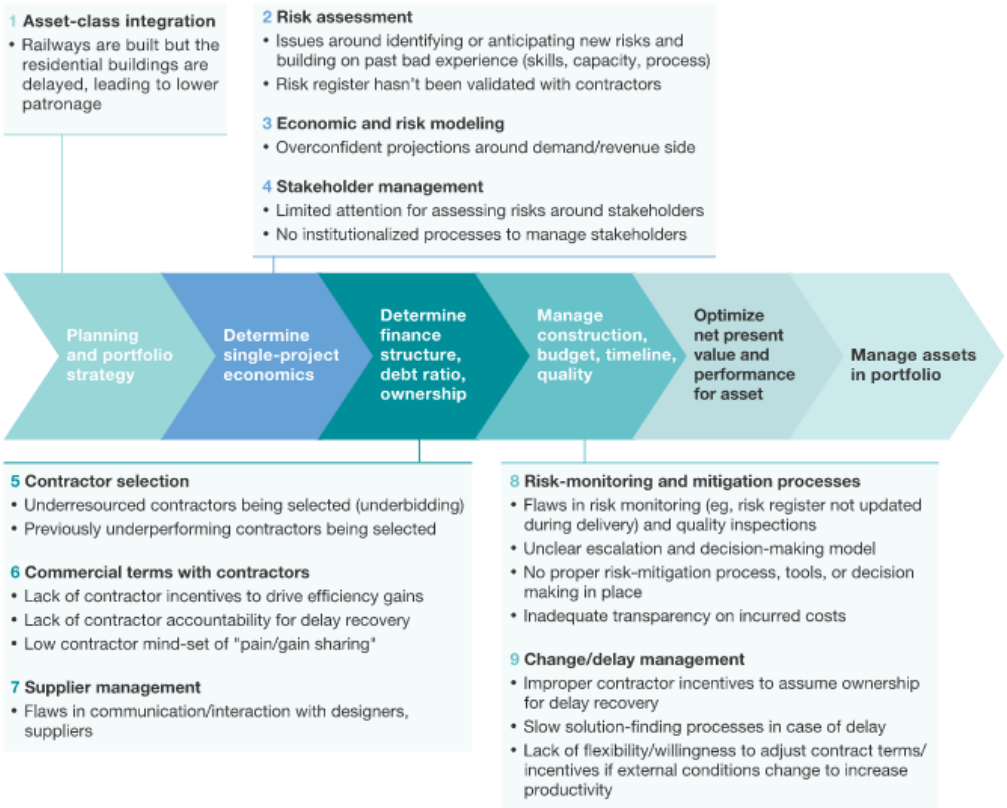

Figure 28: A number of uncertainties in project

At the outset, there was a lack of a single risk definition or risk taxonomy across projects, project stages, and departments. In addition, there was no systematic formulation of how risk management added value to the company, for example, in deriving risk-management objectives from a corporate value framework, or demonstrating how risk management could lead to better decisions. The organization's focus was on the mitigation of project-schedule and cost overruns, but not on risk optimization.

This meant there were disconnects throughout the project stages; design requirements were often not understood in the construction phase, for instance, leading to expensive changes in specifications and orders. There was no streamlined risk-governance model headed by an overarching risk committee or divisional risk committees, and some ambiguity surrounded risk ownership with regard to who was responsible for risk at the project or portfolio level and in migrating risk ownership across project stages.

Further, the organization's existing risk-management tools were not implemented effectively. There were strongly siloed views of risks and risk-management activities across departments and a lack of riskmanagement standards across projects, meaning project managers could shape project risk management to their own preferences. This was compounded by a lack of effective compliance or

management of consequences when things went wrong. Reactions to changed circumstances tended to be slow, as if risk was only really considered at the beginning of a specific project. There was little discussion of root causes and risk events and no clarity on how continuous risk management could add value and enhance motivation.

Improvements to the existing approach were viewed as something that would require extra effort and time and bring the risk of failure.

Senior management decided to embrace a systematic step change to enhance institutional risk-management capabilities, from daily employee practices and behaviors to mind-sets and corporate culture. An integrated life-cycle approach was put in place to address many of the problems outlined above.

Management needed to formulate a clear business case for the value of risk-management activities and to devise a risk strategy that was tightly linked to the business. The appropriate transparency on risk cost and the key drivers and sources of risk then had to be established, along with a much clearer understanding of what risk-management levers and instruments were available. Having established this at the top of the organization, it was then vital that effective risk-management governance, organization, and processes were put in place and that a strong risk culture and awareness was driven throughout the organization.

Issues	Essence of best-practice approach	Possible tools
Lack of communication between top teams of civil and engineering/ maintenance	• Major risks and solutions regularly discussed in a structured way, involving relevant areas • Key decisions always incorporate risk insights along the project life cycle • Continuous and focused risk transparency	• Risk-input template for key decisions • Top-management risk dashboard • Regular senior-management discussions on risk
Insufficient interaction between client's and contractor's top teams	• Early transparency about risk ownership and consequence management • Regular interaction on operational and top level to align on status and anticipation of risks	• Report on allocation of risks • Contract with risk-transfer chapter • Regular risk dialogue with contractor
Failure to cascade risk-management awareness from top levels to lower levels	• Risk-mitigation actions are clearly articulated and compliance mechanism in place • Organization has a risk-conscious culture enforced by consequence management • Clear change-order management in place to allow fast resolution time	• Risk dashboard for site manager • Internal process enforcing mitigation • Change-order routes defined • Dedicated project risk team and local risk champions
Lack of on-site transparency	• Risk-anticipation and mitigation actions are emphasized on the ground via simple, practical tools that are used daily • Bottom-up escalation routes are clear, trigger points are predefined	• Daily check-in/out meetings • On-site visual management • Daily contractor-compliance monitoring • On-site change-request handling
Ad hoc risk management instead of proactive risk anticipation	• Risk discussion/reporting less focused on status checking, rather used as navigation tool for upcoming risk-event anticipation • "Raising the alarm" is preferred to "blaming the bad news courier"	• War room/control tower with regular "look ahead" sessions • Checklists for on-site risk anticipation • Trigger-event checklist for escalation

Figure 29: Day to risk management can be improved in several areas.

Reliable and transparent communication is vital to the success of any project, so it was crucial that an improved system of communication was put in place between top departmental teams involved in any infrastructure project. This enabled cross-divisional cooperation and ensured alignment of goals and processes. Proper interaction with, and performance tracking of, contractors was established to help monitor and evaluate risk on a timely basis, and there were clear directions from the top of the organization to operating levels that cascaded risk-management awareness downward. This approach also required on-site "shop floor" risk transparency to be further advanced, as well as a move from ad hoc reactive risk mitigation to proactive risk anticipation.

Figure shows how far reaching this effort was across the organization; it involved people processes, management practices, governance, approval processes, and day-to-day behavioral norms at every level.

	Findings following risk-culture diagnosis	Initiatives
People processes	• Several **gaps in risk training** • Risk criteria insufficiently taken into account in **promotion and compensation**	• Introduction of **risk orientation** for lateral hires • Introduction of **risk training** for upper tenure as **prerequisite for promotion** • **Letter to newly appointed managing directors,** making clear that leadership review committee considered individual risk behavior
Management practices	• **Lack of systematic consider-ation of how business strategy affects risk** position (eg, no clear view on consolidated country exposure given business-expansion plans)	• **New function on corporate level set up** to monitor high-level risk topics across the corporation
Governance	• Each **division has different practices on risk management**; some are more formal, others less so	• Design of a more **harmonized set of divisionally led risk committees** to strengthen direct risk mitigation and informal risk dialogue
Approval processes	• **Multiple systems for manage-ment approvals** with partial overlaps and with lack of consistent audit trail	• **Multiple adjustments of management approval** for more consistency
Norms	• **Hero** in the organization seen as the person that can **sail close to the wind** and get projects through	• **Symbolic actions put in place** to increase the impact of risk-culture initiatives and emphasize new approach to risk across the organization • **Make risk norms highly visible** to reinforce desired risk behaviors via posters, screen savers, intranet pages, brochures

Figure 30: specific initiatives to improve the risk culture

The infrastructure sector significantly undermanages risks and lacks professional risk management. While under management of risk happens across the whole value chain, poor risk management

during early conceptual planning and design phases, mostly under the responsibility of public project sponsors, has a particularly negative impact on governments' and private developers' ability to achieve the hoped-for improvement of infrastructure services.

Even if the involvement of private-sector risk takers, for example, investors and lenders in PPP projects, means that certain risk-management capabilities are applied later on in the process, they are not able to undo earlystage mistakes. Poorly designed and planned projects lead to significantly higher financing costs and too often even to the inability to mobilize private-sector financing and risk allocation completely. In the absence of private financing and risk sharing, budget-financed public-procurement structures continue to undermanage risk throughout the entire life cycle of the project, leading to even higher rates of project failure and poor results.

Professional risk management can not only significantly improve results in public procurement processes; it can also attract and mobilize additional private financing. Given the scale and scope of emerging infrastructure projects, there is a strong case for embracing risk management throughout the life cycle of individual projects and also at the portfolio level.