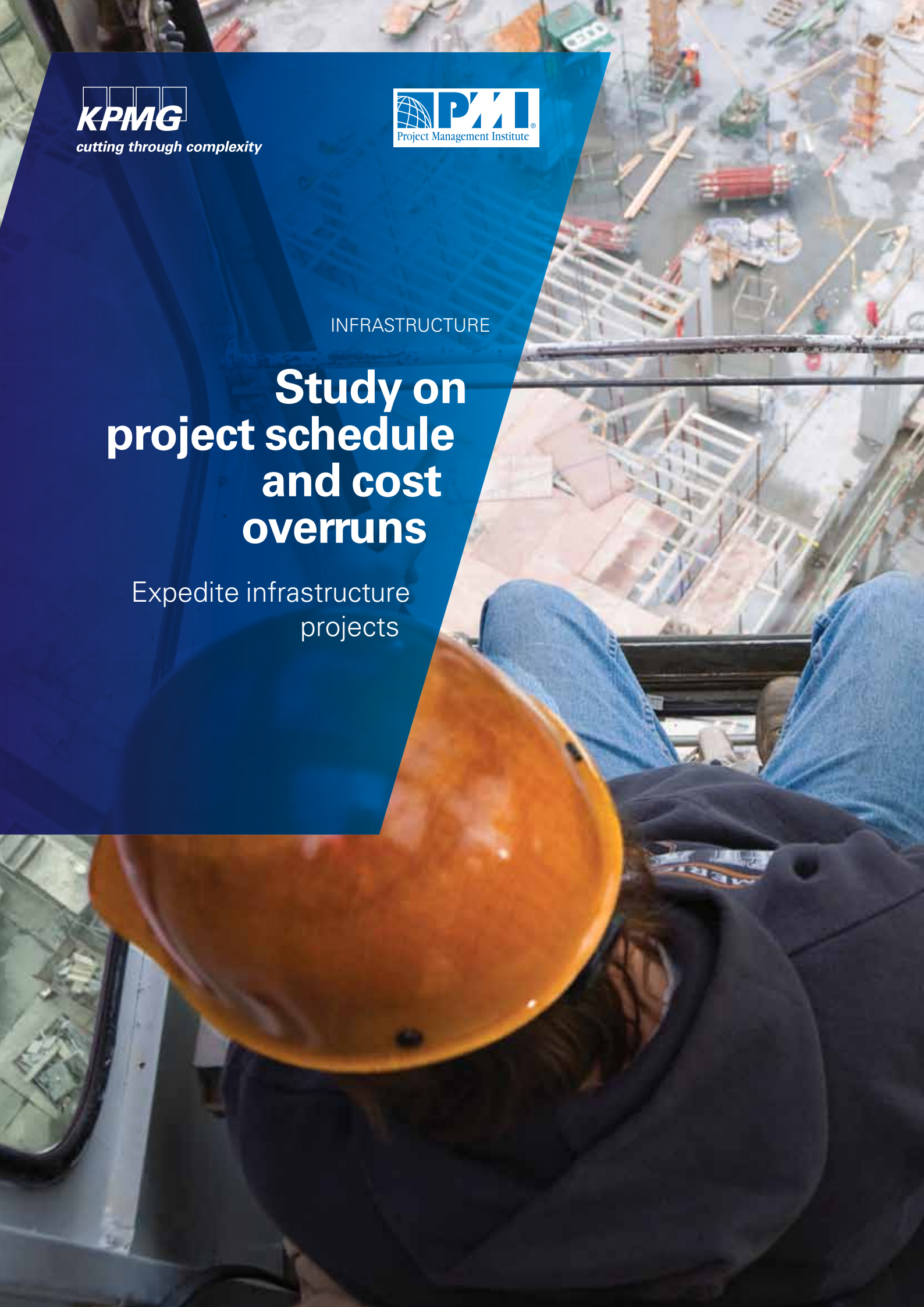

KPMG
cutting through complexity

Project Management Institute

INFRASTRUCTURE

Study on project schedule and cost overruns

Expedite infrastructure projects

Foreword

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सत्यमेव जयते

भारत सरकार
GOVERNMENT OF INDIA
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MINISTRY OF STATISTICS AND PROGRAMME IMPLEMENTATION
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Foreword

The Indian economy has been showing great resilience in the present global scenario and the growth trajectory is also satisfying for the present. But to sustain the envisaged growth trajectory and emerge as a key global economic player, infrastructure development is going to be the key. The thrust of the Government in the 12th Five Year Plan is on infrastructure, and it is estimated by the Planning Commission that investments to the tune of over ₹ 45 lakh Crores would be required during the Twelfth Plan period to sustain and support the targeted growth in manufacturing, agriculture and services and promote inclusive growth, (this would be double the investments that has been made during the 11th Plan period). Given the huge investment, successful delivery of infrastructural projects would be most crucial; on the other hand, time and cost overruns would be a drag on the economy.

The monitoring data which MoSPI is generating on the status of central sector Infrastructure projects shows that many projects are running behind schedule with cost overrun.

KPMG in consultation with PMI came forward to conduct study on the reasons for time and cost overruns in the central sector infrastructure projects and requested this Ministry for non-financial assistance. In order to facilitate the study, a portfolio of 25 projects under the monitor of MoSPI, of varying sizes cutting across all major infrastructure sectors was carefully created. A team of KPMG undertook the study, collected the data through site visits and otherwise, conducted few case studies and presented its findings in the report. The analyses and findings presented in the report have been gathered and validated through discussions with various stakeholders engaged in the execution of these projects.

Based on the observations, the report also makes a few recommendations in order to address the gaps in the implementation of infrastructure projects. We hope this reports provides an insight into the problems that are affecting the successful delivery of infrastructure projects and helps in devising solutions and strategies for overcoming them.

Date: 30.11.2012

(Dr. Davendra Verma)

Foreword from PMI India

Today, India is one of the leading outsourcing hubs in the world. However, the world judges us not just by the talent we have to offer, but also on the basis of our infrastructure capabilities. India has set an ambitious target of investing USD 1 trillion in infrastructure during the Twelfth Five Year Plan period. Given this factor, infrastructure development has been a key focus area in every Indian state more so in the recent past. At the center as well, big budgets have been allocated for infrastructure development in every Five Year plan. However, the country has consistently fallen short of meeting such targets over the last few years. These projects have been invariably riddled with issues of time and cost overruns. With the objective of finding out the reasons for such schedule and cost overruns, Ministry of Statistics and Programme implementation (MoSPI) recommended PMI to conduct a Study, in consultation with KPMG to highlight the major reasons for the time and cost overruns across major sectors in infrastructure projects. The projects surveyed in this report are from nine sectors in the Infrastructure space viz. Power, Petroleum, Coal, Steel, Railways, Roads & Highways, Civil Aviation, Ports & Shipping, and Telecom.

It is a known fact that a large number of infrastructure projects in India have been delayed due to regulatory clearances, environmental issues and problems pertaining to land acquisition. Also, there are challenges in the tendering phase that affect viability of projects thus delaying implementation, construction phase is beset with over-runs and disputes and last but not the least; provider skills are weak all across the value chain. Given the critical role of infrastructure in ensuring a sustained growth trajectory for India, it is imperative that we identify the core issues affecting completion of infrastructure projects in India and chalk out initiatives that need to be acted upon in short term as well as long term. This report attempts to identify these pertinent issues and also brings out how professional project management practices can bring about a positive change in the completion of projects on time and within budget.

Almost 79% of our respondents felt that the infrastructure sector faces an acute shortage of skilled project managers. This absence of project managers with the requisite skill sets has emerged as the major cause for time and cost overruns. Young graduates today are being lured away be other seemingly lucrative opportunities and project management education and training is not yet getting the priority it requires.

Though organizations are realizing the growing need for structured project management, many are looking at short term training programs to enhance the skill sets of their project teams. However, the situation warrants a more serious approach. The survey reveals that by 2022 Indian infrastructure sector is likely to have a shortage of around 3 million project professionals including project managers, civil engineers, planners, surveyors, safety professionals, etc.

The government too realizes the urgency of meeting this skill dearth. In the Twelfth Five Year Plan, the government has plans to focus on improving the project management skills across country to get better returns from public investment in infrastructure and also in the social sectors. Project management, with a view to deliver on time and within cost, is a learnable capability that can be institutionalized in India. There is therefore, a pressing need for industry and academia to realize this growing need. Organizations that employ qualified project managers must encourage and support their professional growth. In addition, organizations must start insisting on hiring qualified project managers. This will provide academia the impetus required to introduce project management into their curriculum.

Project management is the imperative for India's growth story and we believe, the way forward is for industry and academia to work in tandem on this course to reach the country's goal of being ranked as an economic superpower and a developed nation.

Raj Kalady
Managing Director
PMI India

Foreword from KPMG in India

Infrastructure plays a paramount role in the economic growth of a country. Infrastructure investments in India have been growing on a consistent basis. In each five year plan, the government sets an ambitious target which is higher than the previous one. The 12th five year plan also promises significant investment in infrastructure sector to bridge the huge infrastructure deficit. The plan is to double the spending to USD 1 trillion through 2016-17 with 50 percent of the funding to be met by private sector. Although, the sector is considered to be a key driver of economic growth, time and cost overruns threaten to limit the sector's potential to help achieve the desired growth and ensure efficient capital expenditure.

To understand the reasons for time and cost overruns KPMG initiated the PMI-KPMG study on the request of MoSPI to analyze the reasons for schedule and cost overruns across various infrastructural projects running across the country. The study was undertaken after surveying key stakeholders in the infrastructure sector and analyzing several key projects and comparing them with best practices available globally.

It deliberates on both the external reasons for delays, which are beyond the control of implementing agencies and internal reasons, which can curtailed at the project level with proper planning and project management.

The study also dwells on the proposed actions to be taken for expediting infrastructure projects in India.

We hope that all stakeholders find this report meaningful in its bid to highlight the reasons for overrun in the infrastructure projects and possible recommendations.

Neeraj Bansal
Partner, Real Estate and Constructions
KPMG in India

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01

Executive Summary

The KPMG in India - PMI study 2012 was initiated on the request of MoSPI, highlights the major reasons for schedule and cost overruns across major sector's infrastructure projects. While some projects are impacted due to external factors which are beyond the control of the implementing agencies such as land acquisition, regulatory approvals, etc., majority of projects are delayed by factors which can be controlled at the project level through proper planning and project management. The study also highlights the severe skill shortage and the growing demand-supply gap for qualified construction professionals affecting the infrastructure sector in India. Project owners feel this is a long-term issue which not only makes the projects more expensive and risky, but also results in compromise on quality as well as timelines.

Infrastructure plays a paramount role in the economic growth of a country. Infrastructure investments in India have been growing on a consistent basis. In each five year plan, the Government sets an ambitious target which is higher than the previous one. Although, the sector is considered to be a key driver of economic growth, time and cost overruns threaten to limit the sector's potential to help achieve the desired growth and ensure efficient capital expenditure.

Dearth of skilled project managers has the greatest influence on project delivery

Shortage of skilled project managers emerges as the root cause for time and cost overruns in a project lifecycle. It has been observed that the inflow of talent in the infrastructure sector has been declining – as resources are going for alternative, more lucrative options. This concern is felt across various stages of project lifecycle. 79 percent of the respondents agree that the sector faces shortage of skilled project managers with the prerequisite skill set, which results in time/schedule overruns.

One of the reasons for inefficient project delivery is the paucity of skilled project managers in the infrastructure sector.

This decline in the inflow of talent in the sector has emerged as the embryonic cause for time and cost overruns in the project life cycle. Resources are being seen to deflect away from the infrastructure sector towards alternative, more lucrative options.

This growing concern which has been felt across various stages of the project life cycle has been supported by 79 percent of the respondents that advocate the same belief of managers lacking the perquisite skill set. This insufficiency further leads to issues such as prolonged finalization of design, scope creep and contractual disputes.

Reasons for project time overruns across project lifecycle

Stages	External issues	Internal issues
Pre-planning	• Delay in regulatory approvals • Unavailability/delayed availability of funds • Land/site handover	• Lack of project managers/commercial managers with adequate planning skills • Lack of Liasioning Officer/Planning Engineer • Lack of cost managers • Lack of safety officers/enviornmental practitioners
Planning and design	• Lack of strong R&R policies • Ineffective procurement planning • Design/scope change • Delay in regulatory approvals • Delay in decision making	• Lack of planning engineer/commercial managers • Lack of liasion officer or planning engineer • Lack of MEP engineers
Execution and monitoring	• Weak/ineffective project planning & monitoring • Contractual disputes • Unavailability/delayed availabiilty of funds • Lack of strong R&R policies • Delay land/site handover	• Lack of project managers/site managers/planning engineers/quantity supervisors • Lack of awareness modern equipment & technology • Lack of liason officer and commercial officers
Closure and handover	• Pre-commissioning teething troubles • Contractual disputes	• Lack of commissioning, project and site managers, audit and total quality management professionals

Lack of requisite skill set as a major cause of concern is also supported by KPMG International's Global Construction Survey 2012. About 45 percent of the Asia Pacific (ASPAC) respondents were less apprehensive about unfavorable economic prospects as compared to the skills shortages and inflation as a continuing worry. The survey highlighted that while emerging markets like India represent a big opportunity for engineering and construction companies, these markets are frequently accompanied by a high degree of uncertainty. As per KPMG International's Global Construction Survey, about 43 percent of the respondents considered that in ASPAC, access to appropriate skilled resources as the single biggest concern, followed by political risks and cultural differences.

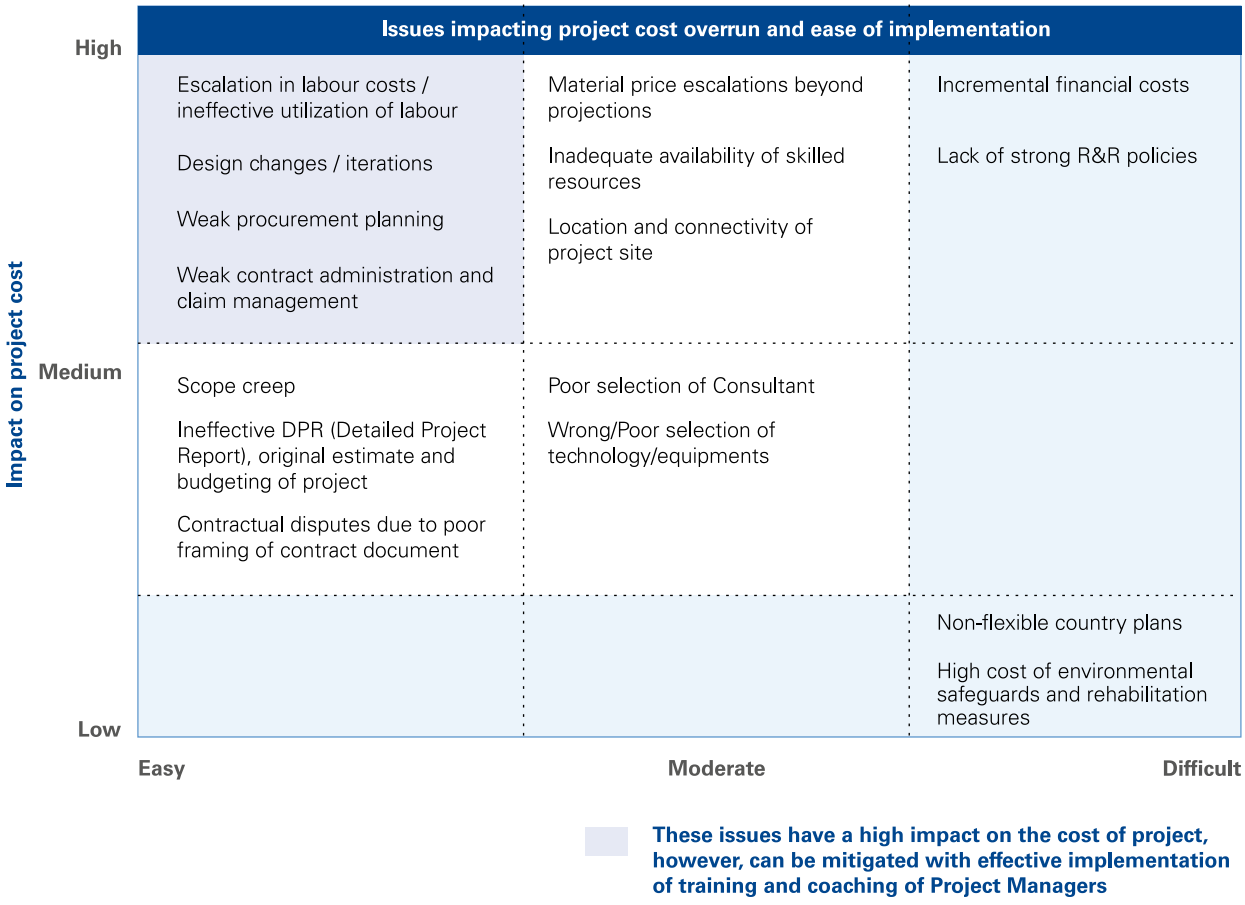
The respondents have adopted resource planning and monitoring strategies to improve efficiency and utilization of the resources. However, there is still a transcendental need for improvements in the quality of project management training being offered both externally and internally. Structured and improved training programs were identified by respondents as a long term solution for building professional capabilities and enhancing skill sets.

About 72 percent of the respondents consider internal training programs such as developing in-house Project Academy / 'Center of Project Management Excellence' for training and certifying project managers as the pertinent step to enhance the quality of talent available in the near future. Other factors such as land/site handover, delay in regulatory approvals, frequent design changes, scope creep, contractual disputes etc., also result in schedule overruns.

Cost overruns are fuelled by frequent changes in design and weak procurement planning, which can be mitigated by adequate training and coaching of project managers

About 67 percent of the respondents feel that weak procurement planning and frequent changes in design have a huge impact on project cost overruns. These issues result in ineffective project planning and designing. The survey respondents agreed that these issues have a high impact on the project cost but can be mitigated by effective training and coaching of the project managers.

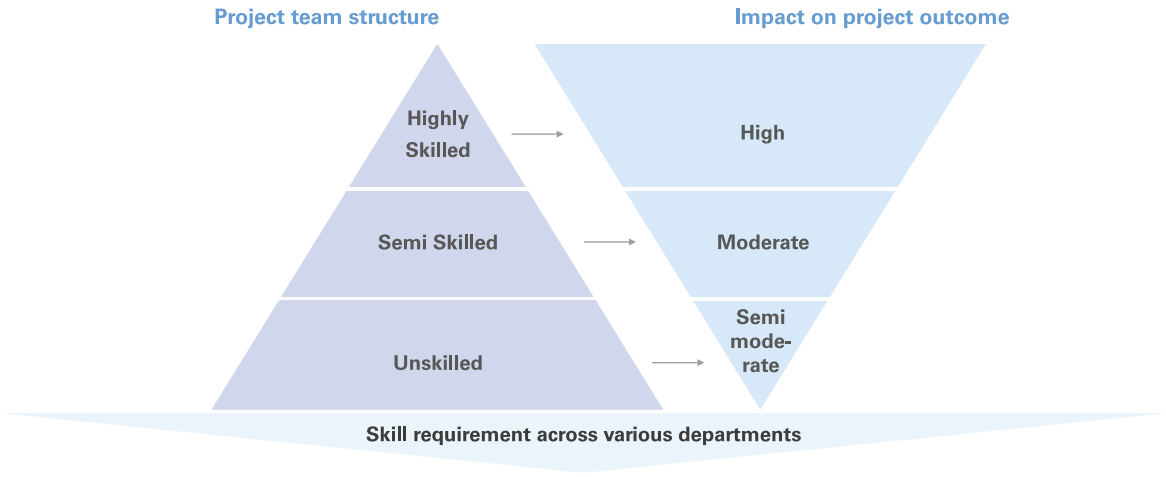
The survey also identified that companies today have a high-level of awareness towards the need for project management as an organization-wide process. However, effective implementation of project management as an organizational process is yet to be realized by the majority.



Source: KPMG in India - PMI Survey on cost and schedule overrun, 2012

Lack of highly skilled professionals becomes critical to address

The survey suggests that there is a dearth of manpower across categories; however, non-availability of highly-skilled professionals can have an adverse impact on the project delivery and cost. By 2022, Indian infrastructure sector is expected to have a shortage of around three million[1] project professionals including project managers, civil engineers, planners, surveyors, safety professionals, etc. Hence, it is imperative to increase investment in training and mentoring to develop the requisite skill set in the professionals, deployed across various departments.



Finance	• Project financing • Indirect taxation • Working capital • Treasury management	**Risk**	• Risk assessment • Impact assessment • Risk planning	**Contracts**	• Contracting • Contract laws • FIDIC/NEC* contracts
Scheduling	• Construction Management • Scope management • Quantity survey • PM software	**Quality**	• QMS • ISO standards • Auditing techniques	**MIS**	• Communication Planning • Reporting • Stakeholder management
EHS	• Environmental laws • Industrial safety • Labour laws • Equipment management	**Cost**	• Estimation • Quantity survey • Cost control • Billing and accounting	**Engineering**	• Civil/Mechanical engineering

Further, to meet the incremental demand of project professionals, it is important to introduce project management in the curriculum of engineering, management and other technical institutes. Moreover, the Government should play a more proactive role by recognizing project management, vocational or skill training institutes as a part of the main stream education. In many of the advanced industrial countries, vocational training is considered at par with university education. However, this is not the case in India. As a result, vocational training is not sought after by the bright and ambitious students. One of the primary reasons is that these institutes cannot offer a 'degree' – which seems to be a critical requirement for any further formal education in India and across the globe. It is important to understand the manpower and skill requirements of the industries before we begin our reforms in the vocational training area. The rapidly growing Indian needs trained manpower now more than ever. There are multiple sectors, Government organizations, support institutions that need manpower to support them.

The introduction of project management curriculum in main stream education is rapidly becoming global. India is expected to benefit immensely by adopting global standards and allowing globally renowned institutes to set up training centers in India. In the short run, it will help some of the best global construction companies to work efficiently and effectively in India and contribute to the richness of workforce in India. In the long run, it will help the Indian labor to be world-class and claim higher salaries and wages.

1 KPMG in India Analysis

Project management helps in efficient project delivery

The industry has started accepting the Project Management Office (PMO) concept for independent reporting and ensuring project management excellence. About 86 percent of the respondents agree that PMO could be an effective way of monitoring projects. Project teams that have adopted PMO feel that it helps in ensuring successful implementation of projects through deployment of project management best practices. PMO also helps in proactive risk identification and provides adequate guidance and information for timely decision-making.

The Government has also realized the importance of project management capabilities. In the Twelfth Five Year Plan, the Government has plans to focus on improving the project management skills across country to get better returns from public investment in infrastructure and also in the social sectors[2]. Project management, with a view to deliver on time and within cost, is a learnable capability that can be institutionalized in India.

Proposed action points for expediting infrastructure projects in India

The following actions points once implemented could help in debottlenecking infrastructure projects and help ensure timely project implementation within the stipulated budgets. These steps include:

- Establishing a three-tier project/ program management office (PMO) structure throughout the country to monitor infrastructure projects
- Optimizing the procedures for transparent bidding criteria
- Developing an efficacious dispute settlement mechanism
- Formulizing project management training for professionals:
  - Further strengthening India's Vocational Education and Training program to impart project management knowledge to working officials having varied experience.
  - Foster collaboration and cooperation with educational institutes to counter the insufficiency/shortage/paucity of professionals well equipped to handle infrastructure projects
  - Encouraging further development of in-house academies and structured training programs
- Introducing a single window clearance mechanism to make the regulatory approval process more effective
- Adopting a unified unambiguous transparent transport policy for movement of project materials especially the ODCs (oversized dimensioned consignments). Further, designing an efficient transport and logistics system to enable faster project implementation throughout the country.
- Managing and sharing the exhaustive list of empanelled vendors (equipped with project management discipline) with giant Government organizations and PSUs on their respective internet websites
- Promoting balanced Public Private Partnership (PPP) in Infrastructure sector for faster implementation of projects
- Promoting joint evaluation of project design by project owners and contractors for value engineering.

2 "An approach to the 12th Five year plan", Planning Commission, October 2011, p12

SECTION 02

Reasons for schedule overruns

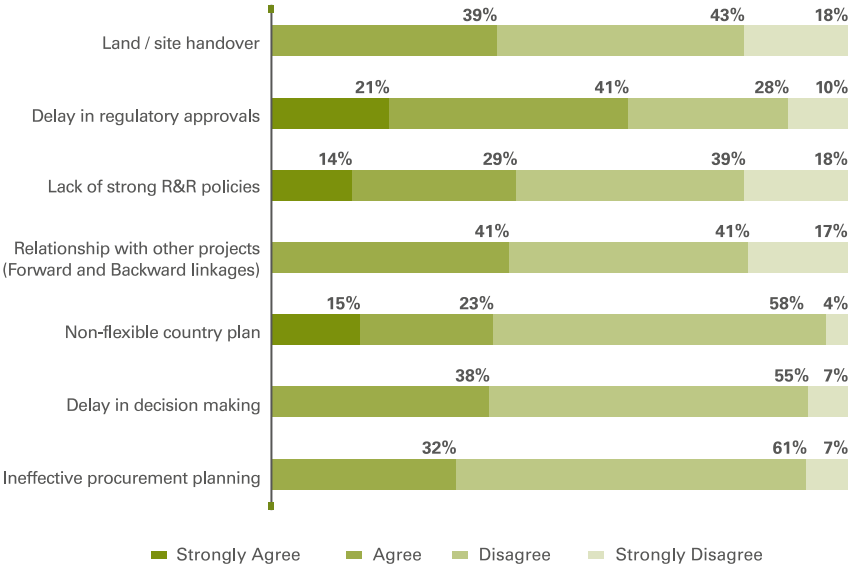
Majority of infrastructure projects in India are affected by time overruns. These overruns vary from a few months to as high as five or more years, placing the project viability at risk. Survey respondents identified the bottlenecks which affect their projects and the challenges they face in conquering them. These bottlenecks, as enlisted below, are divided into two phases – (i) pre-execution phase and (ii) execution and closing phase.

Reasons for schedule overruns in the pre-execution phase

Delays in land acquisition and site handover is the primary reason for schedule overruns in pre-execution phase

According to global leading practices, land acquisition should be complete before a project is tendered. In India, projects are often awarded with only partial acquisition of land by project owners. Delay in subsequent land acquisition and inadequacy in project planning considering the impact of deferred land acquisition is possibly the single largest factor causing project delays. This fact is also complemented by the survey results, where 82 percent of the respondents agree that land/site handover is the main reason for project delays.

Exhibit 1: Reason for project schedule delay in pre-execution phase



Source: KPMG in India - PMI Survey on cost and schedule overrun, 2012

Delays in land acquisition are driven by several factors. One of the prime factors for these delays is the resistance by the local community. This resistance is on account of poor compensation and the undervalued market price of land – leading to many disputes with the local community. According to the existing policy, the compensation offered is on the basis of the value of agricultural land, whereas, post construction the project land value often appreciates considerably where in the incumbent owner does not have any share.

82%
respondents feel that delays in land acquisition lead to project schedule overruns.

In view of the projects being affected by resistance from local community and social organizations, the risk of delays has grown many folds in past years. However, the survey observed that project planning and mitigation strategies have not been reengineered to accommodate the global leading practices to undo the effect of such initial delays during the course of project.

> In this particular project, 70 percent of the land was already acquired before the start of the project. Acquiring the remaining 30 percent took additional 6 months, leading to an overall project delay.
>
> **General Manager, Civil Aviation Sector**

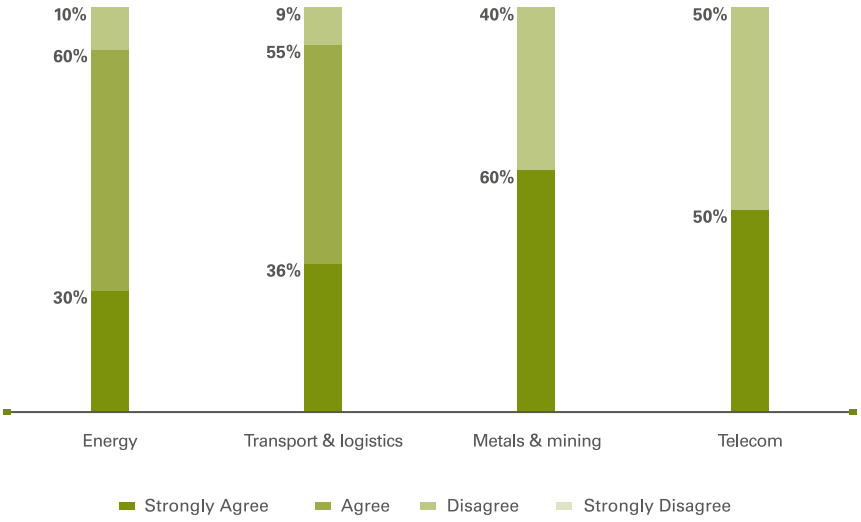
In addition, lack of clarity on Resettlement & Rehabilitation (R&R) related issues adversely affect the sentiments of people about the project. Land acquisition leads to displacement and unemployment. Furthermore, land acquisition often requires cutting of trees (deforestation) for space creation, destruction of water bodies, etc. which leads to soil erosion and land degradation affecting the local environment and the lifestyle of people. Also, if the acquired land falls under the category of heritage site, forest reserve or wild life sanctuary, it faces stiff resistance from social activists and locals alike. Land acquisition issues are spread across sectors. For instance, in steel sector, one of the largest Foreign Direct Investment (FDI) project in Orissa has been stalled due to people's agitation against the land acquisition[1]. Locals fear that once the forest land is acquired, they will lose their agro-based sustainable livelihood.

The land acquisition problem is more pronounced in transportation sector

Transport & Logistics and Energy sector are the worst affected by land acquisition issues.

such as Highway-Roads and Railway projects, with 91 percent respondents of this sector agree that their projects are affected by land acquisition. For example, for a new rail line project in the State of Assam, land for the first phase of the project was to be acquired by October 2009. However, due to delays in initiating the land acquisition process and inter-State disputes, the land was re-scheduled to be acquired by January 2011. Similarly, one of the most prestigious projects in road sector was delayed by around six years due to the land acquisition issues. The project which was started in 2000 with scheduled completion date of December 2004[2] got completed only in January 2012[3].

Exhibit 2: Sectors impacted by land acquisitions



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

1 Posco's Orissa project hangs in balance, The Hindu, 21 June 2012
2 Golden Quadrilateral project may miss deadline, The Hindu, January 07, 2003
3 Govt declares Golden Quadrilateral complete, Indian Express, dated January 7, 2012

In case of brownfield or expansion projects, it has been observed that land acquisition problems are low. However, in some cases, issues related to making the site ready for handover to contractors for construction without hampering the existing plant operation poses a major challenge for the owners. Creating space for installing additional equipment within the existing site requires demolition or shifting of some units to other locations. Considering that a majority of operational sites are congested, it constraints movement of labor, equipment and material within the construction site thereby effecting the contractor productivity. Also, while undertaking expansion projects, it is important to ensure that existing operations of site are not disturbed. This requires additional planning efforts, as overlooking such activities in the planning phase may leads to potential delays in project completion.

Considering the geographical and environmental limitations associated with projects and the resistance they draw from various stakeholders, effective stakeholder management has come up as the basic underlying requirement of mitigation plans across the sectors. The survey observed that only a few agencies had adopted stakeholder assessment and periodic review of it as a part of their mitigation strategy. Globally, however, stakeholder management is an inseparable part of project management and monitoring practices.

During the interaction with Projects Managers/Owners, it was noted that in majority projects, land acquisition and regulatory approvals do not have a defined timeline. The absence of any defined time frame for these activities has an impact on subsequent project plans resulting in unaccounted delays in project delivery.

Manifold regulatory approvals from several agencies leading to delay in construction

The complexity and size of infrastructure projects being undertaken in India has increased substantially during the last decade. As a result, the regulatory frameworks related to infrastructure projects have also witnessed a significant transformation. Average infrastructure projects being executed in the country cost to the tune of INR 600 crore with duration of eight to ten years[4]. Considering such large scale magnitudes, these infrastructure projects require an explicit consideration of the regulatory issues during the planning stage to avoid any delays during the implementation stage. For timely action, project developers should ensure early identification of the required regulatory compliances and the corresponding procedural difficulties associated with it. This could help in detection and prevention of cost and schedule overruns with better control on projects.

While the regulatory approvals related to project financing, technology collaborations and foreign investments have become fast track in the recent years, the scenario has become trickier for issues related to land acquisitions and environmental clearances. Generally, extensive environmental approvals are mandatory at the start of the project itself. However, these clearances can be challenged through public interest litigations which could lead to project execution delays. At times, non-Government organizations challenge the environment clearances through direct activism and protests, creating hurdles for project execution. A global steel major's project in Orissa is a striking example of project delay on account of environmental approvals. The steel major signed a Memorandum of Understanding (MoU) with the Orissa Government in 2005 to construct a 12 MTPA steel plant in the State with a FDI of INR 54,000 crore. Since then, the project has been entangled in legal and environmental clearances. After a review of two and a half years, the Ministry of Environment and Forests gave a final approval to the project in January 2011. Meanwhile, the project MoU expired in June 2011. The steel mill construction project, which involves one of the largest FDI deal in India, has already witnessed a delay of seven years[5].

62%

respondents feel that delay in regulatory approvals lead to project schedule overrun.

4 MoSPI, January 2012 Flash Report; KPMG in India Analysis
5 Posco's Orissa project hangs in balance, The Hindu, 21 June 2012

Another issue that leads to delays in regulatory approvals is the multiplicity of approval requirements from Central, State and local Government. Often, the regulatory authorities at the Central and the State levels lack coordination leading to standoffs on critical approvals. Furthermore, in a diverse and multi-Government country like India, there is often a State-wise disparity in granting approvals pertaining to land acquisitions, R&R, etc. These are compounded by other issues as inadequate support in shifting of utilities for construction. There is often a recurring delay in securing regulatory approvals from governing bodies and various ministries. For example, inability to secure forest approvals for tree cutting required for a highway expansion project led to substantial project delays. Similarly, a major highway project faced a delay of around one year due to delay in executing the State-support agreement towards shifting the utilities to make way for construction. In many cases even after securing clearances, it has been observed the time taken for activities such as tree cutting is often prolonged to as much as 32 months, primarily due to resistance from local communities.

Taking clearances from various authorities is a time consuming process; often there is lack of team work among different Government departments.

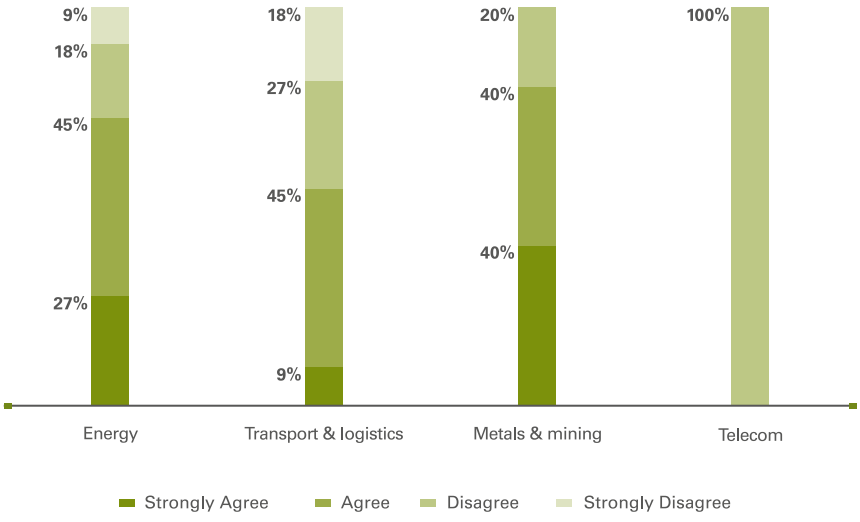
Managing Director, Power Transmission Company

Although, majority of approvals are consistent across all infrastructural projects, such as approval from Ministry of Forest and Environment, Public Investment Board, etc., there are certain sector-specific or project-specific requirements. Securing these approvals often requires additional time. The Road sector is a case in point. In addition to above mentioned approvals, additional clearances need to be obtained from the Ministry of Road Transport and Highways, Public Works Department, Central Pollution Control Board, National Highways Authority of India etc. As most of these approvals don't have a defined timeline, they impact overall project schedule.

62 percent of respondents feel that delay in regulatory approvals leads to project schedule overruns. Our interaction with the project owners suggests that greenfield projects are more prone to be delayed on account of regulatory delays in comparison to an expansion project. Among the broad sectors, as per the survey results, metals and mining is worst impacted (80 percent of the respondents agree) and telecom sector is least impacted (none of the respondents agree) due to delay in getting regulatory approvals.

80 percent of respondent opined that metals and mining is the worst affected sector due to delay in regulatory approvals.

Exhibit 3: Sectors impacted on account of delay in regulatory approvals



Source: : KPMG in India – PMI Survey on cost and schedule overrun, 2012

Poor program management resulting in ineffective co-ordination with other projects and schedule delay

Large infrastructure projects, being part of large scale developmental program, require co-ordination with several other projects. Delay in either of the projects could significantly impact the project delivery of other associated projects and eventually the entire program. For example, a power transmission project of around INR 600 crore is delayed by almost two years due to delay in power generation project, from which this transmission line is to source electricity[6]. This fact is also emphasized by our survey with around 41 percent of the respondents agreeing that ineffective program management results in schedule overruns due to inter-dependencies among projects (forward and backward linkages).

Inadequate co-ordination between projects is primarily due to the lack of detailed time and risk planning at the project conceptualization stage. The project managers are not able to completely foresee the synergies and the risks among various projects leading to overruns. Thus it is important to improve the project management capabilities in the country for efficient project delivery.

41%

respondents feel that relationship with other projects lead to project schedule overrun.

KPMG in India's point of view

The planning phase of projects appears to be largely affected by the factors generating from land acquisition and regulatory approvals. However, these external factors leading to lapses in project delivery are primarily due to insufficient mitigations adopted to overcome them. The project teams must take these activities into account while considering the time cycle for the project completion.

Given the trend of growing size and complexity of projects with time, the increase in number of stakeholders and affected sections is inevitable. Also the growing concern and stronger measures for protection and restoration of environment have added to the efforts required by project management organizations. These external factors can be mitigated by timely actions given that the strong and periodic information system is established to provide the necessary information.

Although the factors affecting the project timelines primarily appear to be associated with external factors, the underlying reason behind them remains the delayed or non-identification of pre-requisites to overcome these factors. In the absence of adequate identification of these dependencies, the projects usually land in trouble at the start itself, which in turn manifests into delayed project delivery or higher cost at completion.

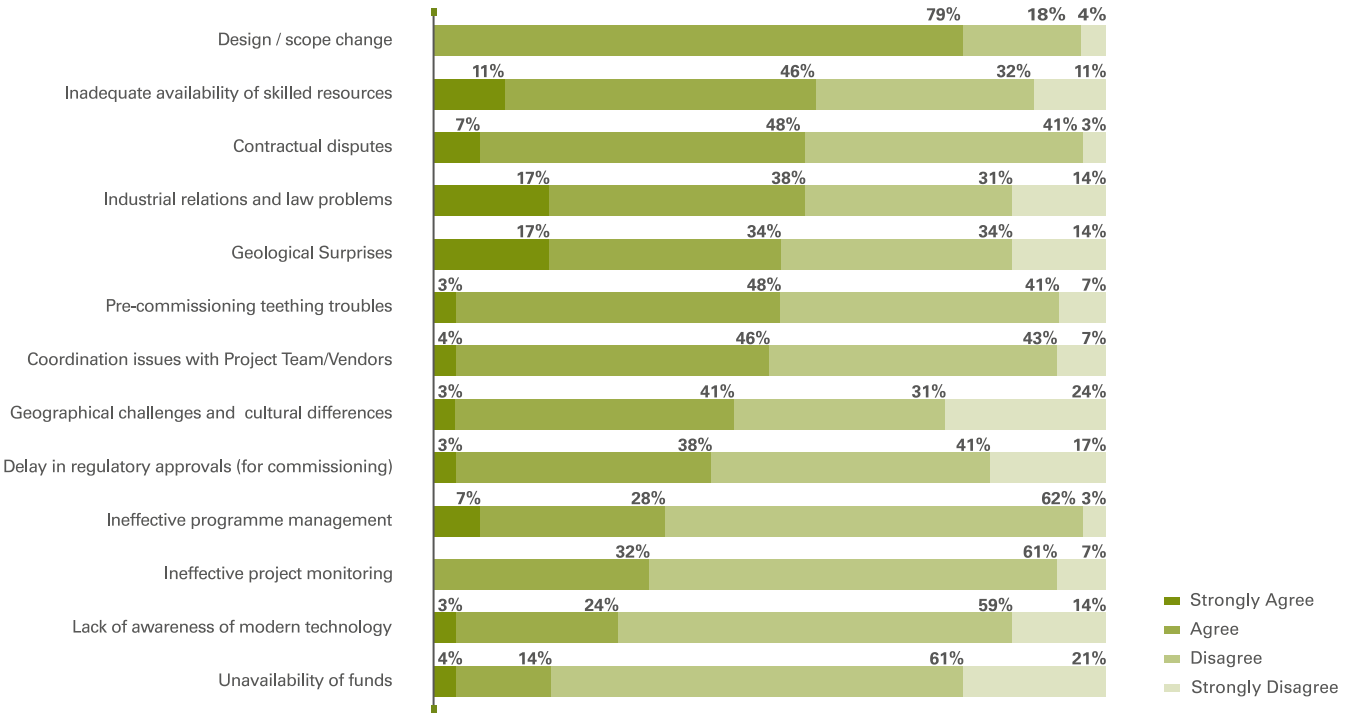
6 Based on one-to-one discussion with the survey respondent

Reasons for schedule overrun in execution and closing phase

Insufficient management of Project design/scope change is widely prevalent in the infrastructure sector

Most infrastructure projects are victims of change in project design and scope which often lead to project delays. Poor project planning coupled with lack of attention to details leads to prolonged discussions between project owners and contractors/ vendors. This often leads to project delay despite the well intentioned efforts to restore to original schedule. The contribution of the market conditions requiring a revision in the project scope is generally low if a project has been planned well.

Exhibit 4: Reasons for project schedule delay in execution and closing phase



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

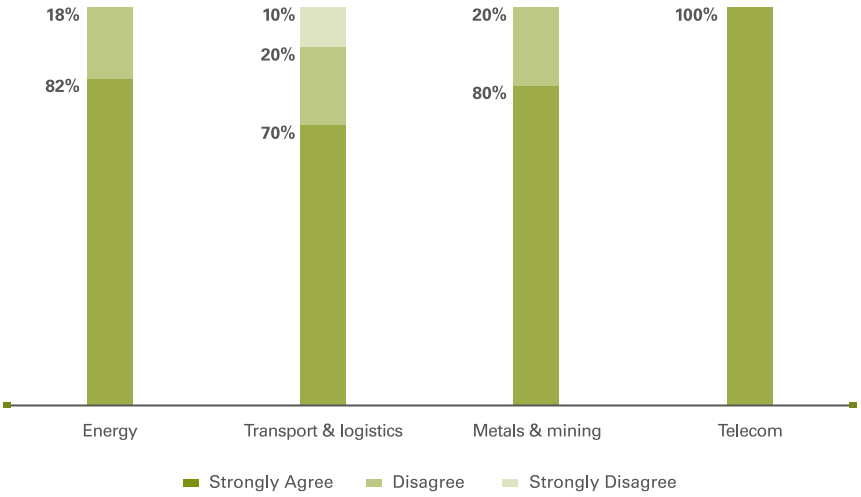
Often, project owners / consultants avoid or de-emphasize critical project planning requisites such as field investigation and topographical surveys. Inappropriate assessment of geological and topographical factors can lead to unexpected barriers (both natural and man-made) during the project execution stage, which in turn may call for changes in project scope. Even a small change in the project scope during the execution stage can lead to disputes related to regulatory approvals and construction contracts, which could further result in schedule overruns.

Schedule overruns on account of changes in the project design and scope during the execution stage are a common feature in large public sector projects involving segments such as petroleum, civil aviation and road construction. For instance, in the petroleum sector, a Greenfield refinery in Orissa is an example of schedule overruns due to changes in the project plan. The original plan included construction of a refinery-cum-petrochemical complex with a capacity of 15 MTPA at an estimated cost of INR 8,000 crore, which was projected for completion by 2010-11. Due to prolonged delays, the project owner, a State owned Oil Company, later decided to split the construction into two phases with the first phase involving the construction of the refinery alone. The project cost has increased to about INR 30,000 crore with the expected completion of the first phase in 1Q-2013 as against the original plan of commissioning in 2010[7].

79%

respondents feel that change in project scope/ design leads to project schedule overruns in the execution phase.

Exhibit 5: Criticality of design/scope change across sectors



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Respondents from the road construction segment reported that very often the original project scope is considerably oversized as compared to the actual requirement to support a probable increase in the traffic volume. Tenders floated for such oversize projects often do not find bidders leading to scope revisions. Further, industry body FICCI has suggested to reduce road sector project sizes to between INR 500 crore and INR 1,500 crore so as to attract more bidders[8]. Small size projects would attract the interest of small and medium size companies in the bidding.

79 percent respondents agree that change in project scope leads to schedule overruns. Further, from qualitative discussions it is also identified that steel, civil aviation and telecom sectors are more prone to delays because of scope change vis-à-vis sectors such as ports and shipping, coal etc.

In view of the fast growing requirements for higher capacity projects, the changes have turned out to be the necessary evil in project management. However,

Inclusion of change management is required for effectively managing changes in project scope.

the changes, if managed well, can be converted to advantage of the owners. Further from the survey, it is evident that in most organization efficient and effective implementation of change management is missing in the existing project management frameworks in use at various infrastructure projects. Since, the scope change cannot be done away with, effective management of change should be adopted to overcome the impact of these changes on time and cost budget of the projects.

6 Based on one-to-one discussion with the survey respondent
7 IOC's Paradip refinery behind schedule; may complete in 2013 Q1, The Economic Times, 11 August 2011
8 NHAI urged to prune project sizes to attract more bidders, Business Line, 31 August 2012

Availability of resources for infrastructure sector is insufficient

(i) Inadequate supply of project management professional

The dearth of qualified white collar professionals in India is a key challenge for the infrastructure industry. Alternative career options in lucrative industries such as information technology and financial services have become a more attractive proposition for the fresh engineering talent in the country. The situation is expected to aggravate further as the current education system is unable to deliver the required number of specialists across the project management value chain. In addition, there is a shortage of experienced engineers with the desired project management skill sets to take up larger roles. Furthermore, India's vocational training curriculum needs to be further strengthened and based on global standards[9].

Survey respondents also agreed that the sector is facing a severe shortage of professionals. The demand for project and site managers, environmental practitioners, safety officers etc exceeds supply, leading to sub optimal level of project management.

To meet the talent crunch for highly critical jobs, many companies are now hiring foreign professionals. These professional have to fulfill several formalities before coming to India which is a time consuming process and generally comes at a higher cost.

Project managers, environmental practitioners and safety officers are top three resources – infrastructure industry is facing a shortage.

Exhibit 6: Ranking of resources in terms of their shortage in the industry

Note: Percentage of respondents who felt that the industry is currently facing a shortages of these resources
Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

9 Power Projects in India: Implementation Challenges and Opportunities, Focus 2015 by Raajeev B. Batra

(ii) Limited availability of skilled labor

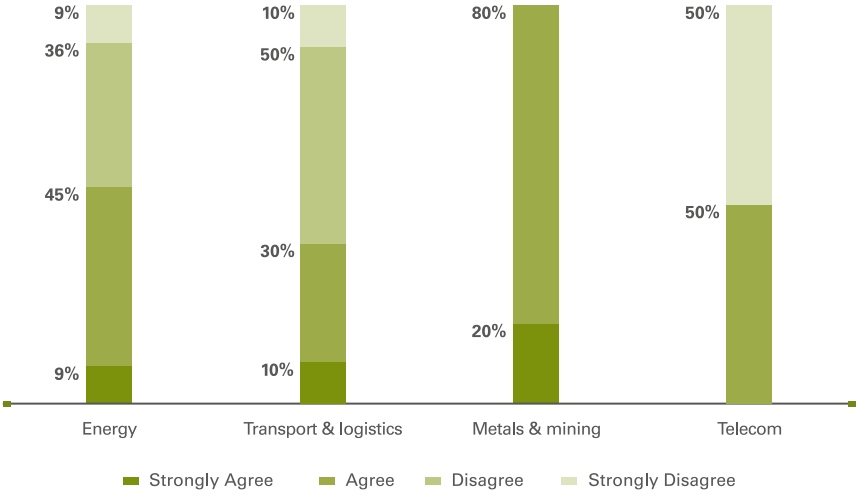
The growth of skilled and semi-skilled manpower in India has not kept pace with the growth in infrastructure projects. This fact is supported by World Bank's report according to which the Indian road construction industry is expected to face a labor shortage of 18-28 percent if the country grows at a medium rate and a shortage of 55-60 percent if we see high growth.[10] Unavailability of welders, carpenters, masons, trained workers often impact project progress. The survey respondents also acknowledge that central and State Government run employment schemes such as National Rural Employment Guarantee Act (NREGA), Jawaharlal Nehru National Urban Renewal Mission (JNNURM), etc have created enough employment opportunities for laborers in their local areas, minimizing the need for them to travel to the project sites in search of livelihood. This has constrained the availability of skilled labor for some projects/States.

Another issue impacting the progress of infrastructure projects across industries is the low productivity of labor due to socio-cultural-political reasons. For instance, work is often halted in Naxalite affected areas. Other issues, such as extended holiday seasons, un-reliability of non-local labor (i.e. labor from other States), frequent strikes by workers, etc. adversely affect productivity at construction sites and impact the project schedule. These risks are usually not planned during the planning phase, but have an impact on project delivery.

55 percent of respondents opine that non-availability of skilled labor is a major area of concern. As per our survey, metals and mining sector is worst affected by the shortage of labor.

> Lack of availability of skilled labor is an issue. Unresponsiveness, strikes and extended holidays further hamper the timely project execution.
>
> **General Manager**
> **Power Generation Company**

Exhibit 7: Criticality of lack of availability of skilled labor across sectors



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

10 World Bank; World Bank's medium growth scenario is based on the vision documents of the states and the country; and High growth scenario incorporates the massive investments in national highways and rural roads announced by GOI.

(iii) Shortage of good equipment suppliers and contractors

Infrastructure projects especially in power sector are hampered due to lack of good contractors and equipment suppliers in the country. The infrastructure projects in the country are growing at a faster pace than the capacity additions by equipment suppliers. This has created a wide gap between the demand and supply leading to delays in completion of projects due to non availability of key project equipments. For instance, one of the largest State-owned power generation company has rolled out several new projects with equipment supply orders to yet another State owned and country's one of the largest power equipment manufacturer. Many of these projects are facing potential delays on account of inability of the equipment manufacturer to meet the supply orders as per schedule. India's inability to meet power generation capacity addition targets for the Tenth Five Year Plan has been mainly attributed to non availability of critical power equipment. The demand for core components of boilers, turbines and generators has exceeded the supply in the last few years. Additionally, various projects in the power sector are also facing shortage of balance of plant equipment such as coal handling and ash handling systems.

> There is lack of good equipment manufacturers in the country leading to heavy dependence on few players.
>
> **Executive Director**
> **Steel Manufacturing Company**

Apart from the manufactured equipments, infrastructure projects are also facing hurdles due to shortage of construction equipments (cranes, forklift trucks, lorry loaders etc) and construction material (steel, cement etc).

To make up for project delays due to lack of reliable equipment suppliers in India, owners could explore two options. The first one is to import equipment from other countries, which would drive up project costs. Alternatively, they could source inexpensive equipment and run the high risk of inferior quality of equipment.

India is also facing a shortage of good engineering procurement and construction (EPC) contractors that are capable of executing complex infrastructure projects. There are few companies in India with desired experience of executing large and complex infrastructure projects. Availability of these contractors is a challenge as their order books are already overbooked. For instance, the order book of one of the largest EPC contractor in India is overbooked by four times its current capacity[11].

Inefficient contracts management resulting in contractual disputes and Industrial relation and law problems slowing down project progress

A common bottleneck in project execution is disputes between project owners and contractors. Contracts management is a major area of improvement for large infrastructure projects in India. 55 percent of the respondents opined that contractual disputes between project owners and contractors act as a major deterrent in timely delivery of projects. The disputes arise on variety of reasons such as quantity variations, rates for incremental works, understanding on payment terms and payment timelines, etc. For example, one of the prestigious road sector project contracts encountered a high number of legal issues. Of the total contracts awarded, nearly 66 percent were under dispute[12]. Similarly, resolution of industrial relation and law problems require Government or court intervention which is a tedious and time consuming process. In the survey, respondents gave equal weightage to both these factors, with 55 percent of the respondents agreeing that these factors impact project delivery.

Ineffective Project Monitoring

A key concern during the project initiation and execution phase is ineffective project planning and monitoring practices and techniques being employed by owner as well as contractor organizations. The inadequate planning results in non-identification of critical activities and concerns while the result of ineffective project monitoring, manifests in form of delay in decision making due to lack of desirable information at the right time.

As per our discussion with various project owners, sub-standard project management is basically a result of shortage in acquisition of talent who are conversant with the latest information technology tools and applications for project management.

11 Based on one-to-one discussion with the survey respondent
12 Report on Construction in India 2011, India Infrastructure

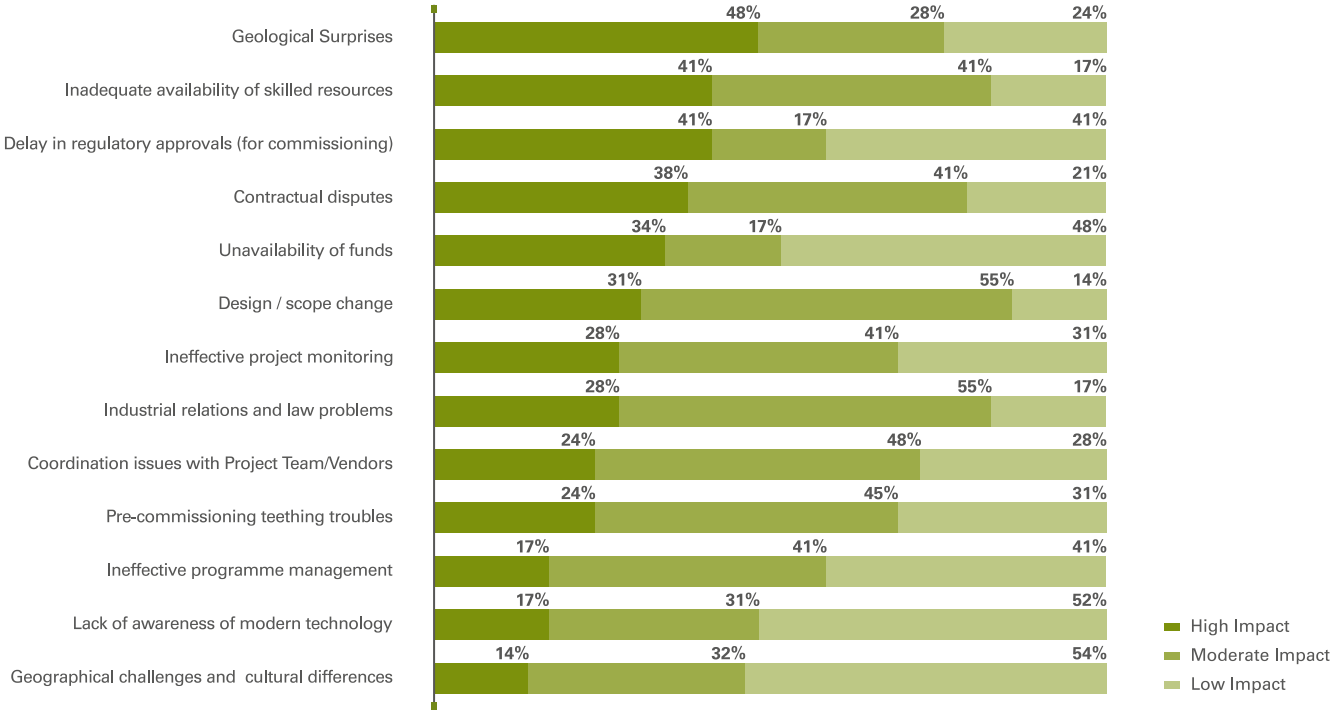
Lack of Integration Management in project planning resulting in coordination issues delaying the projects

Large infrastructure projects by the virtue of their impact and scale involve multiple agencies for execution of the project. In such a scenario, the coordination between various agencies becomes a critical factor for successful project delivery. The lack of coordination is usually a resultant of poor integration during the planning phase. 50 percent of the respondents Stated coordination issues with project team or vendors as one of the primary reasons for delay in projects.

Other factors

Other bottlenecks such as pre-commissioning teething troubles are generally identified by the project management teams and corrective actions are taken. However, there are some factors whose probability of occurrence is less, but if they occur they have significant impact on the overall project delivery. Geological surprises tops this list with 76 percent of the respondents feels that this has high to moderate impact on schedule overruns.

Exhibit 8: Extent of impact on project schedule in execution and closing phase

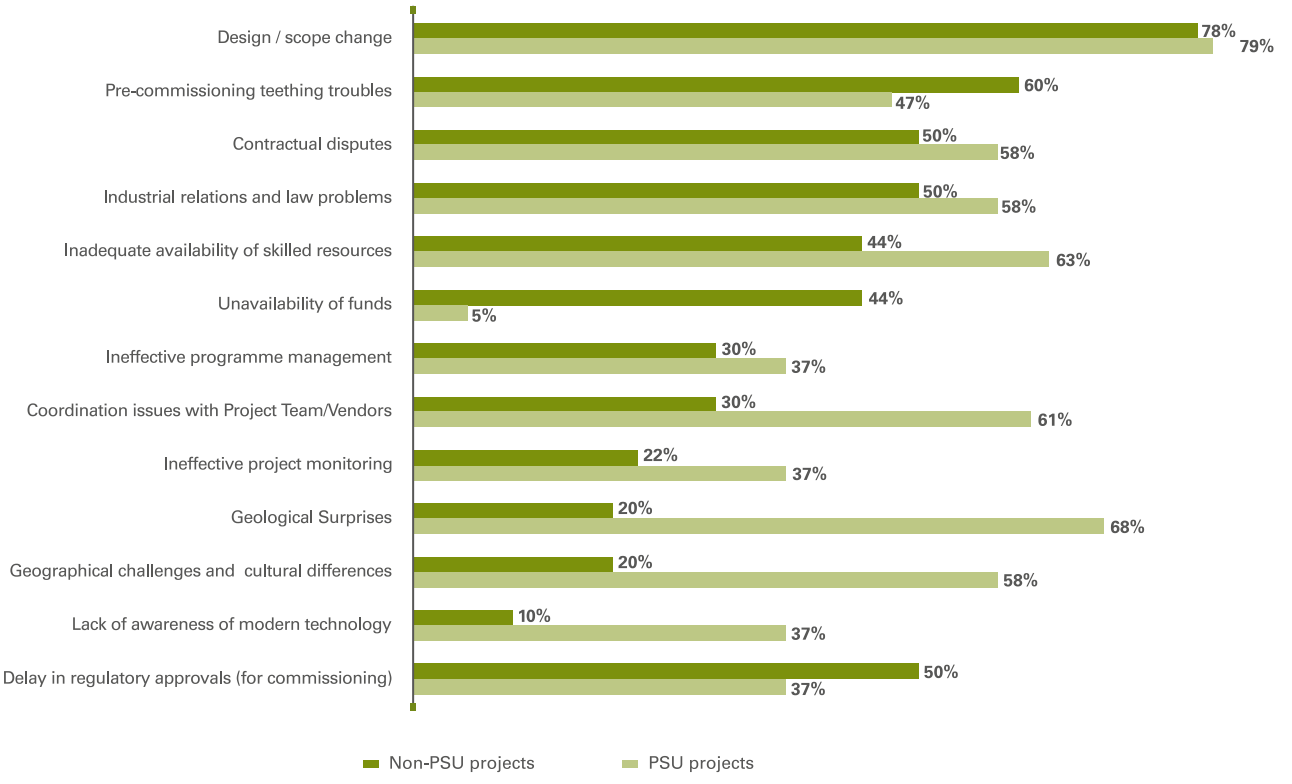


Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Factors impacting PSU's and non-PSU's project schedule

The survey result highlights the difference between central Government projects managed by public sector units (PSUs) such as NTPC and CIL, and non-PSUs such as Railways and NHAI. Although most factors—such as design/ scope change, contractual disputes, industrial relations, law problems, etc.—have more or less the same impact on project execution irrespective of the managing agency, a few factors can affect the execution otherwise. For example, unavailability of funds is a major bottleneck for non-PSU projects with 44 percent of respondents agreeing that projects are delayed due to this, whereas only five percent of PSU respondents opined that this has an impact on project delivery. The reason for this variation could be that PSUs have internal funds for their projects and they don't depend on the Government grant for funds. Further, PSUs are empowered to take investment decisions up to certain limit depending upon their status (Maharatna/ Navratna/Miniratna) without seeking the Government approval. The limit is INR 5000 crore for Maharatna, INR 1000 crore for Navratna, and INR 500 crore for Miniratna category-1 and INR 300 crore for Miniratna category II status . Additionally, it has been observed that PSUs have more flexibility and autonomy in decision making as compared with non-PSUs. On the other hand, impact of inadequate availability of skilled resources is more prominent for PSU's projects. Around 63 percent of PSU respondents agreeing that projects are delayed due to shortage of skilled labour, whereas only 44 percent of non-PSU respondents opined that this has an impact on project delivery. In the recent years PSU's have been expanding their operations aggressively and competing with private sector for talent.

Exhibit 9: Reasons for project schedule overrun for non-PSU and PSU projects



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

KPMG in India's point of view

Projects in the execution and closure phase are affected by non availability of funds, resources and delay in delivery of preceding activities. In addition, multiple changes in the scope and design of projects push project delivery timelines.

However, these factors point to the insufficient monitoring and inefficient project change management in case of infrastructure projects in the country. Furthermore, lack of knowledge and application of tools and techniques for seamless integration of different functions of project/program among the project management professionals often lead to delays.

As highlighted in the survey, the country's infrastructure sector lags behind its foreign counterparts in terms of knowledge and understanding of latest technologies in engineering as well as project management, which results in slow progress of infrastructure projects.

SECTION 03

Reasons for cost overruns

Cost revisions and cost overruns are common across infrastructure projects. According to MoSPI, infrastructure projects in central Government sector costing INR 150 crore and above, are currently experiencing cumulative cost overruns of 16.9 percent[1] of their planned cost. Our survey makes an attempt to identify the key factors, experienced by project owners, resulting in cost overruns in a project from the pre execution stage until the close out phase.

1 MoSPI flash report, dated January 2012

Reasons for Cost overruns in pre-execution phase

Scope creep and inadequate Detailed Project Report (DPR) are primary factors impacting cost overruns

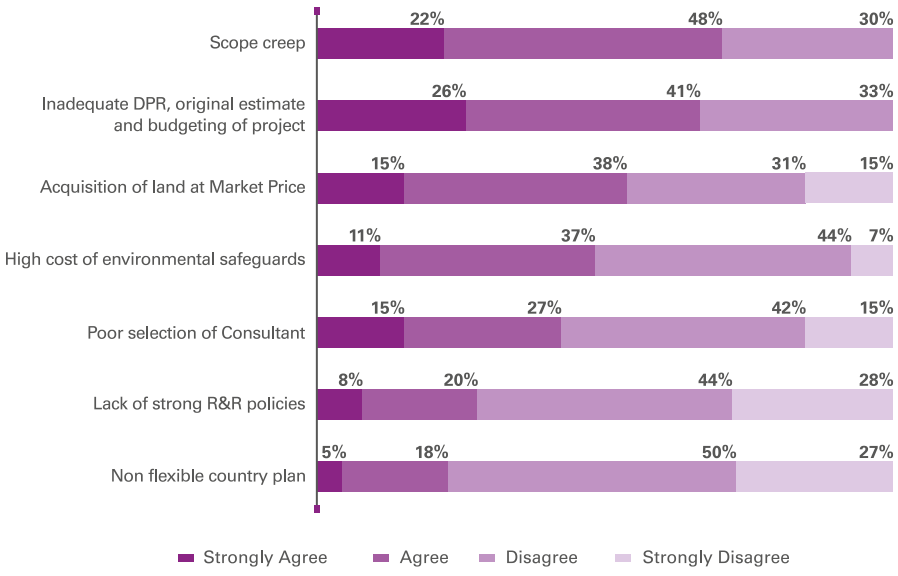
Infrastructure projects executed by State owned agencies usually involve a large number of stakeholders. It has been observed that in several projects, all functional teams were not involved in the conceptualization stage. This results in inadequate assessment of the risks and mutual interdependencies that projects could face in the execution stage. The desired level of collaboration between the project owners and the contractors also appears to be lacking. Consequently, projects face deviations in scope, which affect the delivery both in terms of time schedule as well as budgeted cost. Moreover, in case of Government infrastructure projects, the item rate contract system is the prevalent model used for allotment of contracts. Under this model, detailed drawing and designing of the projects at the time of award of contract is not mandatory. As a result, divergence from the original estimation is quite common during project execution - often leading to cost escalations.

In majority of projects, scope creep and inadequate DPRs arises due to lack of holistic planning and limited ability of project managers to assess all potential risks; and could be easily mitigated by putting an effective project management system in place and providing training to project managers.

70%
respondents agree that scope creep leads to project cost overruns in the pre-execution phase.

67%
respondents agree that inadequate DPRs lead to project cost overruns in the pre-execution phase.

Exhibit 10: Reasons for cost overruns in pre-execution phase



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Cost overrun due to inadequate DPRs is prevalent across sectors. 73 percent of energy and transport and logistics sector respondents agree that inadequate DPRs lead to cost overruns in their respective sectors.

With increasing importance of environmental safeguards, projects require additional budgets

As Indian regulatory agencies tighten their noose by bringing in additional environmental regulations, infrastructure project owners need to ensure project compliance with stringent safety and environment standards. Adhering to the evolving environment and safety standards leads to additional costs.

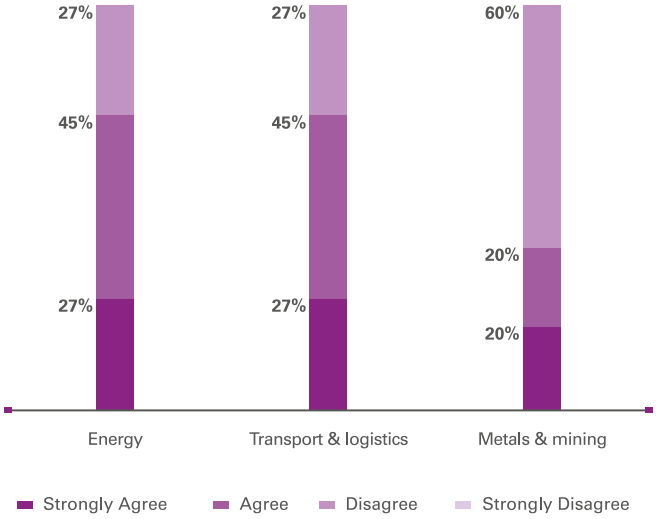
71%

respondents feel high cost of environmental safeguards has high to medium probability of affecting the project cost.

The proactive approach of Ministry of Environment and Forest (MoEF) in recent years has forced project owners to include environmental safeguards in their project plans. Moreover, as environmental policies in the country are constantly evolving, an under-construction project might need to comply with these standards midway through the execution stage. As a result, the project can face cost escalations in order to comply with the approved design, technology, material etc.

While, 48 percent respondents agree that the high cost of the environmental safeguards leads to project cost overruns, 71 percent assign a high to medium probability of project cost overruns due to this reason.

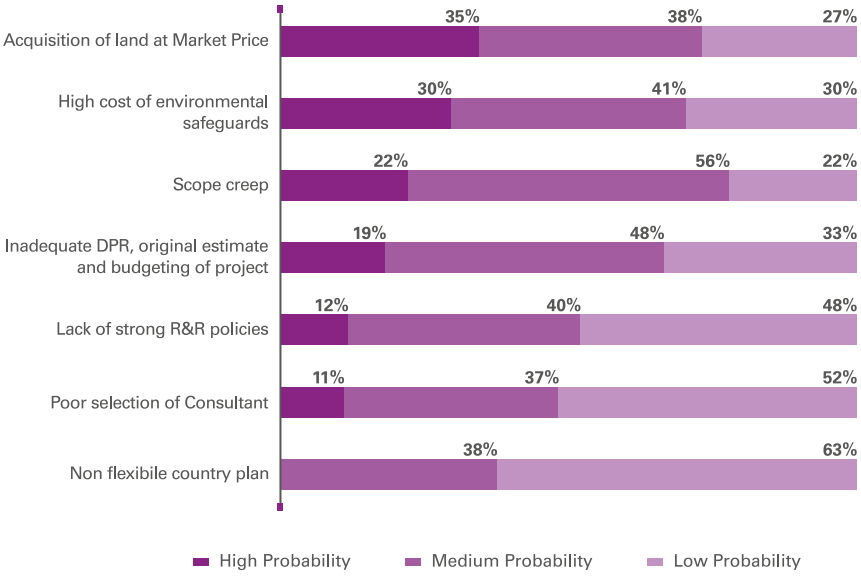
Exhibit 11: Criticality of inadequate DPR's across sectors



Telecom sector doesn't experienced cost overruns for the surveyed projects

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Exhibit 12: Probability of reasons affecting project cost overruns in pre-execution phase



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Reasons for cost overruns in execution phase

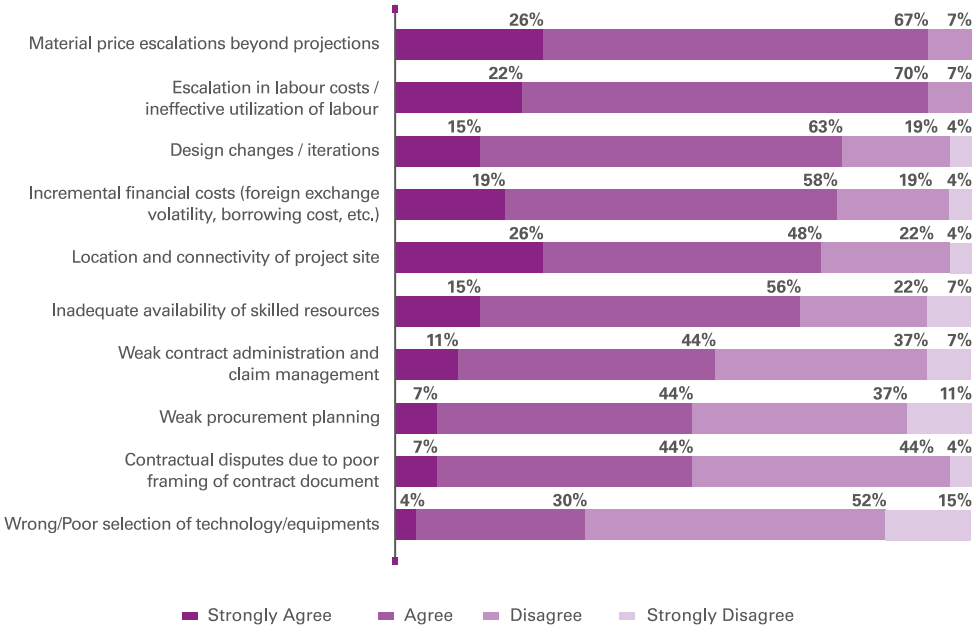
Material price escalation beyond projections is the primary reason for cost overruns during execution

Material price escalation is a business risk faced by all contractors. In recent years, costs of key inputs such as iron and steel, cement, bitumen, concrete, crude oil, etc. have fluctuated sharply. The risk of material cost fluctuation is inherent in infrastructure projects, and to some extent is taken into consideration in overall project cost estimates. However, the volatility in material prices makes forecasting a challenging exercise and leads to inaccurate forecasts. Furthermore, the cost estimate assumes the project completion as per the schedule and does not account for inflation beyond the schedule date. Thus, any delay in project completion makes the initial cost estimates obsolete leading to cost overruns.

Construction material prices have increased several folds in last few years, impacting the project cost estimates.

General Manager, Civil Aviation Sector

Exhibit 13: Reasons for project cost overruns in execution and closing phase



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Quite often, an increase in material cost over the agreed percentage leads to dispute between project owners and contractors. For example, the dispute between one of the India's largest State owned power generation company and its initial equipment supplier on price escalations (over 80 percent) delayed a three-unit 1,980 MW project in Bihar by two years[2].

Many a times, the variables used for cost estimation during project cost scheduling are not adequate to cover all aspects of project costs. As a result, various cost items that are necessary for the project budget estimation remain either unidentified or inadequately defined at the planning stage and lead to cost overruns at a later stage. Project teams need to be extensively experienced (should have costing personnel/ engineers) and adequately equipped with scientific tools and techniques to develop a realistic budget estimate for the project.

Further, the survey identified that building material cost is most susceptible to escalation followed by labor or manpower cost. 67 percent respondents feel that input materials are most susceptible to suffer an escalation. While only 19 percent respondents opine that Contractor/sub contractor costs are highly susceptible, 26 percent of respondents felt that manufactured equipment cost have a high susceptibility for escalation.

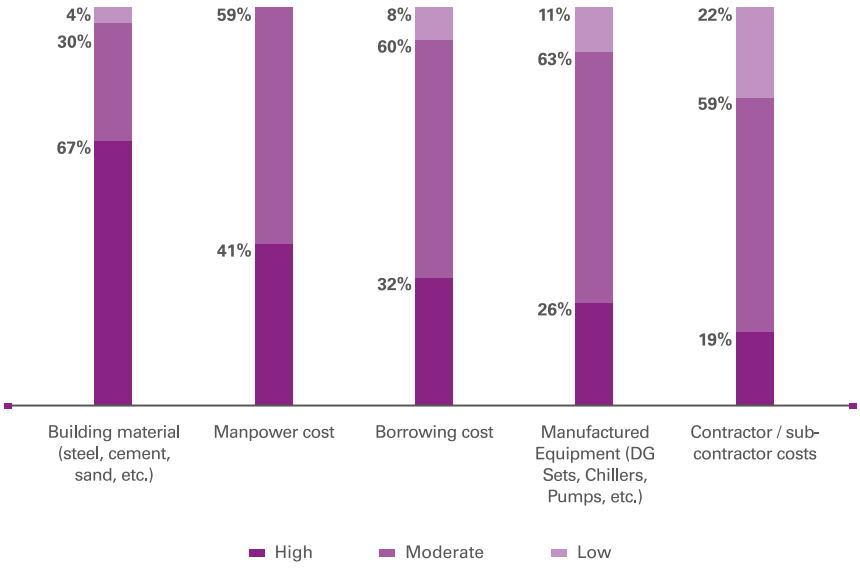
93%

respondents feel material price escalations beyond projections lead to cost overruns.

67%

respondents feel material costs are highly susceptible to escalations.

Exhibit 14: Cost elements' susceptibility to increase



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

2 "Contract disputes delay NTPC's Barh project", Livemint, 1 May 2008

Poor connectivity to project site

Infrastructure projects located in remote locations have poor transport connectivity. Lack of efficient transportation and logistics infrastructure adds to the project cost. For example, a project located in a hilly terrain with no connectivity to railways, depends heavily on roads for its raw material supplies. Transportation through roads is more time consuming and costlier in comparison to railways, leading to overall cost overruns and project delays. This is supported by the survey results, as 74 percent respondents felt that poor connectivity to project site has high to medium probability of impacting the project cost.

Further, the weather conditions at the project site can also have an additional impact on project schedule and cost. In extreme cold or heat, workers cannot work outside for extended periods of time, affecting their productivity, leading to delays. Stormy weather can also affect work schedule for days, depending on the severity of the storms. For instance, a hydroelectric power project of a leading hydro power company in Leh district of Jammu & Kashmir has reported an additional delay of 9 months due to highly inclement weather conditions of Leh and Ladhakh[3].

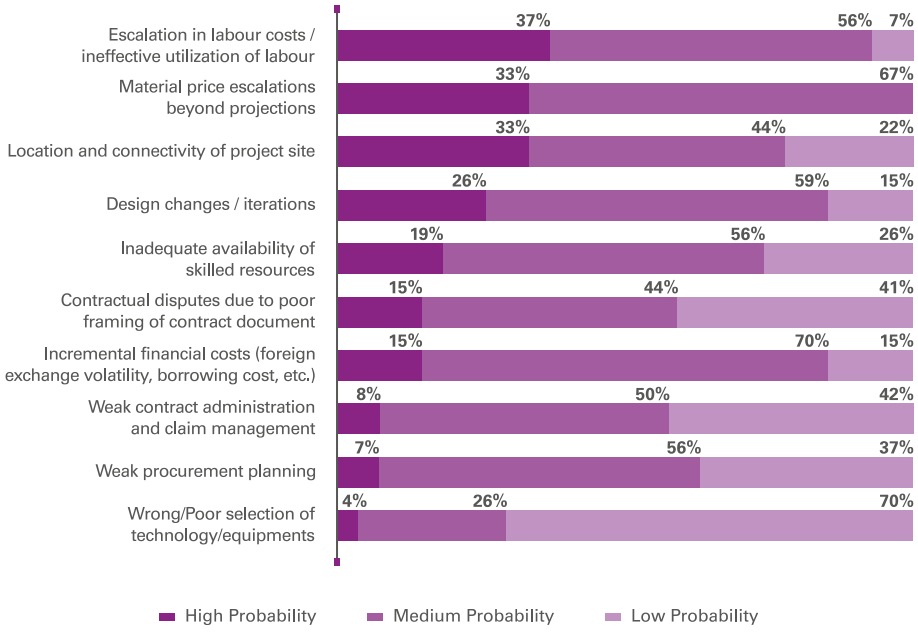
Moreover, the compensation for working under harsh conditions tends to be higher. In an isolated region workers may face problems such as inflated cost of living, lack of after-work activities to take part in and lack of basic facilities like roadways, utilities, medical staff, educational facilities and services. To offset these conditions workers demand higher compensation, leading to additional cost requirements.

Inadequate availability of skilled resources

As discussed in the previous section, adequate availability of skilled resources at all levels of a project organization appeared as critical factor for success of project. Owing to the additional employment support schemes introduced by the Government and the locally available employment opportunities, availability of skilled workforce for construction works has become even more difficult.

Apart from the direct manpower required for construction, skilled and experienced project management personnel are rare assets for an organization. Thus, to retain existing work force and attract new talent, companies need to pay high compensations leading to cost overruns.

Exhibit 15: Probability of reasons affecting project cost overruns in execution and closing phase



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

74%

respondents feel that location and connectivity of project site has high to medium probability of affecting the project cost.

3 306 Flash report on central sector projects, MoSPI, April 2011

Other factors impacting project costs

Other factors such as weak procurement planning, wrong or poor selection of technology etc. adversely impacts the project costs. During procurement planning, companies don't pay sufficient heed to the elements of material cost components such as logistics, storage and economies of scale. This leads to inefficient material procurement. Further, tenders are placed on a need basis. Hence, companies are unable to leverage on the quantitative advantages of low cost or building long-term relationship with suppliers by placing bulk orders.

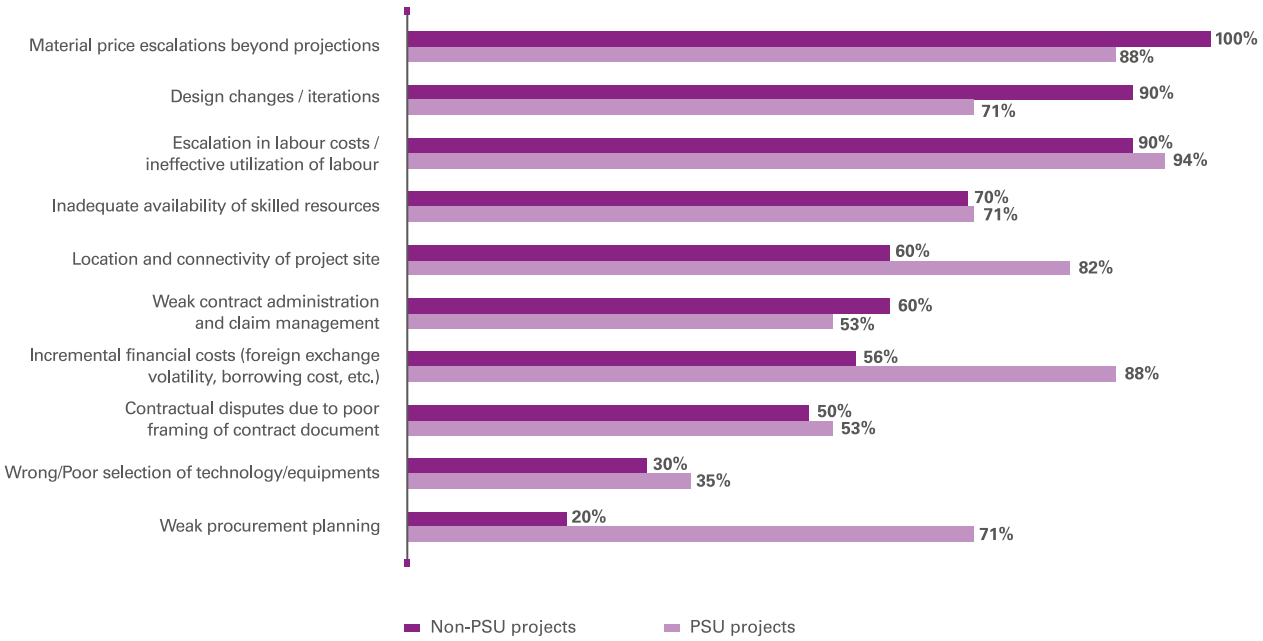
In certain cases, inadequate assessment of the suitability of the procured equipments and materials to the work site results in repetition of the entire procurement process resulting in further time and cost escalations. The endeavor to adopt the best available technology also results in frequent changes in the procurement process leading to increased cost and time.

Though these factors have substantial impact on overall project cost, these could be easily controllable with well established project management techniques.

Factors impacting PSU's and non-PSU's project cost

The ownership of the project executing agency has some impact on the schedule overrun and the cost overrun. Incremental financial cost is an important factor, contributing to project cost overrun. It has been observed that PSUs borrow money from bank/lenders at market-determined interest rates to fund their projects whereas non-PSU projects are primarily funded by the Government. This has an impact on their cost of delivering the project. 88 percent of PSU respondents agree that incremental financial cost is a reason for cost overrun whereas only 56 percent of non-PSU respondents echoed the sentiment. Further, weak procurement has more impact on PSU projects vis-à-vis non-PSU projects, highlighting the need for better procurement management of PSU projects. Other factors such as material price escalation beyond projections, inadequate availability of skilled resources, contractual dispute etc., have more or less the same impact on project cost overrun.

Exhibit 16: Reasons for project cost overrun for non-PSU and PSU projects



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

KPMG in India's point of view

The growing demand for infrastructure in the country has been consuming a major pie of the union budget. For a long period, project funding had been in the domain of the public sector but in recent times, private players have also ventured into the infrastructure sector. The size of the capital expenditure in projects has grown by leaps and bound, which has made the need for cost control even more critical. However, currently projects are facing huge cost overruns due to multiple reasons ranging from delayed approvals to scope creep and shortage of project professionals to price escalations and contractual disputes.

Although uncontrollable factors such as financing cost, foreign exchange fluctuations, etc have a huge impact on the project costs, there are other factors that need to be addressed with-in time to avoid cost overruns. Project organizations have repeatedly failed to address the issues related to contracts administration and timely procurement, which if handled effectively, can help in reducing the costs substantially.

At times, project cost estimates are highly unrealistic. As a result, the actual expenditure incurred is significantly higher than the planned value. Although, in certain situations, the additional expenditure might be uncontrollable, a realistic estimate can go a long way in providing accurate and timely information to relevant authorities to take more informed decisions. The flawed estimates are usually due to the lack of information for estimation and the lack of exposure to such huge projects. Thus, it is important that planning and implementing agencies should have qualified cost engineers and project professionals with expertise of project management tools, techniques and practices, for efficient project delivery.

SECTION 04

Sector-wise impact of factors on cost and schedule overruns

The aforementioned factors have a varying degree of impact on the project delivery from one sector to another. For example, coal sector is more sensitive to regulatory approvals, as majority of the coal fields fall under forest area and it takes around 3-5 years for acquiring all requisite forest and environmental clearances. On the other hand, telecom projects are least impacted on account of regulatory approvals. Similarly, scope creeps are common in airport infrastructure projects mainly due to the need to accommodate allied services (such as immigration, custom, etc). Following section provides sector-wise analysis of how various factors affect the schedule and cost overruns.

Reasons for schedule overrun across sectors

Human resources	Petroleum	Power	Coal	Steel	Civil Aviation	Railways	Roads & Highways	Port & shipping	Telecommunication
Land/site handover	◑	●	◕	◑	●	◕	●	●	◑
Delay in regulatory approvals	◔	◕	●	◑	◔	◕	◕	◑	◔
Geological surprises	◕	◕	●	◑	◑	◔	◔	◑	◔
Relationship with other projects	◔	◔	◔	●	◑	◑	◕	◑	◑
Ineffective procurement planning	◔	◔	◔	◑	◔	◔	◕	◑	◔
Design/scope change	◕	◕	◕	●	●	◕	◕	◔	●
Weak/ineffective project monitoring	◔	◔	◔	◑	◔	◔	◕	◑	◔
Inadequate availability of skilled resources	◔	◕	●	●	◔	◑	◕	◔	◑
Contractual disputes	◔	◕	◕	●	●	◔	◕	◔	◔
Lack of awareness of modern equipment	◔	◑	◔	●	◔	◔	◔	◔	◔

● Very high impact ◕ High impact ◑ Moderate impact ◔ Low impact

Source: KPMG in India- PMI survey on cost and schedule overruns, 2012

Reasons for cost overrun across sectors

Human resources	Petroleum	Power	Coal	Steel	Civil Aviation	Railways	Roads & Highways	Port & shipping
Scope creep	◕	◕	◔	●	●	◑	●	◔
Design change/iterations	◕	◕	◕	●	●	◕	●	◑
High cost of environmental safeguards	◔	◑	◕	●	●	◔	◔	◑
Acquisition of land at market price	◑	◕	◔	◑	◑	◔	●	◔
Inadequate DPR	◕	◕	◔	●	◑	◕	●	◑
Weak procurement planning	◕	◕	◕	●	◔	◔	◕	◔
Material price escalations beyond projections	◕	●	●	●	●	◕	●	●
Poor selection of consultant	◑	◔	◔	●	◑	◔	◕	◑
Location and connectivity of project site	●	◕	◕	◑	●	◑	◕	◑
Incremental financing cost	●	●	●	◑	◑	◔	◕	●

● Very high impact ◕ High impact ◑ Moderate impact ◔ Low impact

Note: The telecom sector does not experience cost overruns for the surveyed projects.
Source: KPMG in India- PMI survey on cost and schedule overruns, 2012

SECTION 05

Mitigation strategies – Helping ensure efficient project delivery

The successful delivery of projects is affected by a wide variety of internal and external factors. Although, both internal as well as external factors impact the delivery of project, internal factors remain an area of concern by virtue of them being controllable. To deliver projects on time and within budget and scope, global infrastructure companies use formalized project management practices and take supportive steps for the developing the competency in this area. Additionally, with increasing project size and complexity, many companies have institutionalized the use of standard methods for project and risk management. Also, various nations have showed an increased willingness to invest in training and development for project and program management staff.

In view of the shortage of in-house project management professionals, Indian organizations have widely adopted the route of having external/independent Project Management Office (PMO). Project management office (PMO) is a relatively new concept in India and is being widely used by Indian companies.[1] However, our discussion with the project managers highlighted that due to the shortage of qualified project management professionals, the PMOs are not able to function to the desired level of capability.

Apart from establishing PMO, focused Risk Management has been widely adopted and welcomed as a key measure of mitigation against project overruns. A comprehensive and detailed risk planning and monitoring establishment ensures prior detection and timely alerts on changing response of various risks.

In addition to adoption of global best practices of establishing PMO and risk management set up, respondents across the sectors have expressed the need for improvement in project planning and monitoring capabilities along with better risk management as areas requiring immediate attention for improved project delivery.

Furthermore, periodic monitoring of projects and training of project staff for better understanding and knowledge of project management practices such as contracts management, procurement management, value engineering during design, etc. have been identified as the most effective measures for successful project delivery.

Project Management Office (PMO) is an effective way for monitoring projects

Setting up a PMO, consisting of experienced managers and subject matter specialist of the company, help in timely identification of issues related to cost and schedule overrun and allow companies to take corrective actions in time. The PMO also serves as an independent body directly reporting to the Board of Directors about the progress of project and supports oversight on the projects. It drives successful implementation of projects, through implementation of leading project management processes, protecting project against risks and ensuring adequate guidance and information for timely decision-making. Implementing a PMO could help in achieving the following project objectives:

Reduced cycle time and delivery costs: The PMO establishes and deploys standard set of project management processes and templates, which enables project managers with an established and tested module for better management and monitoring of projects. These reusable project management components help projects to engage all the functions in a more organized and efficient manner with much less effort. The standard approach reduces the learning time for the project team while adapting to the limitations and uniqueness of a project.

Improved quality of project deliverables: The PMO, by virtue of standard global approach, deploys international best practices used at similar projects, thus, improving the quality of project deliverables. Also, the standardization of deliverable in line with globally established standards improves the acceptability of the deliverables worldwide.

Early identification of issues and risks: The PMO regularly and independently tracks the status of the projects and identifies bottlenecks and risks that may impact project delivery. The use of established methodologies at regular intervals enables identification of issues and risks associated with the projects, enabling timely decision making by the relevant authorities.

Improved accuracy of project estimates: The PMO takes a holistic view of the potential risks and benchmarks the existing project cost with similar projects, thus improving the accuracy of the project estimate. Also, the availability of the trained professionals reduces the chances of errors in different estimations.

Improved people and resource management: The PMO provides training (internal or through vendors) and mentors managers to build core project management competencies. In certain set ups, the PMO also manages shared resources between various projects forming part of a common program providing better efficiency and utilization of these resources.

Re-use of knowledge and the ability to leverage that knowledge on current / future projects: The PMO maintains the repository of key learning's from a project – pertaining to best practices as well as improvement areas. These learning are disseminated to all concerned people in the organization and applied to current/future projects thus avoiding the risk of similar issues at different projects.

> Our company has a concept of Integrated Project Management (IPM), under which all departments related to a project directly report to the project Executive Director (ED). For eg. project department, finance department, personnel department, etc. directly report to the project ED. This avoids bureaucratic delays within the organisation and facilitates faster decision making.
>
> **Executive Director,**
> **Steel Manufacturing Company**

1 PMI-KPMG study on drivers for success in infrastructure projects 2010 – Managing for change

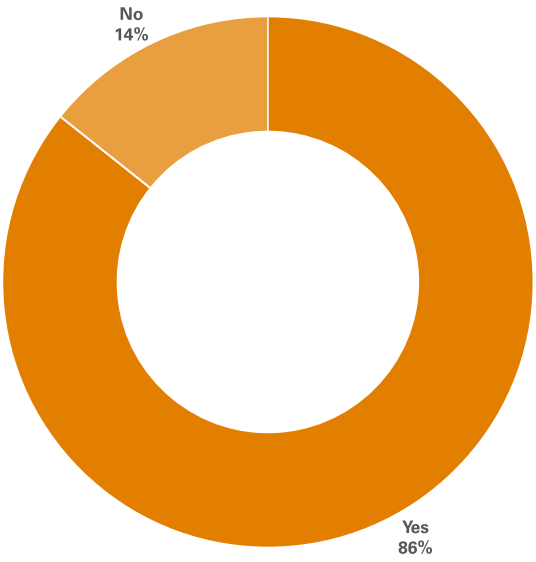
PMO Role	PMO Responsibilities
PMO Manager	PMO Management; Quality Management; Stakeholder Management
Planner	Work plan/ milestone Management; Scope management
Coordinator	Project Support: Scope, integration, change and resource management
Controller	Financial Management
Program Administration Support	Project Support: General Administration
Project Information	Internal and external project communication (not change management)
Project Stream Lead	All typical PMO responsibilities for each of the work streams

In addition, a PMO typically performs the following functions:

- Monitor project performance against the set targets and act as an information center on project progress
- Set-up and deploy standard processes, practices and procedures for project implementation
- Mentor Project managers for future project needs
- Provide consulting support on project planning and implementation
- Conduct portfolio management i.e. monitor inter project interdependencies, audit and prioritize individual projects, etc.

The importance of PMO is demonstrated from our survey results as well, wherein 86 percent of the respondents felt the need for an independent PMO for monitoring project and positively reacted in its potential to manage cost and schedule overruns.

Exhibit 17: Requirement of project management office



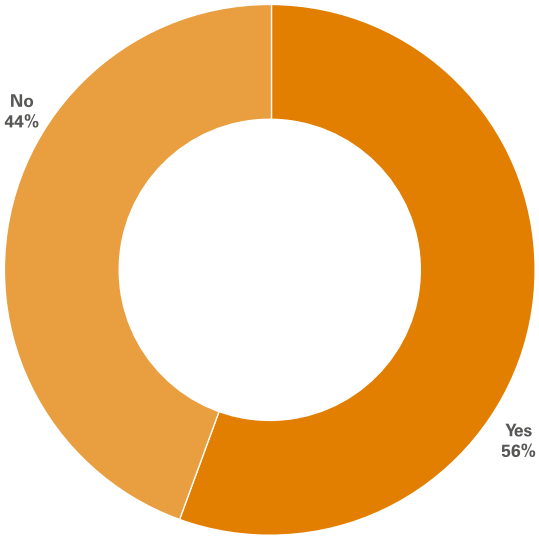
Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Risk Management techniques are used by only 56 percent of the respondents

An effective risk management includes the processes concerned with conducting risk planning, risk identification, analysis, responses, and monitoring and control during the life cycle of a project. Indian infrastructure companies are yet to match their global counterparts in developing a risk–aware culture and a rigorous risk management discipline within their organization. In our survey, only 56 percent of the respondents said that they have a risk management process in place for achieving project objectives. Furthermore, our discussions with the project managers suggest that many companies appear to be short of a 'holistic' approach, where the risk is fully integrated into every aspect of the construction life cycle.

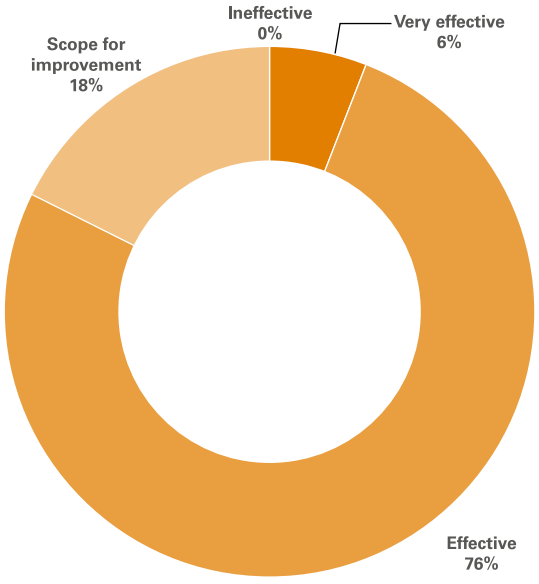
Most organizations taking part in survey showed enough confidence in their existing practices, as more than 80 percent of the respondents, which have established risk management practices, rated their existing practices as effective. Only 18 percent respondents felt that there is a further scope of improvement. Out of the entire gamut of organizations surveyed, only 45 percent opined that they have effective risk management procedures in place. The poor effectiveness in practice is further established by the fact that at the time of survey around 53 percent of projects were running behind schedule with 34 percent were drawing additional expenditure apart from their initially planned budget[2].

Exhibit 18: Usage of risk management techniques for identifying and monitoring risk



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Exhibit 19: Effectiveness of risk management practices



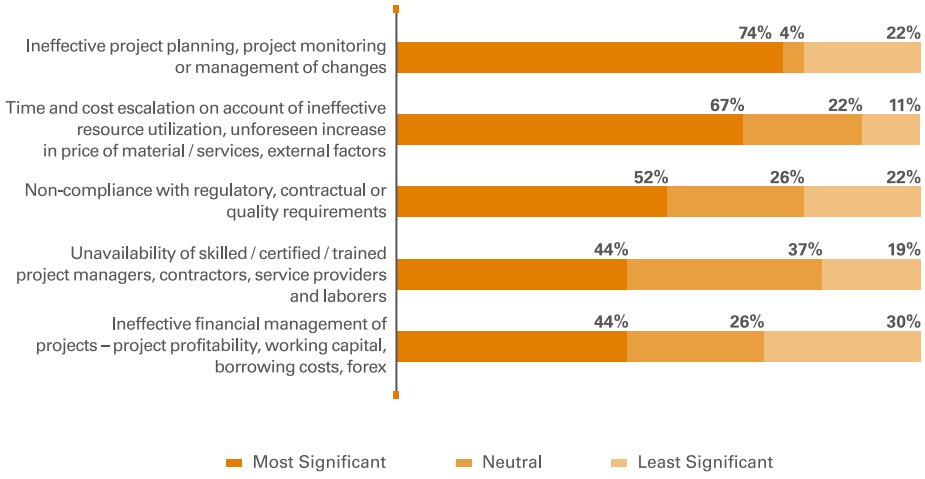
Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

2 315 Flash report on central sector projects, MoSPI, January 2012

Ineffective project planning and project monitoring is rated as the most significant risk having maximum impact on project delivery

Project risk, uncertainty and stakeholder influences are the highest at the start of a project and decrease gradually over a project's lifecycle. Thus, before the project team gets into the execution mode, it is of utmost importance to do a detailed planning for all potential risks, so that the project could be completed effectively and efficiently with as few deviations as possible. The importance of effective planning is even highlighted by the survey results. 74 percent of the respondents rated ineffective project planning and project monitoring as most significant factor impacting project schedule and cost. Ineffective resource utilization, non-compliance with regulatory requirements, un-availability of project managers, etc. are some other factors which could adversely impact project delivery. These risks could be easily manageable at the project level through an independent and objective risk management team that conducts risk reviews periodically and can put in place a mitigation plan that is actionable within the defined timelines.

Exhibit 20: Impact of risks on project delivery



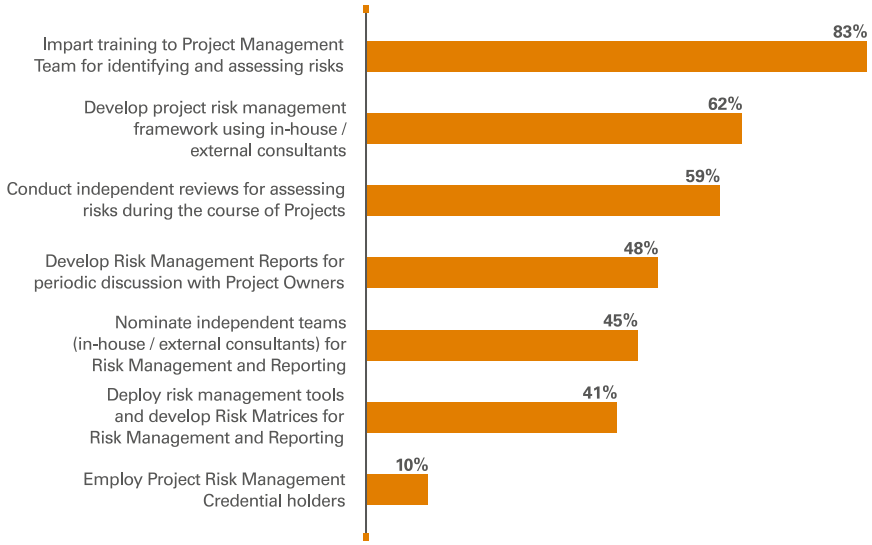
Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Improve risk management skills for successful project delivery

The biggest single factor identified for improving risk management in projects is to enhance the risk management skills of project managers. 83 percent of the respondents believe that imparting training to project team for identifying and assessing risks could significantly improve project delivery. Additionally, our discussion with respondents highlighted that majority of the project teams haven't received any formal project or risk management training.

Developing project risk management framework, conducting independent reviews and developing risk management reports are some other factors that could positively impact the risk management in projects.

Exhibit 21: Strategies to enhance risk management in projects



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Strategies to control schedule overrun

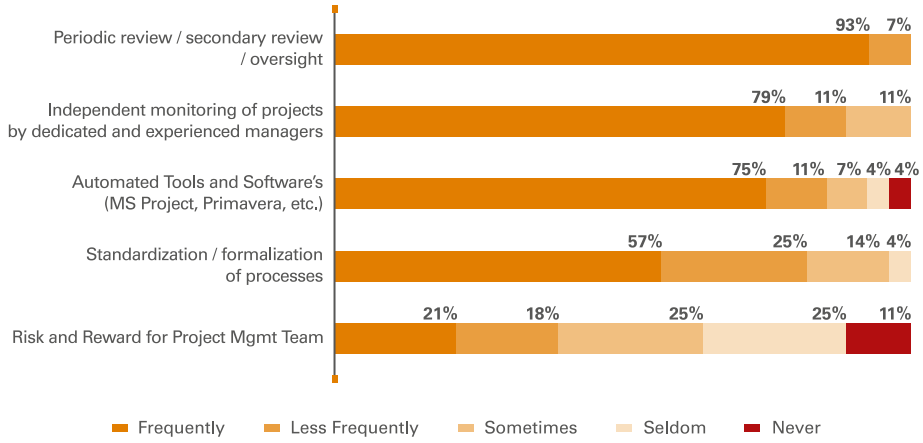
Periodic review and oversight is one of the most commonly adopted strategy to control project schedule delay. This is primarily because infrastructure projects generally span over a long duration and hence require regular progress review. The nature of risk involved in such projects also keeps evolving constantly. Hence, proactive risk assessment is required at the various stages of the project. In docile scenarios, project owners and contractors only attempt to avoid and overcome the type of risks defined by the management during the planning stage. Such a risk management process often leads to failures as the risk managers do not pay attention to the evolving circumstances and fail to envision the bottlenecks that might have to be encountered at a later stage. Thus, it is important to review the project progress regularly.

Internally, project managers need to maintain periodic risk management reports to identify the probable project risks. Additionally, project managers could split the various stages of the project into smaller components to track the target achievement on a regular basis. This would help in improving resource utilization through better planning and closer monitoring.

Project reviews by third parties is another technique to review projects. Independent reviews by third parties provide an objective opinion on the project scope, budget, timelines, design, procurement, technology and contractor selection, etc. Further, this could help in bringing new ideas and break short sighted thinking.

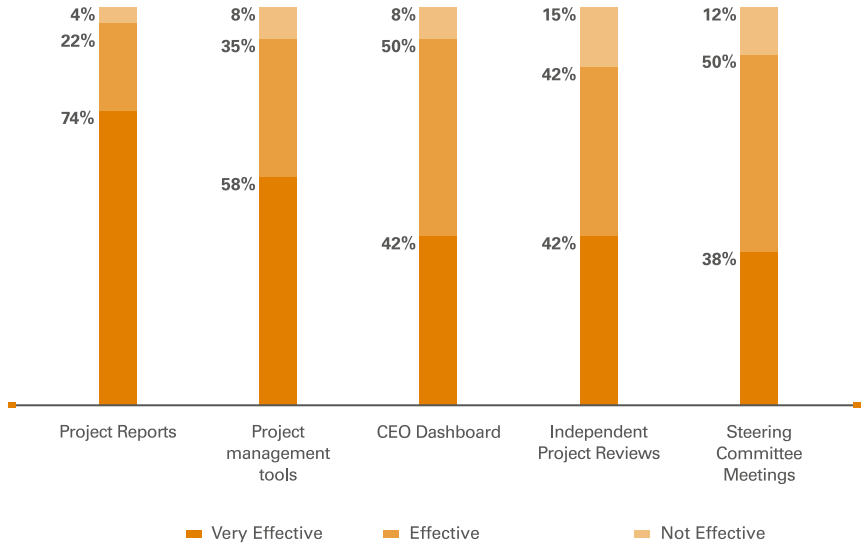
Project plans also suffer due to lack of oversight. For instance, modernization of an international airport in eastern India required the demolition of an old building which stationed critical facilities such as power house, air-conditioning plant and generator room for the functioning of the existing terminal. The planning team unable to assess the criticality of the building and hence did not suggest an appropriate relocation of the facilities harbored by the old building. This led to the delay in demolition of the old building and affected the time schedule of the project.

Exhibit 22: Commonly adopted strategies to control project schedule delays



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Exhibit 23: Effectiveness of project monitoring tools



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Project reports and project management tools are rated as most effective tool for project monitoring, followed by CEO dashboard.

Risk and reward program for project management teams/contractors are used occasionally

Risk and reward program for project management teams and contractors for exceeding or meeting the targets are not common in comparison to other mitigation strategies. In our survey, 21 percent respondents frequently used risk and reward program as a measure for controlling schedule overruns. Due to lack of an appropriate incentive program, the project management teams and external contractors and subcontractors are not motivated enough to take interest beyond their defined responsibility to meet the project schedule and cost. At times, the project management teams desist from introducing innovative moves for efficiently meeting the project timeline, as they do not find any direct advantage (monetary benefits or an appropriate recognition) for themselves.

To motivate the teams, project owners need to include a clearly defined risk-reward program in the project plan for appropriately rewarding the project team and the contractors for meeting or exceeding the targets. Further, the risk-reward programmed should be designed in a clear and quantifiable manner so that it motivates not only the top level personnel of the project execution team but the people involved at all the levels of the team. Incentives such as performance bonus, enrolment to advance training programs, recognition within team, etc. could help in encouraging the project team to apply innovative techniques for meeting the timelines in an efficient manner.

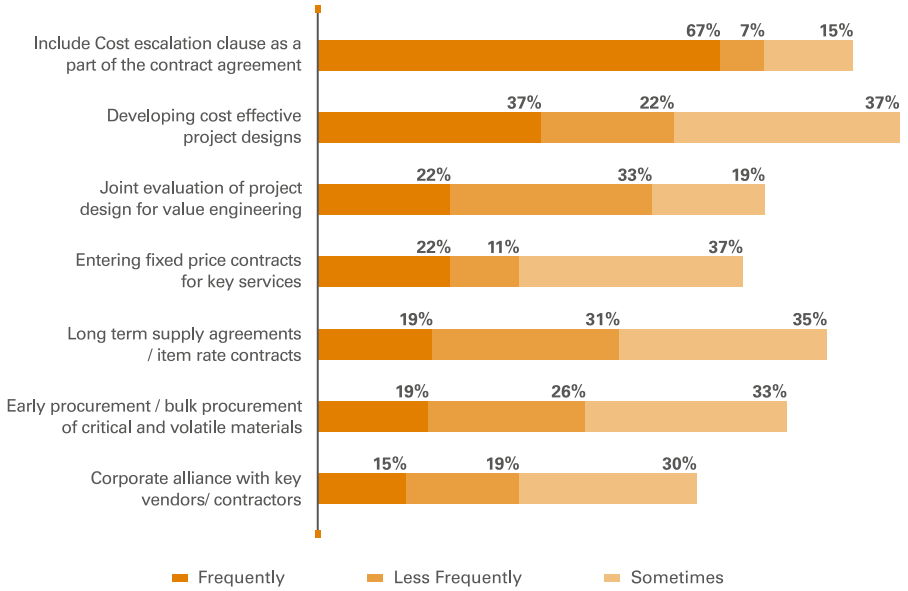
Strategies to control cost

Due to the long gestation period of infrastructure projects, project owners include cost escalation clause as a part of the contract agreement. 65 percent of the respondents use this strategy to control project costs. Further, developing cost effective project designs and joint evaluation of project design for value engineering is also used frequently.

However, not many companies optimize their procurement methods to manage cost.

Project owners need to develop long term relationship with the contractors and sub-contractors so as to map their performance over a period of time and identify the better performers. Deploying practices such as demand consolidation of high spend categories across the entire company, centralized sourcing, developing new vendor and preferred relationships through long term contracts can also help in lowering the project cost. Tools such as ERP and other IT based systems that help in efficiently tracking the source of materials should be promoted. The project owners could also look to leverage supplies from low-cost countries such as China and Russia in cases where the domestic supplies are not cost effective.

Exhibit 24: Strategies used to control project cost overruns



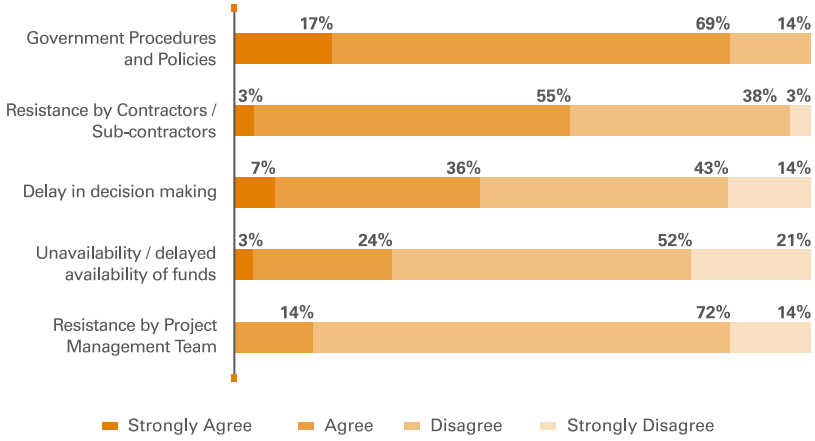
Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

> We have entered the fixed value contract with the vendor, thus any cost increase is borne by the contractor.
>
> **General Manager, Telecom company**

Issues faced in adopting control strategies

Government procedures and policies are rated as a major hindrance by respondents in adopting schedule control strategies. 86 percent of our survey respondents suggest that they are unable to adopt controlling strategies on time due to stringent Government procedures. This is mainly because in a Government set-up, deviation from day to day operations requires an approval from higher authorities. Another major reason highlighted in the survey in adopting the mitigation strategy is the unavailability of skilled resources to execute the projects. Around three fourth of the respondents feel that lack of availability of experienced vendors and around half of the total respondents agree that the shortage of experienced design engineers are major bottlenecks in adopting the mitigation strategies. Further, over 55 percent respondents indicated that they face resistance from contractors and sub-contractors, if they want to replace the existing processes with more efficient ones.

Exhibit 25: Issues faced in adopting the schedule control strategies



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

SECTION 06

Project management – Proven method for successful delivery

Challenges in capital projects have grown multi folds in the last decade. First experiment at three lane track capacity enhancement by railways, set up of country's largest thermal power plant, construction of large hydro power plants initiating one of the biggest planned human exodus, development of one of the world's largest airport in shortest time, etc. have only added greater emphasis on established project management techniques and practices being adopted from project inception till closure.

The rationale for Project Management arises from the need to institute consistent standards and methods, eliminate project delays, correct poor or improve project planning processes, provide clarity on roles to ensure authority is matched with responsibility for project completion, advance project performance, remove cost overruns and contain costs. It thereby aims to separate project performance (success / failure measures) from project progress (meeting time scales, clearly agreed milestones, setting parameters at the end of each phase, etc.), guarantee quality to project needs and augment customer / coordinating agency satisfaction.

Project Management encompasses setting up and sustaining practices / procedures, performing project tracking to report on progress, monitoring inter project interdependencies for review / prioritization of individual projects, creating database for risk analysis and building knowledge management repository from lessons learnt. It includes proposing consulting support on projects, and communicating project needs, status/advancement to senior management.

Furthermore, offering training through project skill development programs and mentoring services to managers are imperatives for realization of future project needs. Provisioning of training budget / level of investment in professional training for employees during the project planning process, collaboration with educational institutions / professional management organizations, participation in Project Management benchmarking forums are crucial mechanisms to cultivate project management expertise in the employees. Level of investment, project risks, technical challenges along with sensitivity in general public and political scenario have not only induced the need for objectivity / independent opinion / valued use of outside experts on project scope, budget, timelines, design, procurement, technology and contractor selection, but also on usage of assortment of project management tools, techniques and best practices.

Absence of robust Project Management capabilities lead to project complexities not being accounted for, inadequate planning, scheduling deficiencies relating to resource unavailability and or material estimation, construction delays resulting in disputes further leading to considerable resource spending on heavy litigation processes, non-addressal to staffing issues limiting agency's contract oversight capabilities. Lack of sufficient stress on planning and management tools / techniques can lead to:-

- Insufficient understanding of local environment
- Inaccurate forecasts on usage projections, demographic trends, market conditions and imminent technological bottlenecks
- Due diligence decisions and ascertainment of risks / changes in exogenous factors not preceding decision making process
- Absence of new ideas being brought in causing short sighted habits and thinking.

SECTION 07

Resource shortage – Plaguing the growth of the sector

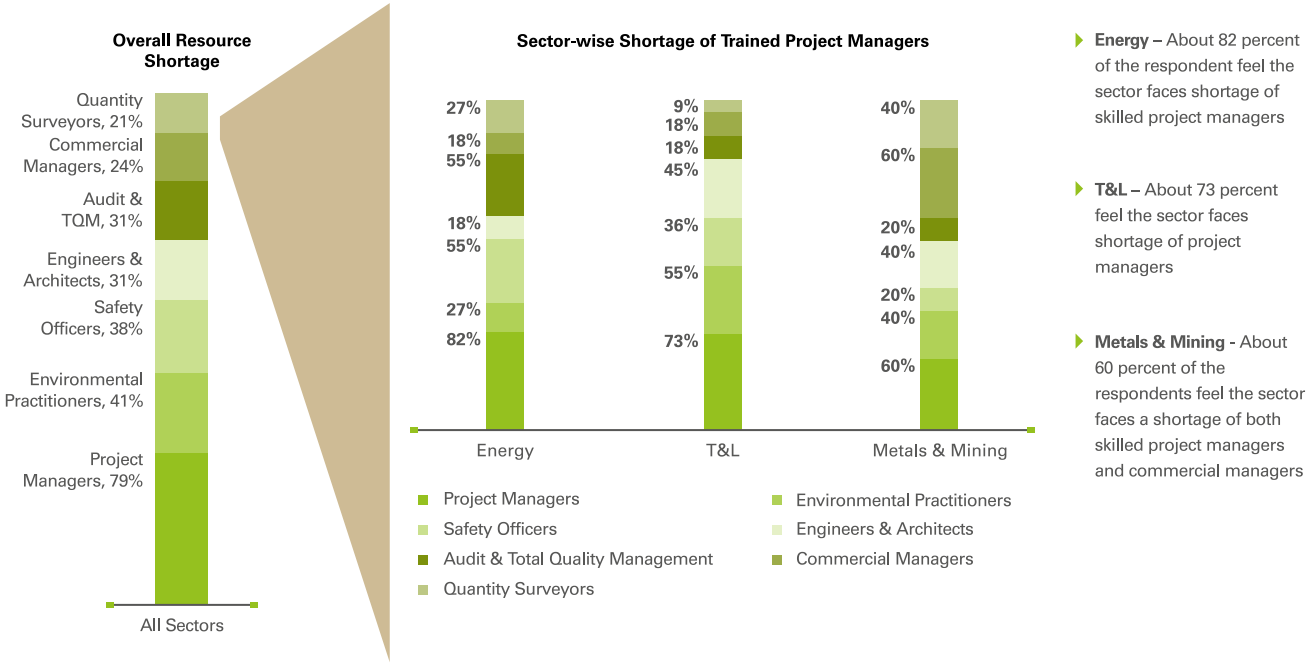
The Indian Infrastructure sector plays an important role in the India growth story servicing the needs of the both public and private sectors. The sector has a huge multiplier effect on the growth of the economy. However, it faces manpower challenges, which are detrimental to the growth of the sector.

The survey also suggests that there is a dearth of skilled manpower across sectors and this shortage can have an adverse impact on the delivery and cost of the project. The availability of skilled project managers is proving to be challenge in the Indian Infrastructure sector and this situation in likely to get aggravated in the future. Furthermore, even the current education system is unable to deliver the required number of specialists across the project management value chain. In addition, there is a shortage of experienced engineers with the desired project management skill sets to take up larger roles.

As per the survey, 79 percent of the respondents feel that lack of project managers is a major cause of concern, followed by Environmental Practitioners (41 percent), Safety Officers (38 percent) and Engineers and Architects (31 percent).

Further, the effects of skills shortage are apparent across various sectors as well. As per the survey, about 82 percent of the respondents in the energy sector feel that lack of skilled project managers is a major cause of concern.

Sector-wise shortage of skilled professional - A cause of concern across sectors



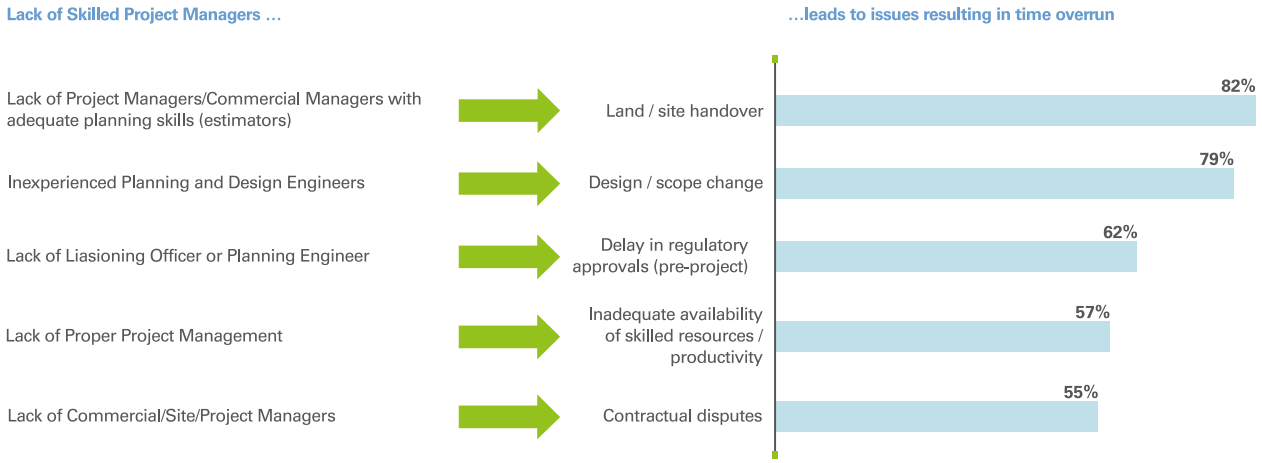
Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; KPMG in India analysis

Lack of skilled project managers is the root cause for the time overruns in a project

Lately, it has been observed that the inflow of talent in the infrastructure sector has been declining – as resources are going for alternative options, which are more lucrative. This issue is felt across various stages of project lifecycle from the conceptualization/pre-planning to the final closure/handover stage.

The survey has identified that the biggest reason for schedule and time overrun is the lack of skilled professionals, which results in problems such as prolonged finalization of design, scope creep, delay in regulatory approvals and contractual disputes.

Sector-wise shortage of skilled professional - A cause of concern across sectors



Note: In the above chart top 5 issues have been considered for analysis
Source: PMI - KPMG survey on cost and schedule overrun, KPMG in India analysis

Source: PMI-KPMG survey on cost and schedule overrun

The survey has indicated that 79 percent of the respondents agree that the sector faces shortage of skilled project managers with requisite skill set, which also results in time/ schedule overrun. The lack of requisite skill set as the major cause of concern is also highlighted in the KPMG International's Global Construction Survey 2012 indicates that about 45 percent of the respondents in the ASPAC region are less pessimistic about economic prospects and instead point to skills shortages and inflation as a continuing worry.

Lack of availability of skilled labour is an issue.

General Manager, Power Generation company

Building Capabilities – Paramount to Achieve Operational Efficiencies

Indian economy has been witnessing a huge spate of infrastructural investments over the last few years and the trend is bound to continue for the coming years as well. We have been witnesses to the strong and sustained growth powered primarily by investment in various infrastructure segments. Construction is the second largest economic activity in India after agriculture in terms of employment and has been growing at a pace never seen before[1]. However, the sector at the same time is also witnessed with shortage of skilled workforce, which is detrimental for the growth of the sector. To overcome this issue, the Government has to play a more proactive role. It should consider recognizing vocational or skill training institutes as part of the main stream.

Demand for construction professionals is growing in India

The infrastructure (construction) sector has one of the largest workforce requirements, and this requirement of skilled manpower is expected to increase considering the growth projections. As per the Twelfth Five Year Plan, the spending on the infrastructure sector is expected to increase to USD 1 trillion from USD 500 million in the Eleventh Five Year Plan, resulting to an increase in demand for the construction professionals across the project management cycle.

Further, the demand for unskilled, semi-skilled, support staff and professionals for construction industry is expected to increase at a CAGR 8.4 percent during 2010-22 to 92 million people[2].

Requirement of human resources for construction industry ('000's)		
Human resources	**2010**	**2022 - Forecasted**
Engineers	928	3720
Technicians and foreman	647	4320
Clerical	833	3650
Skilled workers	3689	23350
Unskilled workers	28903	56960
Total	**35000**	**92000**

Source: Approach paper for 12th five year plan, Planning Commission, KPMG in India Analysis

1 MoSPI, January 2012 Flash Report
2 "An approach to the 12th Five year plan", Planning Commission, October 2011, p123

With the increasing project complexity and usage of advanced technology, the demand for qualified professionals for project management and construction is expected to increase at a faster rate in comparison to overall labor demand. By 2022, construction industry would require between 4.6 – 5.2 million professional which is around four times of existing available professionals[3].

Demand of skilled construction professionals by the end of 2022 (in '000's)		
Professionals	**2010 - Estimated**	**2022 – Forecasted**
Project managers	70	225-350
Civil engineers	815	3500-3700
Planners	50	170-230
Surveyors	50	170-230
Quality control professionals	100	350-450
HSE professionals	50	170-230
Total	**1135**	**4585-5190**

Source: NSDC - Building, Construction and Real Estate Services Sector (2022); KPMG in India Analysis

While the supply of project professionals is not able to keep pace with the demand

Many infrastructure projects in India are suffering due to the dearth of competent and experienced project managers and project professionals. One of the reasons for this is the lack of focus on project management courses in India's education system. India has very few universities (less than 10) that offer degree/diploma courses on project management in comparison to China which has more than 100 universities offering different courses in project management[4]. Further there are very few institutions that offer courses on Infrastructure management. The curriculum covered in these courses focuses on industry knowledge, regulatory aspects etc., but these courses don't provide detailed knowledge about the international standards and leading practices of Project Management. There is need to introduce project management as a subject in engineering and management courses.

Another reason is the number of students that could enroll for civil engineering courses has not increased much in comparison to other engineering streams. For instance, in 1990, civil engineering programs had the capacity to enroll 13,500 students, while computer science and information technology departments could accept only 12,100. By 2007, computer science and other information technology programs reached to 193,500; civil engineering climbed to only 22,700[5].

3 KPMG in India Analysis factoring the investment projections and distribution of human resources in infrastructure sector
4 "India lagging China in project management", The Economic Times, 18 June 2010
5 "A High-Tech Titan Plagued by Potholes", The New York Times, 25 August 2010

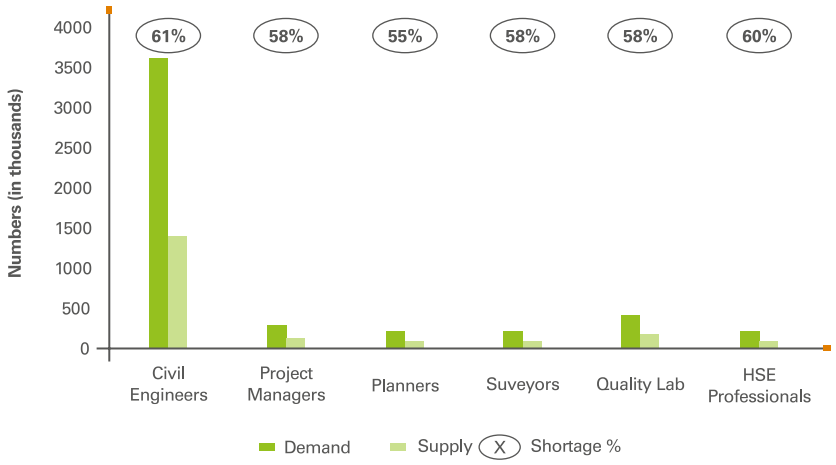
Table below gives the projected supply of construction professional:

Supply of skilled construction professionals by the end of 2022 (in '000's)[6]	
Professionals	**2022 - Forecasted supply**
Project managers	120
Civil engineers	1400
Planners	90
Surveyors	85
Quality control professionals	170
HSE Professionals	85
Total	**1950**

Source: Approach paper for 12th five year plan, Planning Commission; KPMG in India Analysis

Although, the absolute number of workers employed across all categories has increased, the strength of the skilled workforce has been consistently going down. The below chart illustrates the gap between demand and supply of skilled professionals impacting the project delivery. By 2022, India is expected to have a shortfall of around 3 million professionals which is approximately 60 percent of the total demand[7]. This decline in skilled workers proportion brings out the need for skill development of the workers employed in the industry.

Shortage of Project Professionals in 2022



Source: NSDC - Building, Construction and Real Estate Services Sector (2022); KPMG in India Analysis

6 KPMG in India Analysis assuming number of students passing out each year and percentage of students joining the infrastructure industry

7 KPMG in India Analysis assuming number of students passing out each year and percentage of students joining the infrastructure industry

Hence building project management capability and maturity is priority for most organizations in India

Shortage of talent in the construction sector is a long term problem and will continue to push up project costs and risks. The education and training capacity offered through various schemes currently are clearly inadequate to meet the demand of the large percentage of unskilled workers in the Indian labor market. The education system is often not delivering the required number of specialists across project management, engineering, surveying, contract management and the skilled/semi-skilled labor. The 61st round of the NSSO also reconfirmed that according to which more than 90 percent of our population receives no vocational training[8]. So the imminent need is to expand the reach of training providers, set up models and institutes with the capability to scale.

The industry needs a genuine collaboration between project owners, contractors, Governments and training providers to attract more school leavers and graduates, to join infrastructure industry. Companies should also seek to stay in touch with changing employee aspirations. By encouraging diversity in its employment practices, and by offering greater flexibility in working hours, the sector can reach out to a wider potential audience that perhaps would not previously have considered such a career. Investment in existing employees is also crucial in order to offer better-defined career structures, with a greater focus on training and higher salaries where possible.

We surveyed respondents on measures that could be adopted to build the project management capabilities among the employees. Majority of the respondents agreed that the following strategies are effective means to overcome resource shortage and skill set deficiencies.

Meaningful steps would have to be taken to support both the infrastructure and construction industry, for achieving the desired growth of economy. The key step would be to correct the internal imbalances, inherent to the sector, to make the Construction industry competitive and enable it to match the growth of other sectors of the economy. The need of the hour is to create a 'skilled ecosystem' with partnerships between industry players, training organizations and the Government to ensure mutual support and enhancement of collective benefits.

Strategies to overcome skill shortage	Survey response	
	Very Effective	Effective
Develop in-house Project Academy / 'Center of Project Management Excellence' for training and certifying project managers and other key people involved in executing projects	31%	41%
Develop structured training programs and succession plans to build strong professionals	45%	45%
Propagate Infrastructure and allied sector as a lucrative employment option	14%	28%
Increase investments in existing employees with greater focus on training, flexibility in working hours, benchmarking and increasing compensation	48%	31%
Increase cooperation with Educational Institutes to set up special academics, encourage internships and offer scholarships	21%	38%

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

8 Case for Setting up Sector Skill Councils in India", CII, p7

SECTION 08

Recommendations – Next steps

Based on the survey responses along with our research and experience of project management's leading practices, we have identified 10 recommendations for Government, policy makers and project owners that could help in debottlenecking infrastructure projects and improve project delivery in the country.

01 Set up a single window clearance mechanism to simplify the regulatory approval process

To expedite infrastructure projects, there is a need to develop an effective 'single window clearance' mechanism. The mechanism facilitates and streamlines interaction with different regulatory authorities and provides a single point of contact for all permits and approvals necessary for infrastructure projects. This will help in promoting infrastructural development by allowing simplification of processes, documentation, screening, and clearances and increasing transparency in the approval system.

However, to make this successful, it is imperative that institutionalization occurs at all levels of governance-Central, State, and local Government. Further, the final policy framework should be universally accepted by the centre and the States, and amongst various States. Some level of flexibility and customization is acceptable on a case-by-case basis, but it is important that the core policy should not be altered. Also, a timeline should be assigned for giving the final nod to the project. Institution failing to meet these timelines should attract penalties.

Government could follow a three-step approach to institutionalize this:

- Create a checklist for diversified approvals with a step-by-step guide along with a list of required documents. This checklist would also include the list of concerned offices' addresses and contact details.
- Open single service windows that centralize applications and forward them to relevant authorities to minimize the number of physical visits and save time.
- Transform single access service window into one stop agency that processes applications internally and has the authority to take informed decisions by comprising representatives of various approval agencies at a central level.

According to the World Bank study, India ranks at number 182 among 185 economies on the ease of obtaining construction permits. The following table illustrates India's status versus other countries on various aspects related to construction permits.

Currently, in India on an average, any construction project requires approximately 34 permits, which takes almost 196 days to conclude. With the introduction of "single window clearance" mechanism, this timeframe is expected to reduce considerably. This year, Taiwan implemented a single window for pre-construction approvals and made changes to the rules applicable to construction inspections. The changes eliminated 14 procedures and 31 days from the process of dealing with construction permits[1].

In India, several States have successfully implemented single window clearance for industrial development—model that can be replicated for infrastructure sector. For example, Gujarat provides single window clearance facility to entrepreneurs, so that they can get clearances from various authorities under one roof to set up industrial units in the State. The Government of Gujarat has introduced single Window clearance in the State through Industrial Extension Bureau (iNDEXTb) — a single point contact organization in Gujarat[2]. Investors can submit proposals online and avail approvals under single window. The Government has also been investing in upgrading technology infrastructure to consolidate and streamline various processes and stages related to smooth granting of approvals.

Indicators	India	Brazil	China	Indonesia	Japan	Mexico	Best performer globally (Global Ranking)
Dealing with Construction Permits (rank)	182	131	181	75	72	36	Hong Kong (1)
Procedures (number)	34	17	28	13	14	10	Hong Kong (6)
Time (days)	196	469	270	158	193	69	Singapore (26)

Source: Doing Business 2013, World Bank, October 2012

1 Doing Business 2013, World Bank, October 2012
2 http://www.indextb.com/destination-gujarat/formalities.aspx

There are two critical requirements for implementing an effective single window clearance:

- **Empowerment:** A single window clearance agency would be able to promote investment and allow smooth implementation of infrastructure projects. It is important to sensitize various Government departments towards effective functioning of such an agency that ushers positive growth in the infrastructure sector by providing all regulatory approvals in a time bound manner. Different authorities often feel that they will eventually lose their say in the clearance process and finally their control, if such empowered, centralized, front-end department emerges. Such an agency needs to be safeguarded by senior Government officials and an effective Government support to function smoothly.
- **Investment in technology:** There is need to allot appropriate budget for setting up and effectively running single window operations. Investments in technology and IT infrastructure to access various requests through a centralized database are extremely important. Many legacy IT infrastructures either exist in silos or lack the scalability that such a project may require—they need to be assessed for upgrades or replacement.

The Government can insist on listing of the requisite documents and process guide to allow easy access to information and smooth processing of the infrastructure proposals. Then, the approvals can be obtained through a single access point that collects information, conducts screening, and clears proposals, thus expediting the infrastructure projects in the country.

02 Setup a three-tier project/program management office (PMO) structure in the country to monitor and de-bottleneck infrastructure projects

The MoSPI is monitoring the performance of central sector projects in 16 sectors costing more than INR 150 crore. The current mechanism of monitoring projects is at a broad level and doesn't focus on project de-bottlenecking to avoid cost and schedule overruns.

There is a need to set-up up a three-tier project management office in the country. This PMO would monitor and provide oversights at national level. All projects above a certain threshold limit (say over INR 100 crore) or the projects of National importance would fall under this structure. Below is the structure and functions of this PMO at each level:

Three-tier structure for PMO

PMO	Functions
PMO at the Centre (MoSPI)	1. Formulation and review of policy, standards and guidelines on project management. 2. Centralized monitoring of projects in co-ordination with State PMOs and implementing agencies. 3. Mentoring of Central Government agencies for improving project management processes and dealing with exceptions. 4. Country strategy for competence development.
PMOs in each State	1. Coordination with State Government and implementing agencies to resolve issues. 2. Reporting to PMO at the centre on the current status of projects. 3. Defining processes at State level for project related clearances. 4. Project administration support including facilitation of project web site, project management, software support, periodic reviews, etc. 5. Mentoring of State Government agencies for improving project management processes and dealing with exceptions.
PMOs in implementing agencies	1. Monitoring and reporting to State PMO on the current status of projects. 2. Escalating issues beyond their own purview to State PMO for solutions at State and central level. 3. Building project management capability at the site. 4. Identifying trained manpower requirements and arranging for training and competence development.

Source: "A framework for Effective Adoption of Project Management in India", FICCI, May 2011

03 Modify bidding criteria procedures

Most of the Government projects are awarded through competitive bidding. Under this mechanism, the companies that satisfy qualifying criteria, in terms of technical capabilities, minimum years of experience and sound financial capabilities are eligible to bid for the projects. Once the qualifying criteria are met, the decision of awarding the project solely depends on the bid cost/ price/tariff. However, majority of our survey respondents are of the view that awarding contracts in this manner may not be healthy in the long term from the perspective of project quality and viability. The contractor, in order to remain a step ahead of their competitors, may not necessarily include all the cost elements and quote artificially low price. Thus, there is a likelihood that the L1 may compromise on quality and timeline by deploying resources so as to be within the quoted price.

One alternative to the existing bidding process (L1) could be the average-bid method. Under this method, the contract is awarded to the contractor whose bid satisfies a certain relationship with the average of all bid prices. The basic advantage of the average-bid method, from an owner's perspective, is that it safeguards against signing a construction contract for an unrealistically low bid price that would almost certainly lead to disputes during project execution.

Another alternative could be allowing the project owners to negotiate with other suitable bidders (say L2 and L3) along with L1 bidder. This process should be conducted in a transparent manner through reverse auctions. Under reserve auction, the suppliers bid online and are able to see the competitor's bids, without knowing the identity of the bidder. This means that suppliers will instantly have an understanding of where they stand in relation to other bidders. Reverse auctions could offer Government significant cost saving benefits, result in lower cycle times, increase compliance, enhance transparency, increase collaboration, boost supplier participation, and provide feedback for participants.

04 Develop robust process for fast and efficient dispute resolution

In India, dispute resolution through judiciary is generally a tedious, lengthy process and may take several years to resolve. Even though, globally, arbitration is a preferred mechanism of dispute resolution; in India, the arbitration mechanism is still evolving. The Arbitration and Conciliation Act, 1996 was enacted to achieve the twin goals of in-expensive and quick resolution of disputes, but the ground reality is far away from the target. One of the underlying causes is that neither the public nor the private sector in India is enthusiastic about the idea of Arbitration. This is mainly due to the fact that Arbitration awards are invariably challenged in the court on account of ambiguity and lack of enforceability, and there is no fixed timeline for completion of proceedings.[3]

A few initiatives that could improve the dispute resolution process in India:

Strengthen existing arbitration laws: There is the need to modify the present arbitration mechanism in a way that makes it more effective and enforceable. Furthermore, instead of having multiple authorities, one final appellate authority such as an 'Infrastructure Projects Tribunal' needs to be set–up for settlement of these disputes.

Encourage institutional arbitration: The settlement of disputes through institutional arbitration, such as the Construction Industry Arbitration Council (CIAC), is better than ad-hoc arbitration. Institutional arbitration provides an established format with a proven record, ensures impartial decision-making and adherence to pre-established rules and procedures.

Create Dispute Resolution Board (DRB) to avoid disputes: DRBs are created by the express consent of the employer and the contractor to monitor the project execution at various stages of completion. The primary function of DRBs is to monitor the progress of the project with respect to contract requirements. In case of any non compliance with respect to the contract, the Board immediately interferes and suggests ways to resolve the dispute.

However one of the ways to deal with disputes is to avoid disputes. Many disputes in the infrastructure sector could be avoided if contract agreements are meticulously drafted, taking all probable costs and risks into consideration. Further, clearly defining the roles and responsibilities of all parties could help in avoiding unnecessary misunderstandings.

3 Arbitration and Conciliation Act 1996, Vakilno1 website, http://www.vakilno1.com/bareacts/arbitandonciliation/ArbitrationandConciliationAct-1996.htm, accessed 15 December 2012

05 Institutionalize project management training for professionals

The survey results indicate that lack of project management skills in professionals working on infrastructure projects is impacting efficient project delivery. Indian project managers have acquired project management skills primarily through past experiences and project exposures. Although, a rich industry experience helps in gaining oversight, in today's rapidly changing world and evolving technology, there is need to impart formal training to project managers and regularly update their skills. Training will not only help managers in their day to day work but also equip them to handle new challenges in the most efficient way. In our point of view, this could be achieved in three ways:

Change curriculum to introduce project management: Educational institutes in India are not giving much importance to the project management curriculum and in comparison to other countries very few institutions in India offer project management degree programs. For instance, more than 100 institutes in China offer courses specific to project management, whereas this number is less than 10[4] in India. Thus, it is important to introduce project management in the curriculum of engineering, management and other technical institutes. Government can help in expediting the process by pushing the project management courses in the Government institutes of national repute. Once these institutes make the change, others across the country are expected to follow.

Cooperation between industry and educational institutions: There is a need for greater degree of collaboration between the industry and educational institutions so as to reduce the demand supply gap for trained project management professionals. Industry can help educational institutions through capital, participate in curriculum development, provide faculty for industry interface, and help in internship and placements. On the other hand, educational institutes would not only help in filling the incremental demand for project management professionals but can also help in enhancing the project management skills of the existing workforce, by conducting on-the-job training.

Build in house academy for the project management training: Infrastructure industry could adopt the model of IT companies to meet the shortage of skilled professionals. Many IT companies have developed in-house academy for training their employees on key skills needed for their day to day work. Indian infrastructure industry can look to replicate a similar model, where in-house training can be conducted for newly recruited and existing employees to enhance their professional competencies.

4 "India lagging China in project management", The Economic Times, 18 June 2010

06 Reform India's Vocational Education and Training program to create a large pool of employable work force

Though the labor productivity and education levels are rising, India still needs to improve the education and training quality, especially for the infrastructure sector. According to World Bank, the vocational education stream in India is quite small, enrolling less than 3 percent of students at the upper secondary level[5]. Also, Vocational Education and Training (VET) system is not responding to the needs of the labor market, as less than 40 percent of its graduates find employment[6].

To create a large pool of readily employable labor force, both Government and industry need to come together and develop a mechanism to impart training and develop skills.

Setting up of National Skill Development Corporation (NSDC), a Public Private Partnership (PPP) non-profit organization to facilitate skill development in the country is a step in right direction. NSDC targets to enhance skills of 150 million people by 2022[7]. Along with this, the following two initiatives could help in solving the labor scarcity in the country:

Creating a National Board for vocational education – There is a need to develop an organization that focuses on vocational education. This organization should have the representation from industry, ministry, education institutions and NGOs and focuses on:

- developing a broad-based curriculum for vocational education based on sector specific requirements
- awarding degrees, diplomas and certificates to successful candidates
- ensuring a close interaction between industries and vocational institutes
- creating a large pool of qualified and efficient faculty for vocational courses.

Developing skills of local people by corporates – For example, while the land acquisition and regulatory approvals processes are in progress, companies could start imparting training to the local people. So when the construction of the project starts, there is large pool of skilled people available locally. State Governments could facilitate this process in two ways. First, by creating awareness among the local people about the importance of being skilled and second, by allowing companies to use existing infrastructure (such as school premises after normal school working hours) to conduct classes/workshops. This approach has the following benefits:

- Creates large pool of locally available skilled and employable people
- Less resistance from local people for land acquisition, as they will get employment from this project
- Provides access to labor force (based on their performance) which could be developed further for plant operations.

5 World Bank report on vocational education and training system in India
6 World Bank report on vocational education and training system in India
7 National Skill Development Mission, Press Information Bureau, 16 August 2010

07 Develop efficient transport and logistics system in the country to enable faster project implementation

Transport infrastructure in the country, though improving, is not able to keep the pace with increasing logistics demand. To sustain the GDP growth rate of 7-8 percent over the next decade, there is need to reform the India's transport and logistics sector. Our survey results indicate that many projects suffer from cost and schedule overruns, due to lack of good transport infrastructure in the country. As mentioned by our survey respondents, poor health of roads, inefficiency to carry heavy load, non availability of last mile connectivity to project sites and high cost of transportation are some of the factors creating hindrances in smooth execution of the project.

Following steps could help in improving the transport infrastructure in the country:

Expedite the construction of Dedicated Freight Corridors (DFC) and create new DFCs: The Government has plans to increase the railways' transportation capacity by building high-speed and high-capacity dedicated freight corridors. These corridors would facilitate the faster movement of freight, (expected to reduce travel time by a third[8]), enabling a substantially higher level of traffic and reduce transportation cost. Under phase 1, the work on two corridors - Western DFC and Eastern DFC- spanning a total length of about 3300 route km is underway . The Western Corridor will traverse the distance from Dadri to Mumbai, passing through the States of Delhi, Haryana, Rajasthan, Gujarat and Maharashtra; while the Eastern Corridor will start from Ludhiana in Punjab and pass through the States of Haryana, Uttar Pradesh and Bihar before terminating at Dankuni in West Bengal[9].

To promote investment and capitalize the railway connectivity along the western corridor, Government is setting up Delhi-Mumbai Industrial Corridor (DMIC), a mega investment project of USD 90 billion. Under this project, Government envisages to develop 9 Investment Regions (with area spread of at least 200 sq. km) and 15 Industrial Areas (with area spread of at least 100 sq. km). For the first phase, 6 investment regions and 5 industrial areas are shortlisted. These regions are across the States of Uttar Pradesh, Haryana, Rajasthan, Gujarat and Maharashtra[10].

Though these initiatives are in the right direction, the current progress on these mega projects is way behind targets. Government need to prioritize these projects and take all possible steps to remove bottlenecks for timely completion of projects. Further, Government could start planning for at least two additional DFCs – Delhi-Chennai and Chennai-Mumbai.

Increase national highway networks and improve road maintenance program: In India, roads are the primary mode of transport. They carry around 65 percent of India's total freight . For many large infrastructure projects particularly situated in the hinterland, roads are the only transport mode for equipment and construction material.[11]

There is an urgent need to focus on upgrading and broadening of existing national highways and adding new roads under highway category. Further, Government should focus on creating a systematic road maintenance plan to improve roads efficiency, increase average speed and reduce transportation cost.

8 Freight corridor back on track, Times of India, dated November 16, 2011
9 Dedicated Freight Corridor Corporation of India (www.dfccil.org)
10 Delhi Mumbai Industrial Corridor (www.dmic.co.in)
11 India Transport Sector, World Bank

08 Create an exhaustive list of empanelled vendor at Central level for infrastructure projects

Many State Governments and departments maintain different empanelled list of vendors for their respective projects and services. For infrastructure projects, where most of the qualifying criteria are same, it would be appropriate to create an exhaustive list of empanelled vendors at central Government level. This list would have information about the vendor credentials such as total year of experience, type and value of projects executed, financial capabilities, past performance etc. Additionally, there is need to introduce the knowledge of project management discipline, as one of the credentials to ensure that vendor has the complete knowledge of project management techniques and best practices, The information provided by the vendors should then be verified by a central entity before registering them in the list. Also, there should be a provision of updating this list periodically (say quarterly or semi-annually) to include new vendors and removing the non-performing ones.

There are several advantages of having an empanelled list of vendors:

- **Create a large pool of registered vendors** to choose from across the country
- **Reduce time in awarding the contracts** as awarding a contract to the empanelled list vendor doesn't require background check as the vendor's credentials are already verified by the central agency. This could save an average of 2-4 months in awarding the contract
- **Reduce possibility of forming cartel by vendors** as large number of vendors would be available for a particular work
- **Pressurize vendors to excel in projects** as poor performance on a single project could cost them the delisting from the central empanelled list.

09 Promote Public Private Partnership (PPP) in Infrastructure sector

Traditionally, projects for development of Roads, Airports, Railways and Ports have been funded by State and Central Governments. However, due to budgetary constraints, the Governments is looking at increased participation from the private sector for transport infrastructure projects. Although, the Public Private Partnership (PPP) model has evolved in recent times, private investment has fallen short of the targets. For instance, as per the mid-term appraisal of Eleventh Five Year Plan, in road segment private sector invested around INR 18,800 crore (from April 2007 to August 2009), which was well below the planned target of INR 86,782 crore . Private road developers depend largely on highway toll collections as a medium to recover their investments. However, toll collections in India are fraught with challenges such as revenue leakages which are proving to be a major deterrent for private investment in roads.[12]

Following steps could help in promoting PPP investment in the infrastructure projects:

Create a detailed policy for implementing PPP projects: There is need to create a detailed PPP policy clearly defining the sectors open to PPPs, the preferred scheme for each sector and the support available from Government agencies. Further, this policy should aim to bring more transparency in the bidding and awarding processes, which would boost confidence and increase participation of private investors in the infrastructure sector.

Ensure adequate returns to private players: Tariffs for most of the infrastructure projects are regulated and private players are not allowed to fix or adjust them. To help ensure adequate returns to private players on their invested capital, there is need to de-regulate tariffs for specific infrastructure sectors with necessary safeguards.

Develop long term debt market for infrastructure projects: PPP design and policy should provide adequate protection to debt funding, so that more and more financial institution willing to lend their money to PPP projects. Further, improving the health of country's long–term bond market and promotion of infrastructure bonds could result in better participation from foreign investors.

12 Mid-term appraisal of Eleventh Five Year Plan, Planning Commission

10 Promote joint evaluation of project design for value engineering

The project management teams lack value engineering approach leaving minimal opportunities for the contractors to utilize any value engineering opportunity. Moreover, most contractors and companies lack adequate organizational set-up to take advantage of value engineering concepts. Also, the existing system of item rate contracts does not motivate the contractors enough to employ value engineering approach as they do not get any incentive for the savings.

Project owners, who control most of the engineering decisions in projects based on item rate contracts, should look to engage the contractors for joint evaluation of project design. Contractors need to set-up dedicated value engineering teams comprising of experts with significant experience in design, engineering and procurement. The project owners and the contractors should also attempt to collaborate with global engineering institutes and companies so as to employ the latest designing expertise in the project.

Project owners and contractors should clearly define the performance indicators for measuring the efficiency of the value engineering team. It could be, for instance, the measure of the percentage cost saving at the various stages of project implementation. Based on the performance of the value engineering team, they should be offered a share in the estimated cost saving or other incentives to drive them for greater adoption of value engineering concepts.

SECTION 09

Case studies – A deep dive into projects

To understand the project specific challenges exhaustively, we visited few project sites, interviewed several people across levels including project managers, contractors and vendors, etc. To provide a holistic overview of infrastructure industry, these projects have been selected from different sectors, at different stage of implementation and experiencing different magnitude of schedule and cost overruns.

CASE STUDY 1

NTPC Vindhyachal Stage IV[1]

FACTS

- NTPC's largest thermal power station
- Anticipated project cost is within the budget and approximately two months delay is expected in the project delivery
- The project has a dedicated monitoring and reporting team at site — ensuring immediate corrective actions in case of any slippages
- Delayed delivery of critical equipments and poor site connectivity are major reasons for project delay
- Daily monitoring of critical path progress, direct payment to sub-contractors and increase use of railways for equipment transport are some techniques used by NTPC to de-bottleneck the project.

Introduction

Vindhyachal power project is the largest thermal power station of NTPC[2] and is located in Sidhi district, Madhya Pradesh. The plant has an existing capacity of 3,760 MW thermal with 6 x 210 MW and 5 x 500 MW units. The coal is sourced from nearby NCL mines and transported through Merry Go Round (MGR) transportation system (22 kms length with double track) owned and operated by NTPC. NTPC is currently executing a brown field expansion project at Vindhyachal plant with addition of 2 x 500 MW thermal power plants. The boiler-turbine-generator (BTG) contract is given to BHEL while BOP is being executed by various contractors in split package mode.

Following are the key details of project

Capacity under installation	2 x 500 MW
Location	Sidhi, Madhya Pradesh
Coal source	NCL mines
Water source	Discharge canal of Singrauli Super Thermal Power Station
Investment approval	13 January 2009

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

Current project status

	Originally planned	Anticipated/ Revised	Overrun
Project completion date	October-2012	December-2012	2 Months
Project cost (INR Crore)	4,643	4,600	NIL

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

1 KPMG in India- PMI Survey on cost and schedule overrun, 2012
2 Coal Based Power Stations, NTPC Website, accessed 26 June 2012

The project execution at site is in full swing. The contractors have been mobilized in full strength and material delivery is also on going. The project is in its last leg of execution where the systems are nearing completion.

The physical progress of the project is little behind its original schedule and is expected to be delayed by around two months. However, given the complexity and size of the project, and if we compare this project with other infrastructure projects of same scale across sectors, Vindhyachal expansion would be one of the best managed projects. Below are the key milestones with their original/revised completion date:

Sr. No.	Milestone	Unit 1			Unit 2		
		Plan (as per L2 schedule)	Original/ Revised expected completion	Actual/expected delay (months)	Plan (as per L2 Schedule)	Original/ Revised expected completion	Actual/expected delay (months)
1	BES (boiler Erection start)	Nov-09	Mar-10	5	Mar-10	Jun-10	3
2	BDL (Boiler Drum Lifting)	Apr-10	Jun-10	2	Aug-10	Jan-11	5
3	HT (Hydro Test)	Mar-11	Jun-11	3	Jul-11	Dec-11	5
4	BLU (Boiler Light Up)	Sep-11	Nov-11	2	Jan-12	May-12	4
5	SB (Steam Blowing)	Nov-11	Jan-11	2	Mar-12	Jun-12	3
6	CES (Condenser Erection Start)	Sep-10	Oct-10	1	Jan-11	Jun-11	5
7	TGES (TG Erection Start)	Nov-10	Dec-10	1	Mar-11	Jul-11	4
8	TGBU (Turbine Box up)	Oct-11	Dec-11	2	Feb-12	Jun-12	4
9	TGOF	Dec-11	Jan-12	1	Apr-12	Jun-12	2
10	Synchronization	Feb-12	Feb-12	-	Jun-12	Aug-12	2
11	Full Load		Mar-12	-		Oct-12	-

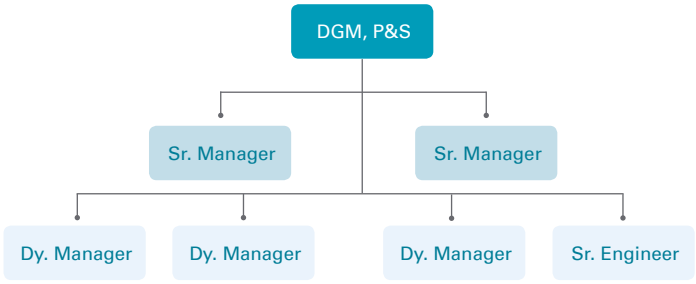
Note: The above status is as on December 2011; expected timelines might have changed

Source: PMI-KPMG survey on cost and schedule overrun; based on interaction with survey respondents

The above estimated dates are provided by the P&S team. While the project team is optimistic of achieving synchronization as per scheduled date, based on the project status at the time of site visit in December 2011, the target appears difficult to achieve. On Financial front, according to P&S Head, the project is within budget and no cost overruns are expected.

Project Monitoring & Reporting system in place at the project site

The project team has a dedicated monitoring and reporting team at site under Head – Planning & Systems (P&S), which reports directly in to the Project Planning & Monitoring Group (PPMG) at NTPC corporate. The structure of Planning & Systems team is shown on the right:



Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012

The P&S team interacts with project team and contractors on daily basis to collect information on project progress and updates reports which are circulated to NTPC Head Office, Regional offices and the project team. Following reports are generated for the purpose of reporting project progress:

- **Daily Progress Report (DPR):** The DPR contains package-wise progress as against monthly planned quantities. The report is generated by respective package engineers and submitted to P&S team, which compiles the report for circulation. The DPR also has separate section for work done in critical packages, which is also sent to users via SMS.
- **Weekly Progress Report (WPR):** WPR is package-wise report on weekly work done as against monthly plan. The report contains detailed information on work completed on critical packages.
- **Monthly Progress Report:** The monthly progress report contains detailed project status report containing information on the project progress, milestones completed and target completion for the project. This report is generated by PPMG team in NTPC head office.

Reasons for project delay

While an enterprise-level risk identification and management exercise was conducted for NTPC, formal exercise for project-level risk identification is not carried out. No formal system of risk planning, mitigation and monitoring is in place at the project level. Following are the key reasons/risks for project delay, as identified by the project team during one to one discussion:

- **Material Delivery from BHEL:** Delayed supply of BTG material by BHEL has been a major bottleneck in progress and resulted in delay of critical milestones. Due to limited manufacturing capacity, BHEL could not meet the supply schedule of various concurrent projects under execution by NTPC as well as other State utilities. Due to spurring industrial activities, several companies have announced greenfield and brownfield thermal power plants, leading to a wide gap in demand and supply of power plant equipments. Further, BHEL had to depend on limited available vendors globally, who manufacture industrial castings, forging and piping materials for power plant equipments. Due to heavy order bookings, vendors of BHEL could not honor their commitments in supplying the critical raw materials to BHEL and this in turn severely affected the manufacturing and supply schedule. This has led to slippages in achieving critical milestones and resulted in delay in unit commissioning. Further, since Government is involved from both sides, NTPC couldn't impose penalty on BHEL.
- **Site connectivity:** The site is not very well connected with major cities, which exposes the project to logistics and transport related issues. There is huge vehicular traffic on the roads connecting to the plant site due to proximity to NCL mines and other industrial area. Thus poor road connectivity and heavy traffic lead to longer transportation time affecting the progress of the work.
- **Contractor Default:** NTPC is executing the project by spilt package mode and there are several small and big contractors that are providing material and services for the project. There is always a risk of default by one contractor that can lead to overall delay in project. There have been instances in past in NTPC project where the contractors had backed out.
- **Project Integration:** The project is being executed in split package mode and hence the risk of integrating project activities comes on NTPC. Individual contractors will perform their piece of work and will be responsible for completing their scope only. Any issues relating to coordination between activities of two contractors and ensuring performance of the plant as a whole lies with NTPC.

Measures taken by NTPC to de-bottleneck project

1. NTPC helped their contractors in easing out their internal cash flow positions; by either making payments directly to their sub-contractors or at times giving them advance payments. These payments are settled against the contractor bills and are helpful in maintain the construction pace, thus avoiding delays.
2. To overcome logistic issues related to road transport, NTPC relied on railways to transport its material. Further, to make railway mode economical, NTPC consolidated the supplies of its different contractors at one place, sufficient for a full load train. These trains may either contain the requirements of one plant or nearby multiple plants. If these trains have supplies for other plants as well, it is then transported to designated site either through road or railways (if there is connectivity).
3. NTPC has a detailed project monitoring and reporting system in place. Projects are monitored at micro level, enabling early identification of any slippage and ensuring immediate corrective action.

CASE STUDY 2

GEVRA Expansion OCP (SECL)

FACTS

- The project involves capacity expansion of one of India's largest open cast coal mine
- Latest technologies (shovel-dumper combination, surface miners) are deployed to remove overburden. These technologies are environment friendly and minimize requirements for blasting
- High cost of land acquisition, lack of experience in awarding global contracts and delay in getting regulatory approvals are major reasons for cost and time overruns
- To expedite the land acquisition and regulatory approval processes, project team has proactively prepared employment proposals and revised compensation figures. Further the team has proposed to outsource R&R activities.

Gevra Open Cast Block (OCP) is located in the south-central part of Korba Coalfield in Korba District of Chhattisgarh. It has an area of about 19 sq. km. and is the largest open cast coal mine in India[1]. The project under-consideration is the capacity expansion project from an existing 12 million tonnes per year (mtpa) to 25 mtpa and further to 35 mtpa. Initially, when the expansion was envisaged from 12 mtpa to 25 mtpa, the target completion date for this expansion was March 2010. Before this expansion could have been achieved, approval for subsequent expansion (from 25 mtpa to 35 mtpa) was received and the milestones were revised for a completion date of March 2014. The delays that were attributable to 25 mtpa were being absorbed in the expansion from 25 mtpa to 35 mtpa. Thus, as per the current project progress, there is no schedule delay. In this case-study, we have primarily focused on the 25 mtpa expansion phase.

Following are the key details of project

Expansion capacity	From 12 mtpa to 25 mtpa and from 25 mtpa to 35 mtpa
Location	Korba, Chhattisgarh
Land Requirement	4184.5 Ha
Investment approval Date	July 2005 (25 mtpa) June 2010 (35 mtpa)
Project cost	INR 1,667.5 crore (25 mtpa) INR 2,675.6 crore (35 mtpa)
Target completion	March 2010 (25 mtpa) March 2014 (35 mtpa)

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

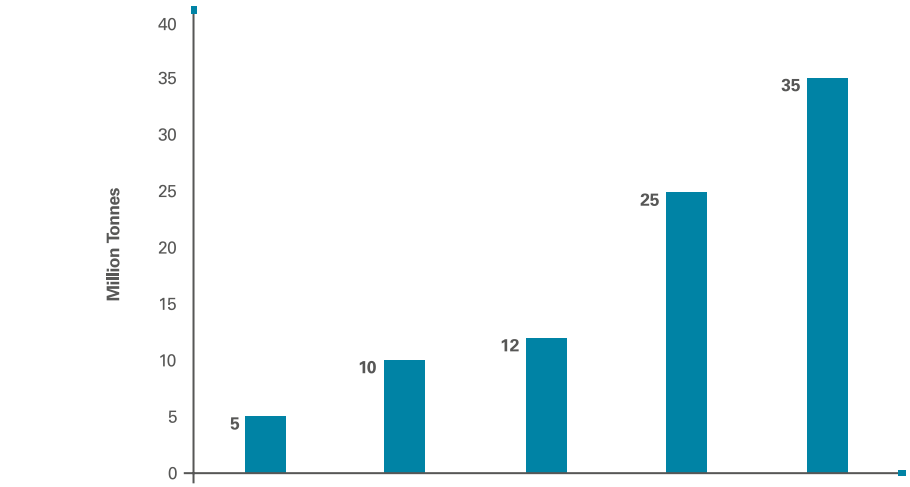
1 Mineral Resources of Korba, Official website of Korba district, http://korba.nic.in/kwMines.htm

Background and current status

Gevra mine project report was prepared by Central Mine Planning & Design Institute Limited (CMPDi) in 1979 with initial capacity of 5 mtpa. First expansion plan was prepared in March 1982 for an annual production upto 10 mtpa. In 1992-93, a scheme for augmentation of production by 2 mtpa was prepared and sanctioned by Coal India Limited (CIL) board (31 July 1992). In 2005, SECL got the approval for expanding the mine capacity from 12 mtpa to 25 mtpa. On 18 March 2007, Gevra mine produced 100,000 tonnes of coal, the highest quantity of coal ever produced by any mine or coalfield in India on a single day. In 2010, it was decided to further increase the mine capacity from 25 mtpa to 35 mtpa.

As on April 2011, Gevra mine has the mineable reserves of 778.12 MT, with an expected life of 28 yrs and maximum quarry depth of 220 meters. Present depth of workings is about 100 meters against an ultimate planned depth of 220 meters, as per sanctioned project report (PR).

Gevra mine capacity expansion plan



Project Approved Date	1979	1985	1992	2005	2010
Cumulative Expenditure (INR crores)	50.08	224.39	264.01	1667.55	2675.00

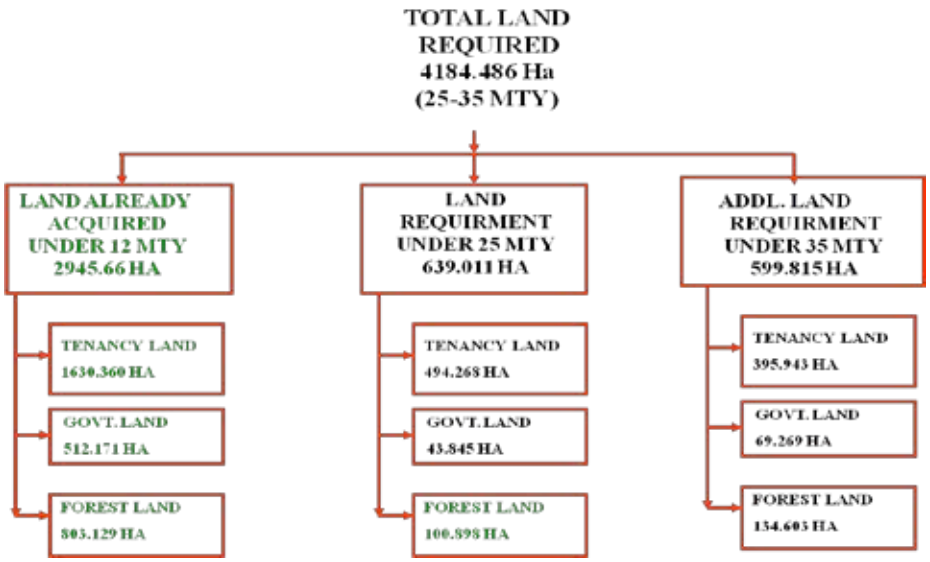
Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

Need for expansion from 25 mtpa to 35 mtpa

In May 2005, the demand of coking coal for Eleventh Plan was estimated at 622 MT whereas indigenous supply was estimated at 562.32 MT, thus leaving a shortfall of 59.68 MT. To meet this deficit, CIL has formulated an emergency coal production plan and Gevra Open Cast was identified as one of the projects in emergency coal production plan.

Land Requirement

The total land requirement including the Forest Land in Safety zone for Expansion to 25 mtpa as per the Project Report (PR) was 3,620.67 Ha. The land acquired against the PR is 3,046.558 Ha, thus having a shortfall of 538.1 Ha. Further, there is a planned capacity expansion to 35 mtpa, for which 599.8 Ha of additional land is required. Thus, the total land requirement is 4,184.4 ha out of which only 73 percent is acquired[2]. The summary of land requirements are given below:-



Note: - Values mentioned in green indicate that the land has been acquired.

Technology

Gevra opencast project is being worked by opencast methods deploying shovel dumper combination and HEMM (heavy earth moving machinery) configuration. Surface miner technology is used, which does not require drilling, blasting & crushing of coal. Further, this technology provides coal of the required sizes.

This technology has following advantages against the conventional method:

- Environment friendly technology
- Improvement in coal quality by selective mining
- Minimum manpower required for operating the machines
- Elimination of drilling, blasting and crushing processes
- No dust generation during coal cutting, as in-built water spraying system suppress any dust which could be generated during coal cutting
- Production of -100mm size coal
- Minimum chance of fire in the coal face.

2 As on Dec 31, 2011

Nature of contracts

At present, the Overburden (OB) removal is done by departmental Labor (SECL employed) with drilling and blasting and using high capacity Shovel-Dumper combination mechanism. At present approximately 75 percent of the extraction is through surface miner and balance is through conventional method (drilling & blasting of Coal).

Coal mining is subcontracted to various contractors / vendors who are responsible for extracting coal using surface miner, loading, transporting to CHP & unloading of coal.

Global tenders were floated for the HEMM's (ER Shovel 42 Cum, Dumper 240 T). 42 Cum Shovel was procured for the first time by SECL.

Economic Valuation

According to initial project report dated October 2006, the incremental capital required for capacity expansion from 25 mtpa to 35 mtpa was estimated at INR 618.16 crore. The updated capital estimate for the project dated July 2007 was INR 780.12 crore. In September 2009, this cost was further revised to INR 1,008.12 crore. This is the final approved cost and is around 63 percent more than the actual estimates.

The capital investment of plant and machinery for incremental 10 mtpa was estimated at INR 705.60 crore. The capital investment on HEMM (Heavy Machinery) alone was estimated at INR 464.09 crore.

Milestone Status

Below is the list of major project milestones with their schedule completion date:

S. No.	Milestone Description	Target Date of Completion
1.	Notification of 639 Ha Land u/s 11(i) of CBA Act	July 2005
2.	Final Forest Clearance of 100.01 Ha land	August 2008
3.	Environmental Clearance	June 2009
4.	Commissioning of Workshop	March 2011
5.	Commissioning of Store	March 2011
6.	Doubling of Junadih –Korba Railway Track of Siding	November 2006
7.	Commissioning of 1st 42 Cum Shovel alongwith 240 T Dumpers	January 2010
8.	Commissioning of 2nd 42 Cum Shovel alongwith 240 T Dumper	August 2010
9.	Construction of Haul Road	March 2011
10.	Construction of Residential Building	March 2012
11.	Construction of 33/3.3 KV Sub-station	March 2012
12.	Commissioning of 33KV O/H Line	March 2013*
13.	Physical possession of Tenancy Land in 1st phase	December 2012
14.	Augmentation of CHP including Silo	March 2014*
15.	Installation and commissioning of In-pit coal transport system	March 2014*

* Tendering is in process. Scheduled month of Finish is tentative (As on January 2011)

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

Reasons for cost and schedule overruns

- **Increase in land compensation due to policy change:-** In the project report, for the cost estimation of land acquisition, the rate of agriculture land was assumed as INR 7.00 Lakh per Ha. or INR 2.83, lakh per acre. This was based on the State Government compensation rate of INR 75,000 per acres. As per the revised Chhattisgarh Gazette dated – 19 March 2010, the rate was increased to INR 8.00 Lakh per acre. Thus, for tenancy land of 395.943 Ha, the budget cost increased by over 180 percent from INR 27.8 crore to INR 78.27 crore.
- **Delay in Procurement of HEMM: -** The ER Shovel 42 Cum was to be procured for the first time in the project, which was done using the Global Tender process. In the project report, the total time considered for tender finalization was 1.5 years and a period of one year for manufacturing & supply of the equipment. However, due to lack of experience in awarding the contracts through global tender process, the actual time taken for tender finalization (from revised specification and terms and conditions to work order issue) was approximately 2.25 years (January 2006 to March 2008), which is a delay of approx. 8 months from planned estimates. Further, the deliveries of the material were expected to start from April-2009 onwards, in actual it started only from January-2010, which is a delay of approx. 9 months.
- **Procurement of specialized equipment at a higher cost: -** In the PR of 25 mtpa the cost of ER Shovel 42 cum was considered to be INR 203.26 crore for four equipments (i.e. INR 50.81 Crore per shovel). The actual cost of procurement for each shove is approx. INR 92 crore, thus almost an increase of approximately INR 41 crore per Shovel & increase of approximately INR 165 crore in total. The PR estimate for the HEMM's and other P&M were based mainly on the standard price list of mining equipment published by CMPDIL, Ranchi.
- **Delay in getting approvals from State Government: -** Approvals / assistance related to Land acquisition, R&R etc. are pending with the State Government. These are acting as bottlenecks / delay factors in physical possession, acquisition and other processes related to land. The pending items are:-
  - Help to start with production from acquired forest land, which is the only land left under physical possession.
  - Finalization of re-habilitation site at Utarda.
  - Submission of Statement V & VI of remaining villages under acquisition.
- **Delay in getting internal approvals (SECL Board): -** Many of the approvals are pending at the SECL corporate level, which have been sent from the Project Site. The approvals pending are:
  - Proposal for employment of another 5 Nos. eligible candidates of land looser was submitted to HQ for approval vide letter No. 90 dated 12 April 2011
  - Compensation of houses and dwellings of 37 house owner of Pondi village was submitted to HQ for approval vide proposal no. 175 dated 14 June 2011
  - Revised compensation of 172.719 Ha land of Pondi village was submitted to HQ for approval vide proposal no. 468 dated 11 July 2011
  - Proposal for appointment of an external consultant as advisor to facilitated land acquisition.

The pending approvals are affecting the acquisition of land.

- **Ambiguity over R&R Policy: -** The CIL R&R policy stipulates employment to all the land losers subject to availability of vacancies in the organization. Additionally, under Clause (ii) of point number 13 (page no. 6) of CIL R&R Policy 2008 stipulates that land losers who are not eligible for employment shall be offered cash compensation at the rate prescribed in the new R&R policy notified by Ministry of Rural Development (MoRD). However, the State R&R policy specifies compensation and employment to all. Thus, there is an ambiguity in company's and State R&R policy. Thus, delay in finalizing the employment and compensation is affecting the land acquisition.

Measures taken by SECL to debottleneck project

1. For expediting the progress of land acquisition, the Gevra team proactively prepared employment proposal, got the list approved from the collector and obtained consent of the villagers. Additionally, revised compensation figures were prepared for one of the villages. Also, project team proposed appointment of retired Deputy Collector for expediting the land acquisition process.
2. In the case of ambiguity over R&R Policy, the Gevra team proposed modalities in the existing CIL R&R policy, such that the issue can be resolved as soon as possible.
3. For Rehabilitation, as per prevailing practice, State Government on the request of the project owner allots the land in the nearby area of the project. The land provided by the Government has to be developed with infrastructural facilities such as schools, houses, parks etc. and handed over to the affected families. Gevra team foresees this as a risk as Government land is not available in nearby area of the project for resettlement. To overcome this risk, Gevra team has proposed that the entire activities (land acquisition and development) of Rehabilitation may be outsourced or cash compensation / monetary package in lieu of resettlement plot and building assistance (INR 3,00,000 per family as already approved by MCL Board) be provided.

CASE STUDY 3

Construction of an Offshore Container Terminal at Mumbai Port Trust

FACTS

- First container privatization project at the Mumbai port
- Project is delayed by three years and anticipated project cost is expected to increase by 40 percent from scheduled cost
- Lack of detailed planning, non performance of contractor and poor coordination between dredging and berth construction works leads to schedule and cost overrun.

Mumbai Port has been the principal gateway to India, as it caters to 10 percent[1] of the country's sea-borne trade handled by major ports of the country. Though traditionally designed to handle general cargo, over the years, the port has adapted to changing shipping trends and cargo packaging from break bulk to unitization/palletization and containerization. Construction and development of two offshore container berths and terminals is the first container privatization project at the Mumbai Port. The project involves construction, financing, equipping, operations and management of the offshore container terminal in the Mumbai Harbor on a Build Operate Transfer (BOT) basis. The project is awarded to Indira Container Terminal Pvt. Ltd (ICT), which is a joint venture between Gammon Infrastructure Projects Ltd, Gammon India Ltd and Dragados SPL of Spain for a 30-year concession period.

Construction details

The complete construction work is divided among two parties:

- Mumbai Port Trust (MbPT): MbPT will have to do the capital dredging of the designed draft of 14.5 meters and filling of the existing Prince's and Victoria (P&V) Dock basin areas up to +4.79m CD by dredging sand available near Dharamatar creek area, within the Mumbai port limits. MbPT has awarded this work contract to M/s Jaisu Shipping Co.
- Indira Container Terminal (ICT): MbPT has signed a licensed agreement with M/s Gammon India Consortium for the construction of Offshore Container Terminal on BOT Basis. The work include construction and operation of two container berths of 350 meters each including approach trestles, laying of tracks for Rail Container Depot (RCD), demolition of existing structures at Prince's and Victoria Docks for integrated development of the container yard and relocation of services.

Below are the major details of project

Capacity Addition	Two offshore container terminals
Location	Mumbai, Maharashtra
Project Execution	BOT basis
Investment approval Date	November, 2007

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

1 Introduction, Mumbai Port Trust, http://mumbaiport.gov.in/index2.asp?slid=34&sublinkid=10&langid=1, accessed 19 June 2012

Current project status

		Originally planned	Anticipated/ Revised	Overrun
Project completion date	MbPT	Dec 2010	Mar 2013	28 Months
	ICT	Dec 2010	Dec 2013	36 Months
Project cost (INR Crore)	MbPT	445	610	37%
	ICT	1,016	1,429	41%

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

The project was approved in November 2007, with planned completion date of December 2010. However, based on the current progress project is expected to be completed by December 2013, with a delay of around 36 months.. On financial front, project cost is expected to increase by 40 percent from INR 1,461 crore to ~INR 2,040 crore.

Project Planning and current status

Agency	Description	Planned date	Actual date	Delay in months	Percentage of work completed
ICT	License Agreement signed between Mumbai Port Trust and M/s Indira Container Terminal Pvt. Ltd.	Dec 2007	Dec 2007	-	100
	Financial Closure	June 2008	Nov 2008	5	100
	Commencement of Construction	Aug 2008	May 2009	9	100
	Completion of civil works and commissioning of two berths at ICT	Dec 2010	Dec 2013	36	85
MbPT	Handing over the site for trestle	Dec 2007	Dec 2007	-	100
	Handing over already developed land at Princes and Victoria Dock of the Licensed premises for OCT	Dec 2007	In phases	-	85
	Completion of Capital dredging for the berth pocket and handing over to the Licensee for construction	Dec 2009	Apr 2012	28	100
	Filling of Victoria Dock and handing over to the Licensee.	Dec 2009	Dec 2012	36	85
	Filing of Prince's Dock and handing over to the Licensee	Dec 2009	Dec 2012	36	85
	Completion of Capital dredging for Approach Channel and Turning Circle.	Oct 2010	Mar 2012	17	55
	Laying of Railway Tracks for RCD	Dec 2010	Mar 2013	28	5

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

Project cost overrun

Agency	Description	Original estimate (INR crore)	Actual/revised (INR crore)	Increase (%)
ICT	EPC contract for civil work (comprising construction of trestle, berth, container yard & utilities)	437.2	589.6	34.9
	Non EPC contract	34.8	72.2	107.5
	Mechanical equipments and electrical & Fire Fighting works	268.3	450	67.7
	Miscellaneous fixed assets (AC, computers etc.)	10.0	44.9	349.0
	BPS investments	15.0	25.0	66.7
	Contingencies	41.2	20.8	(49.5)
	Preliminary & preoperative expenses	76.0	86.7	14.1
	Debt service reserve	24.3	25.9	6.6
	Interest during construction	108.8	114	4.8
	Total	**1,015.7**	**1,429.1**	**40.7**
MbPT	Capital Dredging	279.4	468.2	67.6
	Filling	78.0	38.37	(50.8)
	Dock closure works	23.0	15.32	(33.4)
	Rail tracks for RCD	9.2	16.0	74.7
	Relocation of underground services	0.7	0.7	-
	Navigational aids	3.6	1.8	(49.4)
	Environment Management Plan	1.2	1.2	-
	Total	**444.9**	**610.0**	**37.1**
Grand Total		**1,460.6**	**2,039.1**	**39.6**

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

Reasons for schedule and cost overrun

- **Delay in financial closure:** As a part of BOT, project financing had to be arranged by private concessionaire. Due to 2008 global recession banks put stringent norms for project financing; thus delaying the process of financial closure by 5.5 months.
- **More dredging work than estimated:** Due to inaccurate estimates during planning phase, the actual rock dredging quantity was much more than estimated. Further, the estimates prepared by the consultant were inaccurate resulting into major variation in quantities, leading to project schedule and cost overrun. This is the major reason which has cascading impact on the overall project delivery.
- **Slow mobilization by EPC contractor:** EPC Contract was signed on 2 December 2008; however the actual work commenced only from 12 May 2009, causing a delay of 5 months. The delay was primarily on part of the BOT operator in finalization of EPC contract.
- **Delay in project site handover:** The project requires some work on the existing Prince's and Victoria (P&V) Dock. MbPT delayed the handing over of this area to the contractor by 4 months. This also led to increase in cost, as resources were idle during this period.
- **Delay in awarding dredging work contract:** Delay in tendering process occurred as the eligibility criteria were revised based on the standardization committee's recommendations. The offers received from the contractors necessitated revision in cost estimates, which requires additional Government approval, leading to project delay.
- **Delay in completing work by dredging contractor:** As per the provisions of the contract, the contractor had to complete 3 milestones i.e. dredging in berth pocket by October 2009, filling of P&V Dock basins by June 2010 and dredging in approach channel by April 2011. However, the contractor missed the targets leading to delay of 18 months. The reasons for delays in achieving these milestones were as follows:
  - Accident of MSC Chitra in Mumbai Harbor resulted in suspension of soil dredging by 28 days
  - Delay in deployment of dredgers in time by the contractor
  - Slow progress in filling work by the contractor
  - Non-deployment of requisite dredgers to meet the weekly output specified in the contract by the contractor
- **Lack of integrated project master schedule:** The project is divided into two packages i.e. dredging and berth construction; and both these activities have individual project schedule. These schedules are not integrated to make a single project schedule. Further, the project progress is monitored separately, with accessing the interdependencies (risk) between them. The delay in completion of works by the dredging contractor has resulted in delayed handing over of the assets to the BOT operator, leading to overall project delay.
- **Delay in obtaining security clearance:** The security clearance for the bidder was received after a period of 18 months from the Central Government.

Measures taken by MbPT/ICT to de-bottleneck project

1. The ICT has very efficient reporting system for construction activities. There have not been any major delays due to execution of construction activities, but due to delay in handover of construction site
2. The MbPT has appointed an independent engineer for design approvals, quality control and monitoring progress of the BOT operator. Due of regular monitoring there was no delay from BOT operator side. However, scope of independent engineer's work only focuses on BOT operator and does not include dredging activities, making it difficult to monitor interdependencies among these two activities.
3. The estimates for dredging prepared by the consultants were not appropriate leading to cost and schedule overruns. The MbPT board has instructed the HOD committee comprising of CE, FA&CAO and DC to suggest appropriate action against the consultant for the lapse.
4. In lieu of non-compliance of the contract (deploying requisite dredgers) and delay in completion of the work MbPT board has recovered NR 38 crores (10 percent liquidated damages) from the contractor
5. MbPT appointed an independent engineer and project management consultants to submit monthly progress reports of the project.
6. To have smooth execution of project works MbPT ensured to include all infrastructure works like Capital dredging, RCD etc. in the Licensee's scope of work.
7. To minimize the impact of delay of one activity into other i.e. dredging and berth construction, independent Engineer was appointed to monitor interdependencies of works by MbPT and BOT operator and Project Management Consultant (PMC) was monitoring MbPT component of work.

CASE STUDY 4

Installation of FCCU at Mumbai Refinery

FACTS

- The project targeted to improve the refinery margins, by enhancing the production of value added products such as MS and LPG
- Project was delayed by one year and three months years and completed within the budgeted cost
- Change in project scope, delay in equipment supply from vendors and shortage of skilled manpower are some factors that leads to schedule and cost overrun
- To expedite the project delivery, HPCL's senior management was involved in negotiation with vendors.

Mumbai refinery is owned by Hindustan Petroleum Corporation Limited (HPCL) and has a capacity of 6.5 million metric tonnes per annum (MMTPA). The project under consideration envisaged the setting up of a new grass root Fluidized Catalytic Cracking Unit (FCCU) with a capacity of 1.456 MMTPA at Mumbai refinery. This project has helped refinery to produce high value distillate products such as LPG and MS, thus achieving higher refinery margins.

Following are the key details of project

Capacity under installation	FCCU with a capacity of 1.456 MMTPA
Location	Mumbai, Maharashtra
Contract Type	Engineering Procurement Construction Management (EPCM)
Investment approval	March 2007

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

Project Description

The Project envisaged setting up of a grass root secondary unit in an existing refinery. The facilities incorporated the UOP FCC Technology for high conversion with advanced combustor regenerator feature and integration of the Flue Gas Scrubbing Unit (FGSU) with Belco Technology. The new FCCU project was very complex with 331 systems spread across the refinery. The project had following major facilities:

- FCCU Feed Section consisting of feed Pre-heaters & Furnace
- Reactor – Regeneration section consisting of catalyst circulation circuit, catalyst handling section, flue gas cooling circuit
- Main Fractionator and Gas Concentration Unit (GCU)
- Flue Gas scrubbing section (FGSU)
- Fuel gas treating section
- Associated utilities, Distributed control system (DCS), substation required for parallel operation of new FCCU with existing FCCU.

Project Planning and current status

	Originally planned	Anticipated/ Revised	Overrun
Project completion date	September-2009	December-2010	15 Months
Project cost (INR Crore)	900.47	900.47	NIL

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

The project was approved on 27 March 2007, with planned completion date of 29 September 2009. However, the project got delayed by 15 months and commissioned on 16 December 2010. On financial front, the project was completed within the allocated budget. Following are the major milestones planned with their actual completion date:

Project Planning and current status

	Milestone Description	Planned Date	Actual Date	Delay (in months)
Process	Issue of equipment data sheets	16 August 2007	16 November 2007	3.1
	Issue of P & ID's & line list for engineering	17 September 2007	26 December 2007	3.3
	Issue of complete process package - FCCU	01 October 2007	26 December 2007	2.9
	Issue of P & ID's & line list for utility distribution	15 October 2007	05 February 2008	3.8
	Prepare and issue P&ID's and line list for utilities/offsites	23 January 2008	01 February 2008	0.3
Engineering	Prepare and finalize equipment layout	01 October 2007	29 November 2007	2
	Prepare preliminary piping MTO (complete)	31 January 2008	30 June 2008	5
	Prepare DCS (PKG)	29 February 2008	11 April 2008	1.4
	Complete modeling, GAD and ISOs	01 September 2008	10 November 2009	14.5
	Prepare final piping MTO	15 October 2008	18 September 2009	11.3
	Prepare main air blower	01 October 2007	26 December 2007	2.9
	Prepare fractionator column	04 October 2007	06 November 2007	1.1
Ordering	Issue LOI for main air blower	01 February 2008	29 April 2008	2.9
	Issue LOI for fraction Column	05 February 2008	08 February 2008	-
	Issue LOI for heat exchangers	19 February 2008	02 April 2008	1.4
	Issue LOI for vessels	04 March 2008	31 July 2008	5
	Issue LOI for DCS	30 June 2008	24 October 2008	3.9
	Issue LOI for Burner	31 May 2008	14 October 2008	4.5

	Milestone Description	Planned Date	Actual Date	Delay (in months)
Manufacturing and Delivery	Manufacturing and delivery at site - Flue gas cooler	31 October 2008	09 April 2009	5.3
	Manufacturing and delivery at site - Quench Tower	20 January 2009	04 September 2010	19.7
	Delivery at site - Slurry Pumps	06 February 2009	25 September 2010	19.9
	Manufacturing and delivery at site - Wet gas compressor	27 February 2009	23 April 2010	14.0
	Manufacturing and delivery at site - Fractionator Column	04 April 2009	30 September 2009	6.0
	Manufacturing and delivery at site – DCS	29 April 2009	13 August 2009	3.5
	Delivery at site – Burner	01 April 2009	22 October 2009	6.8
	Manufacturing and delivery at site - Main air blower	01 June 2009	23 February 2009	-
Construction	Removal of existing facilities and area clearance	31 December 2007	19 August 2008	7.7
	Completion of flue gas cooler works	31 January 2009	15 March 2010	13.6
	Civil work for sub-station complete	29 April 2009	25 March 2010	11
	Installation of wet gas compressor	13 June 2009	06 May 2009	-
	Fabrication & erection of heater	29 July 2009	10 June 2010	10.5
	Installation of DCS	31 July 2009	15 September 2009	1.5
	Completion of scrubbing unit work	31 July 2009	16 December 2010	16.8
	Erection of reactor/regenerator	05 August 2009	23 March 2009	-
	Complete electrical and instrumentation work	29 September 2009	15 December 2010	14.7
	Mechanical completion	29 September 2009	16 December 2010	14.8

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

Reasons for Schedule Delay

Change in Project Scope: Due to lack of proper planning and external factors, the project scope was changed during the execution phase leading to delays. The project scope was changed on following fronts:

- As per the original plan, the implementation of FGSU facilities was to be done through Lump Sum Turn Key (LSTK) mode. However, due to poor response to LSTK public tender for FGSU-PTU caustic facilities, the contract was converted to EPCM mode. In original LSTK mode, the FGSU implementation schedule was for 14 months, but in conventional mode, Engineers India Limited (EIL) estimated 24 months
- A number of improvement measures were initiated during the course of the project implementation including
  – relocating of caustic facilities, implementation of catalyst cooler facilities, standardization of FGSU-PTU-caustic facilities, streamlining of offsite piping and cable trenches, which were not planned in original project plan.

Delay from vendors and contractors: Many of the critical equipment supplies were delayed from the contractors and vendors side. Specifically, following equipments were delayed affecting the overall project delivery:

- Delay of 15 months in delivery of Auxiliary Main Air Blower with respect to project schedule
- Delay of 14 months in delivery of the Flue Gas Scrubber Mid-section by M/s BHPV
- Delay of 9 months by EIL in achieving 80 percent detailed engineering milestone and delay of 15 to 16 months with respect to critical Engineering milestones with cascading impact on procurement and construction
- Deliveries of balance lose items for MAB / AMAB / WGC was delayed by M/s BHEL to November 2010
- Completion of Catalyst Cooler facilities by M/s L&T extended beyond November 2010.

Delay in shifting of existing facilities: Since it was a brownfield project, it required shifting of existing facilities to make site ready for construction. Delay in shifting existing facilities and site handover, led to project schedule overrun

Other factors: Other factors which were not considered during project planning leading to project delays were:

- Extended and severe monsoon conditions from July to September 2010, severely hampered site activities
- Shortage of skilled manpower such as piping engineers at the contractor side.

Measures taken by HPCL to debottleneck project

1. One of the reasons for schedule overrun was delay from vendors and contractors. To expedite the progress on this front, HPCL senior management and project team initiated a series interactions with senior management of equipment suppliers and contractors (BHEL, EIL and BHPV), to understand the challenges and decide on the corrective measures.
2. HPCL project progress was closely monitored by the project team and the critical issues were escalated to the top management of HPCL. At times, the issues were even escalated to the ministry to expedite the progress.
3. For expediting site construction and to limit the impact of delays, a series of recovery plans and innovative measures were implemented. For example, control of drawings was shifted from head office to site office so that drawings were released on priority basis in line with the sequence of execution

CASE STUDY 5

Expansion and Modernization of NSCBI Airport

FACTS

- Capacity expansion project from 9.6 million to 20 million passengers annually
- Anticipated project cost is 20 percent higher than budgeted cost and approximately one year and two months delay is expected in the project delivery
- Delay in handing over of construction site to contractor, ineffective DPRs and delay in getting approval from Government on revised cost estimates are some critical factors that leads to schedule overruns.

Netaji Subhas Chandra Bose International (NSCBI) airport is situated in Kolkata, West Bengal. From April 2011 to March 2012, it was the fifth busiest airport in the country in terms of overall passenger traffic[1], and ninth busiest in terms of international passenger traffic. The expansion and modernization project is targeted to increase the existing airport capacity from 9.6 million to 20 million passengers annually. The scope of work includes construction of two five-storied State-of-the-art interconnected domestic and international terminals, a park-cum-water body and a right-turn flyover dedicatedly connecting VIP Road to the airport. The terminals will have car parking facility, hotels, food courts, and duty-free shops etc. The project has been awarded to ITD- ITDCem JV, a consortium of Italian Thai Development Public Company Limited and ITD Cementation India Limited.

Following are the key details of project

Capacity expansion	From 9.6 million passengers to 20 million passengers annually
Location	Kolkata, West Bengal
Investment approval date	August 2008

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

Project Planning and current status

	Originally planned	Anticipated/ Revised	Overrun
Project completion date	August 2011	October 2012	14 Months
Project cost (INR Crore)	1942.5	2325	20%

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

The project was approved on 5 August 2008, with planned completion date of 5 August 2011. However, the project got delayed by 14 months and now expected to be commissioned in October 2012. On financial front, the project cost is expected to increase by 20 percent from INR 1,942.5 crore to INR 2,325 crore.

1 Traffic News, Airport Authority of India; KPMG in India Analysis

Project Milestones

Below are the major milestones for NSCBI Airport as on August 2011. These details are provided with the survey questionnaire.

Task Name	Start Date	Actual/Expected Finish Date
Construction of Integrated Passenger Terminal Building (NSCBI, Kolkata)	November 2008	March 2012
Terminal Building	November 2008	March 2012
General Requirement	November 2008	March 2012
Construction Information (Client Deliverable)	November 2008	February 2010
Preliminaries	November 2008	September 2011
Earthwork	March 2009	July 2011
International Terminal	May 2009	December 2010
Excavation	May 2009	March 2010
Waterproofing Basement	November 2009	December 2010
Domestic Terminal	March 2009	July 2011
Excavation	March 2009	July 2010
Waterproofing	October 2009	July 2011
Structure	October 2009	September 2011
RC Superstructure	October 2009	September 2011
International Terminal	October 2009	September 2011
Arrival Lower Level	October 2009	November 2010
Arrival Upper Level	January 2010	January 2011
Departure Lower Level	April 2010	March 2011
Departure Upper Level	January 2011	September 2011
Steel Structures	May 2009	September 2011
Domestic	February 2010	September 2011
International	May 2009	September 2011
Roofing	December 2010	December 2011
Façade	February 2011	October 2011
Road Work	May 2009	December 2011
Wood Work	April 2010	December 2011
Domestic Terminal	April 2010	November 2011
International Terminal	September 2010	December 2011
Internal Finishing	April 2010	December 2011
Domestic Terminal	September 2010	December 2011
International Terminal	April 2010	December 2011
Car Park	November 2009	July 2011
RCC Floor Slab	November 2009	December 2010
RCC Middle Level	July 2010	April 2011
RCC Top Level	August 2010	July 2011

Task Name	Start Date	Actual/Expected Finish Date
External Finishing	August 2010	December 2011
MES Work	August 2010	December 2011
Power Supply & DG Sets	August 2010	November 2011
Elevators & Escalators	April 2011	December 2011
Fire Fighting	November 2010	December 2011
HVAC	October 2010	December 2011
Internal & External Electrification	November 2010	November 2011
Plumbing, Sanitary, Drainage, Water Supply	November 2010	December 2011
Testing & Commissioning of MEP Systems	July 2011	September 2011

Note: The above status as on August 2011; expected timelines might have changed

Source: KPMG in India – PMI Survey on cost and schedule overrun, 2012; based on interaction with survey respondents

Reasons for Schedule and Cost Overruns

Delay in handing over of the site: At the time of award of contract, only 70 percent of land was handed over to the contractor. The remaining land was handed over in parts; so that existing airport operations should not be interrupted. Further, delay in required removal or demolition of existing structure, led to schedule overrun.

Inaccurate DPRs and ineffective planning: The project plan did not focus on the relocation of critical facilities such as water reservoir, power house, air-conditioning plant and generator room which were stationed in an old building and needed to be demolished under the expansion project plan. As a result, the demolition of the old structure was delayed, leading to an overall project delay

Shortage of land at construction site for stacking of construction materials:

- The site of Integrated Passenger Terminal Building is very close to the existing operational facilities i.e. apron, domestic terminal building and other allied structures due to which no land contiguous to the work site could be handed over to the contractor for stacking of construction materials and fabrication / structural steel works constitutes a major part of the job. These materials including fabricated steel structure were stacked in non-contiguous and scattered sites around the Airport premises causing logistics problem and delay in fabrication work.
- Delay in completing security clearance for dumping of excavated material inside operational area

Pending revised budget approval from PIB, leading to delay in awarding packages: Due to cost escalation of construction material, the budget cost was overrun by 20 percent. A revised cost estimate was submitted to Public Investment Board (PIB), for which approval is awaited[2]. Due to budget constraint there is delay in awarding the contracts.

Delay in obtaining approvals: NSCBI Airport received late approval from State Government for VIP flyover and there was a delay in removal of encroachments by State municipality.

'Work-to-rule' agitation: Protest from Airports Authority of India's (AAI) international airports division (IAD) engineers and employees, which had taken around 60 engineers off the overtime roster, slowed down the project progress. This agitation is one of the major reasons for pushing the project completion date from March 2012 to October 2012.

Measures taken by AAI to debottleneck project

1. Chairman of AAI was himself involved and had meetings with the leaders of protesting employees. It was only after his assurance agitation was suspended.
2. Along with in-house Project Monitoring & Quality Assurance (PMQA) cell, AAI has appointed an independent consultant to ensure the quality of construction work.

2 As on September 2011

Common risks and suggestive measures across five case-studies

As observed in the above case studies, there are common factors impacting the project delivery across these projects whereas the risk are peculiar to each project. Further, we have seen companies adopt different approaches to overcome or minimize the impact of delays on the overall project completion. Based on our experience of case-studies, below are few suggestions that can be addressed by project owners to help rule out key concerns:

Exhaustive risk identification at the planning stage

While analyzing the projects, we identified that most companies don't conduct detailed risk assessment at the planning stage. Each project has some specific risks related to the surrounding environment, contractors and local stake holders that could impact project completion. For example, Vindhyachal project has risks around timely supply from equipment supplier and NSCBI airport has risk related to constructing a project at an operational site. Thus, there is need to do a very detailed analysis of all possible risks. Further, these risks need to be formally documented and monitored at each stage of project execution.

Holistic view of regulatory approvals

Majority of projects faced hindrances in getting statutory approvals. There is a need to include approvals process and timelines in the project plan with specific timelines. Any deviation in achieving these timelines should have a suitable mitigation plan, for timely completion of project. Further, from Government side there is a need to make approval and clearance processes smooth by introducing innovative measures such as single window clearance.

Develop Integrated Project Delivery Schedule

Most projects are being executed by split package mode, in which multiple contractors are carrying out different scope. Further, each contractor submitted its own schedule which is generally not integrated to make a single project schedule. The monitoring is carried out based on individual schedules. In this system if one contractor is delaying, the effect will not be seen on activities of other contractors. Thus, to monitor the project with multiple contractors, it is very important to have one a single integrated project schedule encompassing the scope of all contractors. Additionally, this schedule has to be updated frequently to monitor overall project status.

Build power partnership with vendors

Delay in getting equipments from suppliers/contractors is another reason which impacts the project delivery. Building a long term relationship with vendors could help in timely delivery of equipments. Further, joint evaluation of project by project owners and the contractors, can help in identifying the bottlenecks and taking corrective actions. In case of HPCL, timely involvement of senior management of both parties (HPCL and contractor), had helped in identifying the concerns and they mutually agree on the corrective actions.

Enhance monitoring agency (PMO) to monitor the progress and bottlenecks on regular basis

Most companies have an in-house system of monitoring project progress. However, setting up a centralized independent monitoring agency (PMO) could help in monitoring the project progress and identifying bottlenecks in an efficient manner. Further, this would act as an interface between project site and corporate office, enhancing the project delivery.

Buy-in from execution team on project schedule

The project schedule is often prepared by the corporate office and given to the project team for execution. The schedule is not prepared by taking in to confidence all the executing agencies such as engineering, procurement and execution teams. This creates issues around accountability of the timelines given in the schedule. The project schedule has to be signed off by all agencies after agreeing to the timelines given for their activities.

SECTION 10

Global insights — Learning from global projects

Although building infrastructure projects is a global challenge today, the sector is expected to experience an unprecedented level of investment and expansion in infrastructure around the world. An estimated USD 40 trillion of investment would be needed by 2050 to sustain the global growth[1].

To understand the infrastructure challenges and how industry is preparing to overcome them, KPMG International conducts 'Global Construction Survey', which reflects the concerns and views of the world's leading engineering and construction companies. This survey also highlights that while the intensity of some issues is same across the globe, others have more impact in a particular region or country.

1 KPMG International's publication — "Insight – The global infrastructure magazine", November 2010

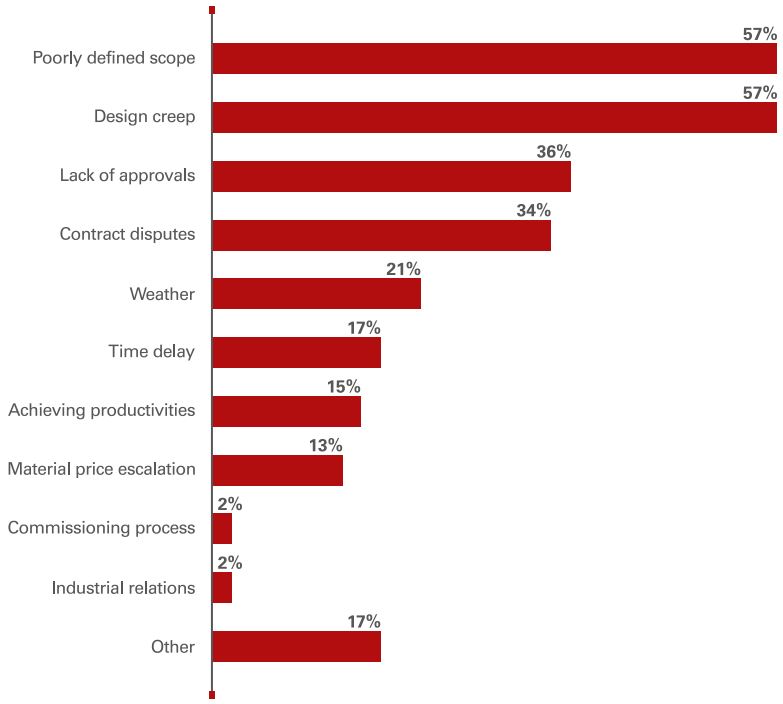
Challenges of global construction industry

Project delays and cost overruns is a global phenomenon and India is no exception. Due to difference in the socio-economic and political maturity levels, the underlying causes and therefore, the remedies differ from country to country. Design creep, poorly defined scope and lack of approvals have been regarded as the main causes of delays across the globe. Contractual disputes also impact the project schedule although none of the global construction survey respondents from the Americas region cited this as a concern, which could indicate that contracts are tied down more tightly in this region.

Skill shortage is another issue impacting the implementation of infrastructure projects. 84 percent[2] of the respondents felt that the construction industry is not doing enough to tackle skills shortages. Also, the industry is making extensive use of foreign labor on projects, which is both a reaction to local shortfalls and a natural consequence of the increased mobility of people.

Further, due to increasing concerns for clean environment, sustainable construction is very high on the agenda of project owners. Nearly all surveyed companies have an environmental policy in place, with the Board taking responsibility in over two-thirds of cases. Though sustainability is perceived as a compliance burden, surprisingly most (70 percent) believe it will actually increase profitability. Companies could benefit by presenting a green image to stakeholders – particularly customers, the local community and employees. The survey respondents agree that there are multiple benefits of sustainable construction. However, some respondents do not have a management system to set appropriate key performance indicators to measure sustainable performance. Inability to deliver sustainable infrastructure projects can have dire consequences for the developer's reputation.

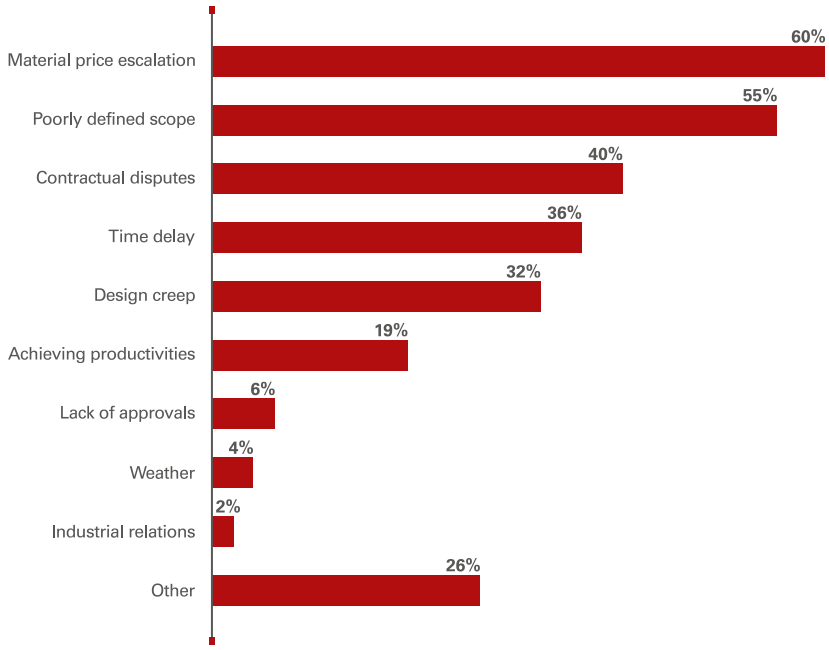
Reasons for schedule delay globally



Note: Respondents could answer more than one option

Source: Global Construction Survey 2008, KPMG International

Reasons for cost overrun globally



Note: Respondents could answer more than one option

Source: Global Construction Survey 2008, KPMG International

2 Global Construction Survey 2008, KPMG International

Leading practices followed in the construction industry

Sophisticated approach to risk management - With growing uncertainties in the global market, risk management is emerging as one of the key imperatives for project management. Leading companies of the world apply 'holistic' approach where risk is fully integrated into every aspect of the project life cycle. Rigorous analysis is done at the planning and bidding stages as part of an evolving risk culture. Further, project owners consider and evaluate factors that may have a direct or indirect impact on the project such as macro-economic condition, tax structure, environmental policy, and credit availability.

During project execution, a mechanism is put in place to seek a more objective review of projects by dedicated risk professionals, often on a quarterly basis.

According to KPMG International's Global Construction Survey 2010, 77 percent of the respondents believed that their systems and controls were fairly or very sophisticated, reflecting increasing investment in risk management over a number of years.

Preferred partnership with suppliers - Globally, most of the companies have formal or informal partnering agreements with contractors, vendors and suppliers. According to KPMG International's Global Construction Survey 2008, over 90 percent of respondents had some preferred partnerships with their contractors and suppliers . Preferred partnerships not only helped companies to get reduced prices but also guaranteed resources to carry out the work onsite, gain priority attention for critical projects and reduce contractual claims.

Talent management - To overcome resource shortage, talent management is one of the top agenda for infrastructure companies. To develop and retain a high quality employee-base, companies are nurturing talent in key positions, investing in necessary training, and retaining the best people during adverse conditions. Further, to attract fresh talent in the industry, some practical measures are undertaken including better training, greater cooperation with universities, and an improved salary and career structure.

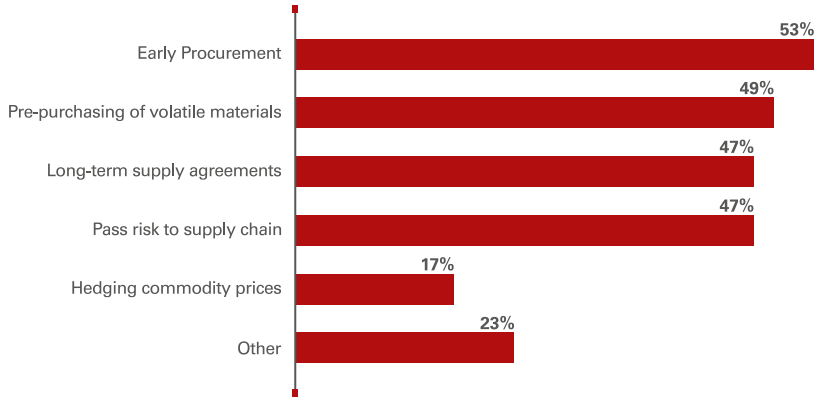
> We're entering into more strategic partnerships and joint ventures when executing larger projects, in order to spread the risk and leverage key strengths
>
> **Survey respondent, United States**
> **Global Construction survey 2009, KPMG International**

> We try to identify key staff early and give them job rotation and training opportunities.
>
> **Survey respondent, Europe, Middle East and Africa region**
> **Global Construction survey 2009, KPMG International**

Cost escalation management: In a world where costs are constantly increasing, greater efficiency is the key to control the project cost overruns. To create a lower-cost operation, companies are carefully managing all elements of the supply chain, and focusing on increasing their productivity. Companies employ a variety of techniques to manage rising costs, with usage spread fairly evenly across long-term supply agreements, early procurement, pre-purchasing of volatile materials, passing risks to the supply chain and hedging vital commodities.

Contract clauses: Due to uncertainty in the cost of key material, companies are increasingly using contract clauses that specifically address inflation. Most companies choose to be transparent by referring to publicly available cost indices in their contracts. According to KPMG International's Global Construction Survey 2008, 45 percent of respondents claim to practice this for the majority of their projects. This practice is found to be the most common in Europe, Middle East and Africa, with relatively little such activity in Asia Pacific. However, these types of contracts are preferred by contractors, whereas not all project owners are willing to share these risks by agreeing to contract clauses that cover rising costs.

Reasons for schedule delay globally



Note: Respondents could answer more than one option

Source: Global Construction Survey 2008, KPMG International

KPMG in India's point of view

Majority of reasons that lead to project cost and schedule overruns in India are not much different from anywhere else in the world. However, the techniques used by Government and industry to overcome these bottlenecks are different. Faster regulatory approvals, detailed project planning, continuous project monitoring and inclusive risk management, could make India comparable to any other country in the world in terms of project delivery.

SECTION 11

Sector snippets

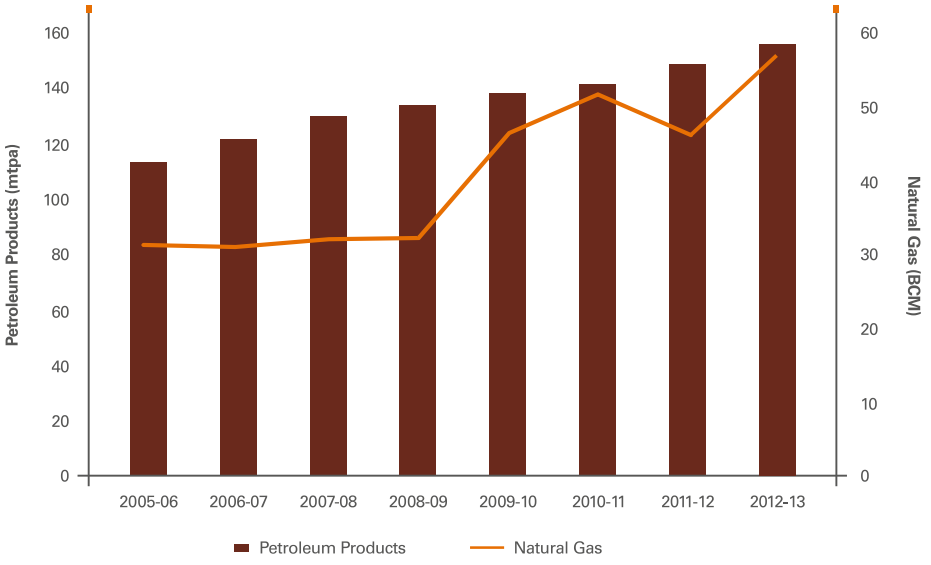
Petroleum

- India's demand for oil & gas is continuously increasing, though the indigenous production is almost stagnant, leading to increasing imports
- Major sector players are ONGC, IOCL, BPCL, HPCL, OIL, GAIL, RIL, Essar[1]
- Slow pace of exploration activities, maturing oil & gas fields and controlled price regime are some of the key challenges.

Sector Overview

- India is the fourth largest consumer of energy. Oil & Gas sector contributes around 40 percent in India's primary energy consumption[2].
- Oil constitutes around 35 percent of India's total imports (2012-13)[3].
- As of March 2013, India has 22 refineries with a total capacity of 215 MTPA[4].
- From 2005-06 to 2011-12, production of crude oil has grown at a CAGR of 2.9 percent from around 32.1 million tonnes to 38.1 million tonnes. During the same period the production of natural gas has increased at 6.7 percent p.a from 32.2 BCM to 47.5 BCM[5].
- From 2005-06 to 2012-13, consumption of petroleum products increased at 4.6 percent p.a and gas consumption at 6.3 percent p.a.[5]

Petroleum products and natural gas consumption



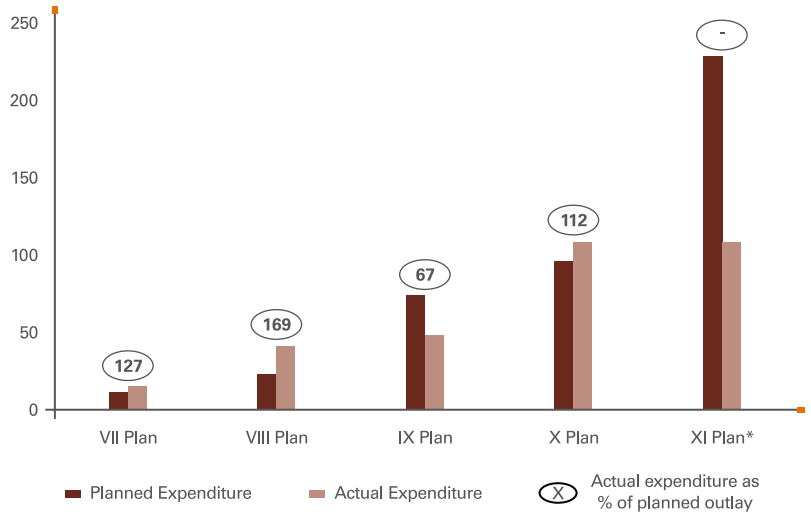
Source: Historic consumption of petroleum products and natural gas, Petroleum planning and analysis cell (PPAC), accessed June 2013

1 India Oil & Gas sector competitive landscape, BMI, 11 December 2012
2 BP statistical review of world energy 2012, June 2012
3 Handbook of Statistics on Indian Economy, Reserve Bank of India, June 2013
4 Installed Refinery Capacity, PPAC, accessed June 2013
5 Historic production of petroleum products and natural gas, (PPAC), accessed June 2013

Five year plans performance

Oil and gas is one of the few sectors which mostly exceed the investment targets laid out in five years plans. For instance, in Tenth Five Year Plan, the actual expenditure was 112 percent of planned outlay at INR 1,08,003 crore. Similarly, during the mid-term appraisal of eleventh plan, Government had revised its planned outlay to INR 2,69,461 crore from INR 2,29,278 crore, a 17 percent increase in planned expenditure. This is mainly because of aggressive investment plans by oil and gas companies. The actual expenditure during the first two years and 4 months of Eleventh Plan (up to August 2009) was INR 1,08,625.91 crore which is 47.38 per cent of the plan approved outlay[6].

Planned expenditure vs Actual expenditure



* XI plan actual expenditure is only up to August 2009

Source: Planning commission

Key Challenges

1. **Slow pace of exploration activities:** In India, around 35 percent of acreage still falls under poorly explored to unexplored region[7]. Also, even after discovering oil/gas, development and production of fields take much longer time.
2. **Maturing Oil/Gas fields:** Most of the producing fields have matured and are witnessing a declining production. Mumbai high and Gujarat are typical examples of such fields. Also, Improved / Enhanced Oil Recovery (IOR/EOR) programs implemented by ONGC were unable to arrest the decline.
3. **Underutilization of existing natural gas infrastructure:** Natural gas pipeline and City Gas Distribution (CGD) infrastructure laid down by companies might be under-utilized primarily due to constrained domestic supply of natural gas.
4. **Risk of natural gas infrastructure not being laid down:** Due to low entry barrier, non serious players have entered in to the business and now they might not lay the gas pipelines. Further some new companies that have entered in the gas business don't have requisite capabilities to lay infrastructure.

Emerging Trends

1. **Exploration activities:** To promote investment in upstream activities Government has launched New Exploration Licensing Policy (NELP). In the first eight rounds of NELP spanning 2000-2010, Production Sharing Contracts (PSCs) for 234 exploration blocks have been signed. NELP IX received 74 bids for 33 blocks .[6]
2. **Unconventional sources:** India has huge potential to develop unconventional sources of hydrocarbon including Shale gas and CBM. The Government of India is planning to launch the first round of bidding for shale gas in the Twelfth Five Plan[8]
3. **Fuel prices:** Petrol prices have been decontrolled with effect from June 2010 and there are plans to decontrol diesel prices as well. Currently, Government is working on a mechanism of direct transfer of subsidy for kerosene and LPG.[9]

6 Seventh to Eleventh Five Year Plans, Planning Commission
7 Directorate General of Hydrocarbon (DGH)
8 India to launch shale gas exploration bid during 12th Plan, Indian Express, dated 22 November, 2011
9 Poor consumers may get cash subsidy on LPG, kerosene and fertilizers, Economic Times, 6 July 2011

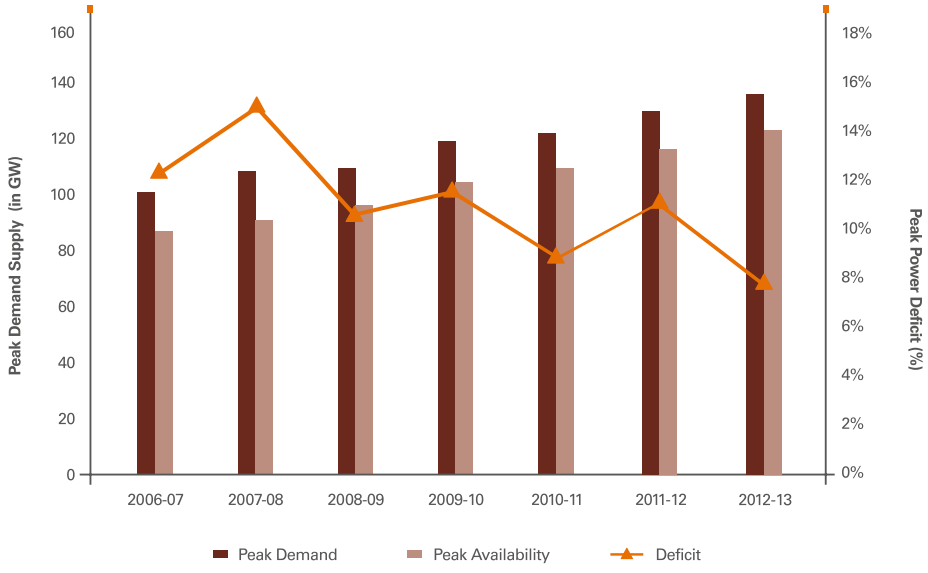
Power

- With substantial addition in power generation capacity, peak power deficit has decreased in the recent years
- Major sector players are NTPC, NHPC, PGCIL, PTC, Tata power, Lanco Power[1]
- Slow pace of project execution, shortage of power equipments, delays in land acquisition and regulatory approvals are some of the key challenges.

Sector Overview

- India's power demand and supply is continuously increasing. During 2007-08 to 2012-13, peak electricity demand has increased at a CAGR of 4.5 percent and supply at a CAGR of 6.3 percent[2].
- As on 30 April 2013, the total installed capacity for power generation was about 223 GW. Around 58 percent of this comes from coal, 18 percent from hydro, 9 percent from gas and the remaining 15 percent is contributed by nuclear, diesel and other renewable sources of energy[3].

Peak power demand supply in India



Source: Power Scenario at a Glance, Central Electric Authority, 2013

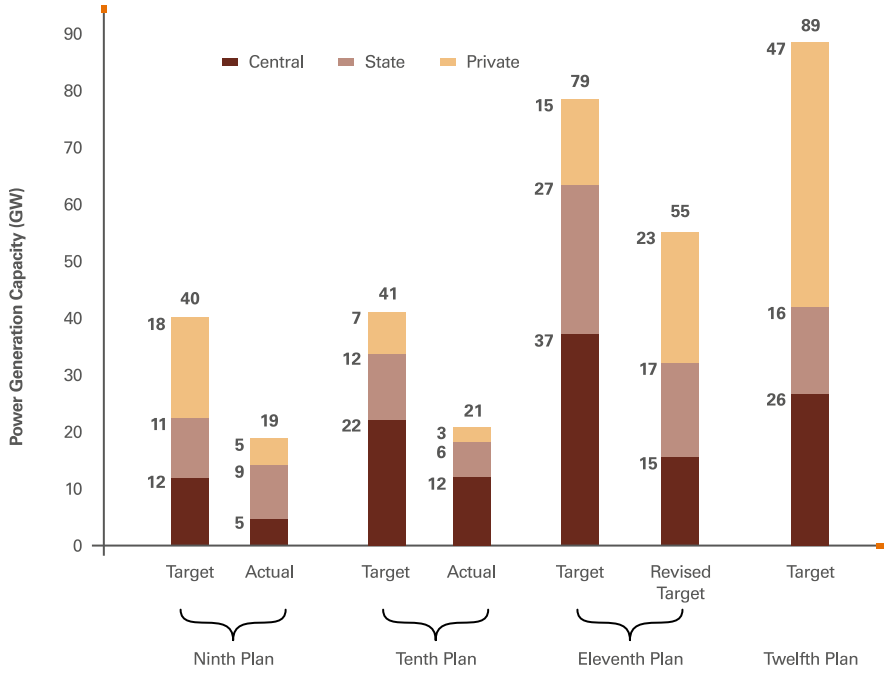
1 India power sector competitive landscape, BMI, 4 January 2013
2 "Power Scenario at a Glance", Central Electric Authrotiy, June 2013
3 "Installed Generation Capacity", Central Electric Authority, April 2013

Five year plans performance

The performance of power sector in five year plans is mostly lower than the planned target. Historically, all three sectors – central, State and private – have fallen short of achieving the planned targets. For instance, Ninth and Tenth Five Year Plan barely managed to achieve half of the planned capacity addition. However, the prospects of Eleventh Plan look better and according to mid-term appraisal, of it is expected to achieve around 80 percent of the targeted capacity addition.

Also, for every five year plan the capacity addition targets are much higher from the previous year achievement. For example, Eleventh Five Year Plan target is around four times then the actual capacity additions achieved in tenth plan. Participation from the private sector is also increasing mainly due to favorable Government policies and power sector reforms.

Planned target vs actual achievement



Source: Power Scenario at a Glance, Central Electric Authority, 2012

Key Challenges

1. **Delay in project execution:** India has been failing to meet the capacity addition targets by significant margins. For the Eleventh Five Year Plan, only around 70 percent[4] of the planned target capacity addition was met.
2. **Shortage of fuel availability:** Power sector is facing significant challenges in securing fuel supply primarily due to lack of good quality domestic coal, expensive imported coal and limitation in domestic gas supply.
3. **Delay in land acquisition and environment clearances:** Absence of single window clearance mechanism results in delay in acquiring land and other environment clearances, thus leading to a prolonged pre-development cycle.
4. **Shortage of power equipment:** The demand of power equipment exceeds the supply primarily for the core components of Boilers, Turbines and Generators. The primarily reason for this mismatch is the equipment manufacturers were unable to keep pace with increasing generation capacity.

Emerging Trends

1. **Power Reforms:** Government has taken several steps to promote investment and private sector participation in the sector. Some of the major reforms that have been implemented over the years include: The Electricity Act 2003, unbundling of SEBs, tax benefits, Accelerated Power Development and Reform Program (APDRP) for distribution, permission for trading of power, etc. These developments have given rise to new opportunities for power players especially in the power generation space.
2. **Increased private sector participation:** As a result of favorable Government policies and initiatives, there have been a plethora of new projects announced by the private sector companies. The share of private sector in total electricity generation has grown rapidly from less than 10 percent in the Tenth Plan to around 32 percent during the Eleventh Plan. This share expected to further increase to 50-60 percent during the Twelfth plan[5].
3. **Promotion of renewable energy for power generation:** Government is promoting renewable energy for power generation to meet the dual challenges of energy security and climate change. India has significant potential for solar energy and to tap this potential the Jawaharlal Nehru National Solar Mission (JNNSM) was launched in 2010. The mission targets 20,000 MW of solar power by 2022[6].

4 Mid-term appraisal of Eleventh Five Year Plan, Planning Commission
5 Tenth and Eleventh Five Year Plan, Planning Commission
6 PM launches Jawaharlal Nehru National Solar Mission – Solar India, Press Information Bureau, 11 January 2010

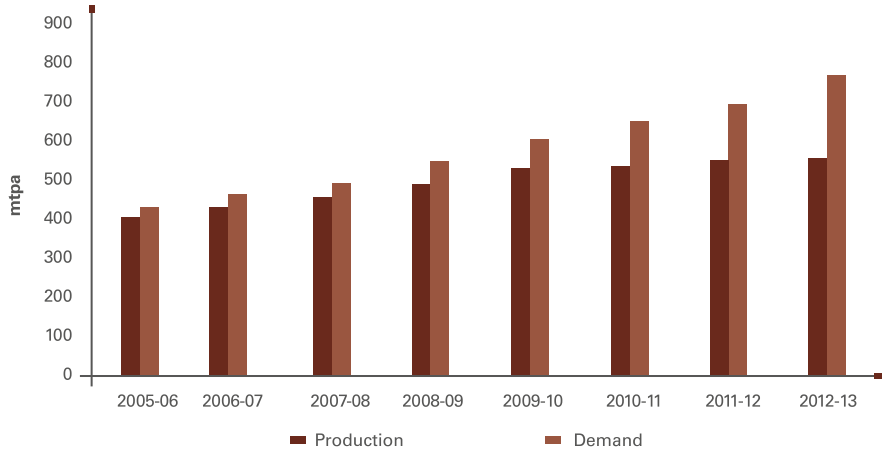
Coal

- Driven by significant increase in demand from power and steel sectors, the gap between the demand and supply of coal is widening
- Major sector players are CIL, SCCL[1]
- Slow pace of exploration, lack of evacuation infrastructure and environmental concerns are some of the key challenges.

Sector Overview

- India is the third largest producer of coal in the world, accounting for about 5.6 percent of the total global production[2].
- Around 53 percent of India's annual primary energy consumption is sourced through coal[3].
- As of April 2012, India's total recoverable coal reserves stood at 293.5 billion tonnes (bt) of which about 118 bt are proved reserves[4].
- The power segment is the largest consumer of coal in India accounting for about 75 percent of the total coal consumption[1]. Other segments include steel, cement, railways and fertilizer industry.

Coal production and consumption



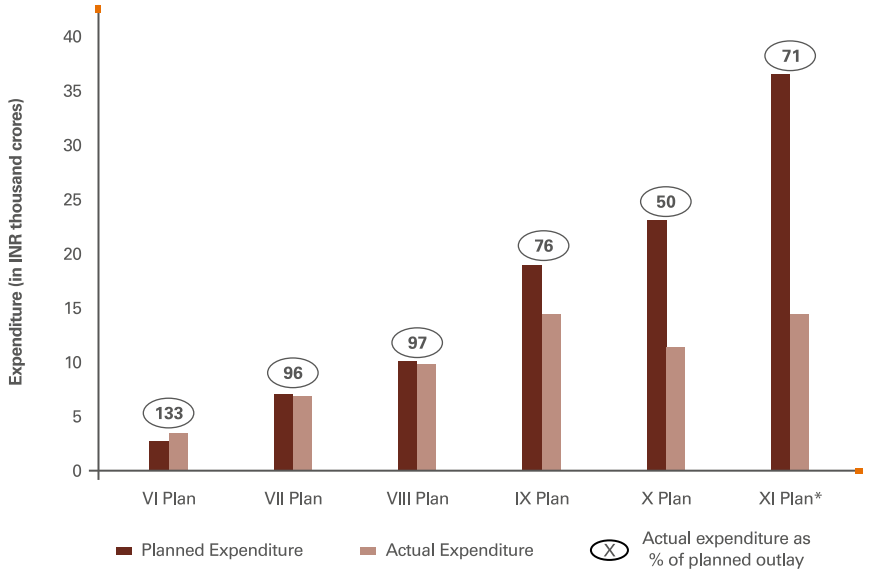
Source: Ministry of Coal

1 India mining sector competitive landscape, BMI, 26 October 2012
2 BP Statistical Review 2012, June 2012
3 Ministry of Coal
4 Ministry of Coal

Five year plans performance

Till the end of Eighth Five Year Plan, coal sector was able to achieve the planned expenditure targets. However, the performance of recently concluded five year plans has been disappointing. For instance, in Ninth and Tenth Five Year Plans, the actual expenditure against the planned outlay was about 76 percent (INR 14,805 crore) and 50 percent (INR 11,896 crore) respectively. During the mid-term appraisal of eleventh plan, Government has revised its planned outlay of INR 37,100 crore to INR 32,593 crore, a decline of about 17 percent. The main reason behind this is the monopolistic role of the State owned players in the Indian coal sector[5].

Planned expenditure vs Actual expenditure



* XI plan actual expenditure is only up to August 2009

Source: Planning commission

Key Challenges

1. **Slow pace of exploration activities:** Of the total recoverable coal reserves, about 60 percent are in the 'indicated and the inferred' category[6]. This reflects sluggishness in the exploration domain in the Indian coal sector.
2. **Socio-environment issues:** Significant portions of the India's coal reserves lie in the forest areas infested by naxals. Land acquisition in such sensitive areas poses a major challenge for the sector. Also, environmental clearance and forest clearance processes for project implementation is generally slow.
3. **Lack of Competition:** The Indian coal sector is predominantly monopolistic in nature, largely controlled by Coal India and other State owned miners. Moreover, there is an absence of an independent regulator in this sector.
4. **Inadequate evacuation infrastructure:** Coal sector primarily depends on rail evacuation for off-take and delivery of coal stocks. With significantly growing demand, the evacuation infrastructure needs to be enhanced for sustaining an efficient transportation.
5. **Environmental concerns:** Unscientific mining of coal in India has led to a number of environmental problems in the past. There is a dominance of open cast mining techniques in India as the production from using such techniques can start in short span of time.

Emerging Trends

1. **Captive mining for coal:** Captive mining for coal is gradually increasing in the country. As of March 2009, 201 coal blocks with reserves of 45.89 billion tonnes have been allocated for captive mining. Private companies, whose involvement in the country's coal sector is limited to joint ventures, have been allocated 100 blocks with reserves of 17.93 billion tonnes[7].
2. **Efforts for technology enhancement:** Indian coal miners are increasing their R&D expenditures in an attempt to enhance technology and ensure productivity gains. Indian players are also warming up to collaborate with the foreign partners for implementation of complex projects in the sector.
3. **Widening demand-supply gap:** The demand for coal in India is rapidly increasing mainly driven by the new projects in the power sector, whereas indigenous production is not able to increase with same proportion. This has created a demand supply gap in the country and to meet this gap, India has been increasingly importing coal. In 2011–12, the country imported 98.9 million tons of coal (including thermal and coking coal), reflecting a 44 percent increase over imports of 68.9 million tons in 2010–11[8].

5 Seventh to Eleventh Five Year Plans, Planning Commission
6 Ministry of coal
7 2011 India Energy Handbook
8 Coal Imports, Press Information Bureau, 14 May 2012

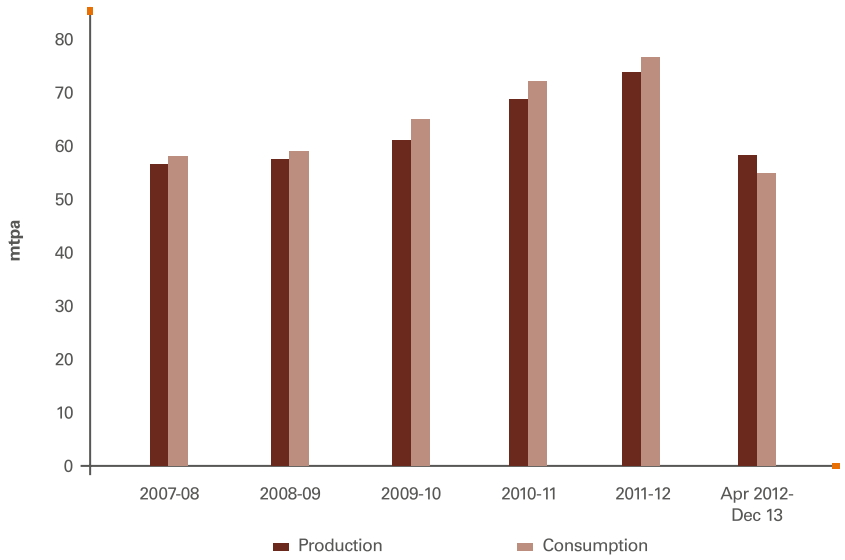
Steel

- India has surplus iron production and is a net exporter of steel
- Major sector players are SAIL, TISCO, JSW, Essar[1]
- Hindrances in land acquisition, depleting iron ore reserves and shortage of raw materials are some of the key challenges.

Sector Overview

- India has become fourth largest producer of crude steel in the world and is expected to become the second largest producer by 2015[2].
- Export of finished steel during 2011-12 stood at 3.64 million tonnes while imports during 2011-12 stood at 6.83 million tonnes[3].
- Although the per capital steel use has increased from 35 kg in 2005-06 to 55 kg in 2010-11[3], it is significantly lower compared to the world average of about 215 kg[3].
- The construction and infrastructure segment was the largest consumer of finished steel, accounting for about 61 percent of the total consumption[4]. Other major segments include manufacturing and automobile industry.

Finished steel production and consumption



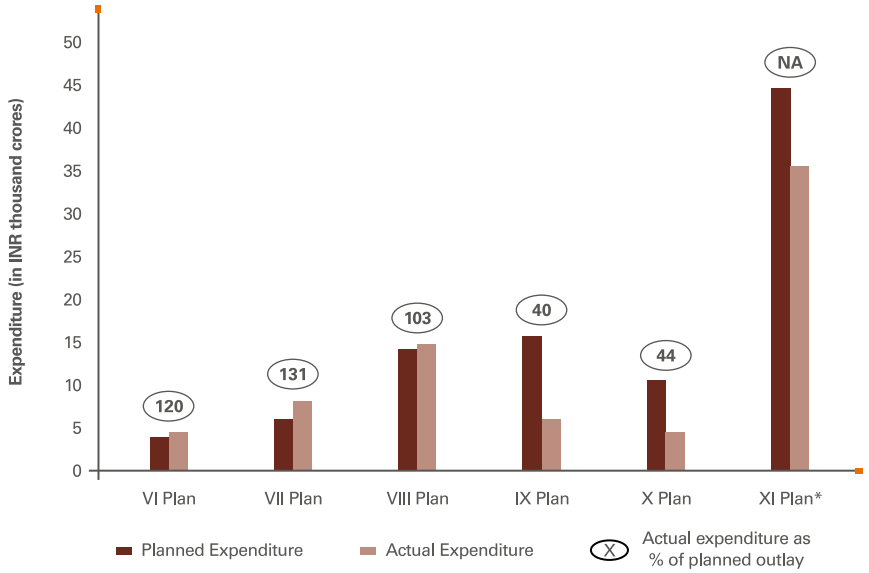
Source: Annual report 2011-12, Ministry of Steel

1 India Metal sector competitive landscape, BMI, 25 May 2012
2 Annual Report 2011-12, Ministry of Steel
3 Ministry of Steel
4 IBEF Report

Five year plans performance

After achieving only 40 percent and 44 percent of the planned outlay during Ninth and Tenth Five Years Plans, the steel sector has posted a strong recovery during the eleventh plan. Till December 2010, the sector has already achieved about 80 percent of the planned expenditure for the eleventh plan. The main reason behind this is the aggressive spending by the steel companies for capacity expansion projects[5].

Planned expenditure vs Actual expenditure



* XI plan expenditure during April 2007-December 2010

Source: Planning commission

Key Challenges

1. **Hindrances in land acquisitions:** Land acquisition is a sensitive issue in India. Land acquisition approvals often take a long time in the country resulting in project delays. Moreover, the environmental clearances also generally take longer than stipulated time in the country.
2. **Shortage of raw materials:** The steel manufacturers often face the shortage of raw materials especially coal and natural gas in India. India is an importer of high grade coking coal which is a major feedstock for the steel sector.
3. **Depleting iron ore resources:** India has limited resources of iron ore. Moreover the iron ore resources are depleting fast in the country.
4. **Lack of adequate infrastructure:** While the coking coal is imported into India through ports, most of the steel manufacturing plants are located inland. Hence, the steel manufacturers have to bear extra burden in their transportation costs.

Emerging Trends

1. **Brownfield expansion projects:** In view of the surge in steel demand in the country, a number of brownfield projects have been initiated in the recent past to increase the production capacity. The domestic demand for steel is expected to increase at an annual average rate of over 10 percent till 2014 and would require a significant increase in the existing production capacity[6].
2. **Efforts for technology enhancement:** Indian steel manufacturers are warming up to the application of advance technologies such as high top pressure, high blast temperature and pulverized coal injection in the production processes. Both public and private sector players are also increasing their R&D budget with focus on introduction of advance technologies.
3. **Mergers and acquisitions:** The Indian steel industry has witnessed a number of major merger and acquisition deals in the recent past. Apart from the domestic deals, the sector also witnessed significant a number of cross-border (both inbound and outbound) deals.

5 Seventh to Eleventh Five Year Plans, Planning Commission
6 IBEF Report

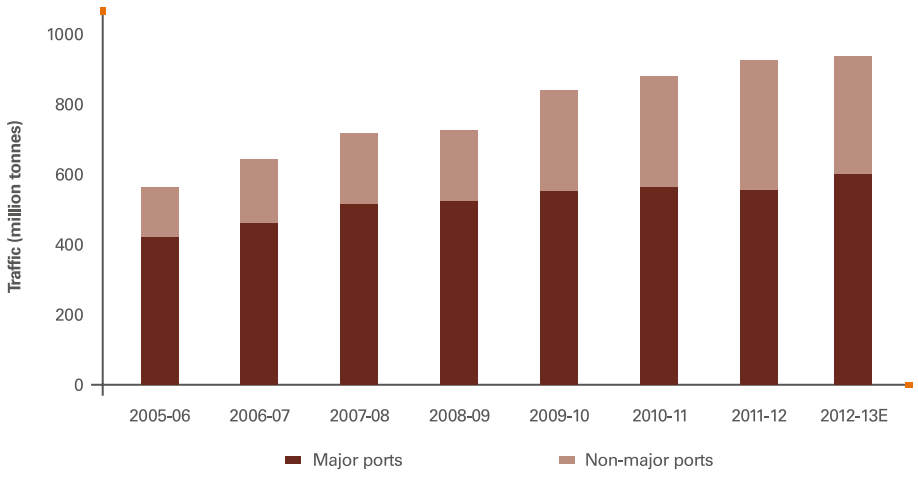
Ports

- Share of non-major ports in total traffic has risen sharply from 26 percent in 2005-06 to 40 percent in 2011-12
- Major sector players are Government authorities, Adani Group, DP world, APM Terminal[1]
- Slow pace of development, lack of integrated approach and highly congested ports are some of the key challenges.

Sector Overview

- India's port sector handles about 95 percent of India's total international cargo by volume and about 70 percent by value[2].
- Over the last several years, the role of major ports has been reducing in growth terms when compared to non-major ports. The traffic at major ports has been growing at CAGR of around 3.7 percent during 2005-06 to 2012-13 while that at non-major ports has been growing at CAGR of 14.1 percent – a difference of over 10 percent[3].
- The Government's Maritime Agenda 2020 aims to increase the psort capacity to over 3,000 million tonnes by FY2020 against the expected traffic of about 2,500 million tonnes by then[4]. This is likely to bring down the current average utilization level of over 90 percent to about 80 percent[5], thus, reducing port congestion.

Traffic at Indian ports



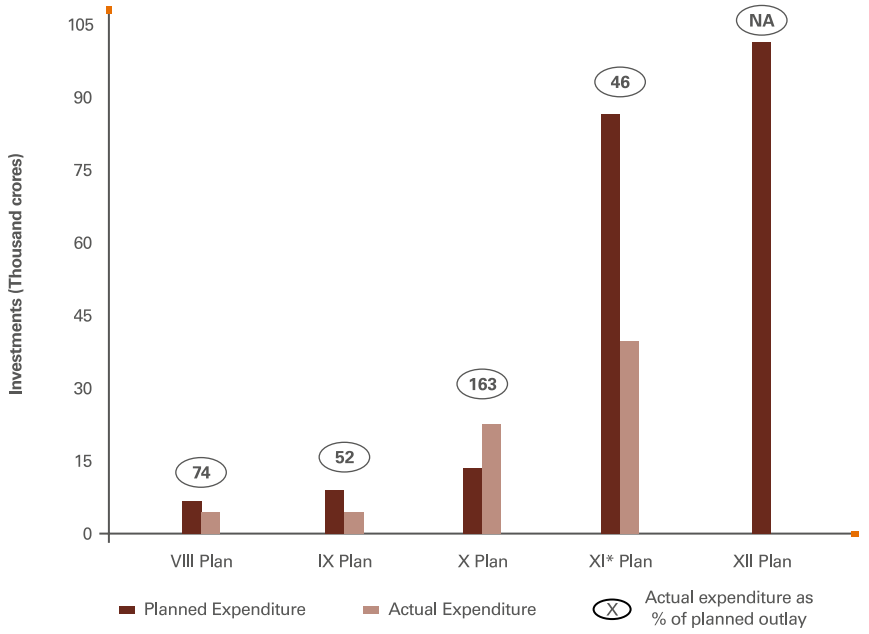
Source: Indian Ports Association, Crisil, KPMG in India analysis

1 India port sector,BMI, accessed 4January 2013
2 India in Business, Ministry of External Affairs
3 Indian Ports Association, Crisil; KPMG in India analysis
4 Ministry of Shipping's Maritime Agenda 2010-20
5 Indian Ports Association, Crisil; Maritime Agenda 2010-20; KPMG in India analysis

Five year plans performance

The performance of the port sector in terms of the five year plans has been a mixed bag: among the last 5 five year plans, only 2 plans witnessed more of actual expenditure than what was earlier allocated. The scenario in rest of the 3 plans was critically unfavourable with actual expenditure being as low as just 52 percent of the target (in Ninth plan). Further, during the mid-term appraisal of the Eleventh Plan, the investment target in the port sector is reduced to INR 40,647 crore which is less than half of the original projection of INR 87,995 crore[6].

Planned expenditure vs Actual expenditure



* XI plan actual expenditure is only for first two years, 2007-08 and 2008-09

Source: Planning commission

Key Challenges

1. **Delay in Infrastructure development:** It has been observed that of the 276 port projects envisaged under National Maritime Development Programme (2005-12), only 50 could be completed till fiscal 2010[7]. Thus resulting a delay in development of port projects
2. **Lack of integrated approach:** Standalone initiatives by various ministries results in lack of master plan approach for development of mega projects.
3. **Over port utilization levels:** In India, the port utilization is approximately 90 percent as against the global standards of 75-80 percent. Thus resulting, in high congestion and turnaround time and hampering global competitiveness of most of Indian major ports.

Emerging Trends

1. **Capacity addition:** The capacity at both the Eastern and Western Major Ports has increased at a CAGR of 8.4 percent during FY05-FY11[8].
2. **Change in International trade pattern:** Lately, India has shifted its trade pattern from traditional dominance of the US and Western Europe to focusing on East and Asia-Pacific regions. It has been observed that the share of China (including Hong Kong) and few economies (Australia, Indonesia and Republic of Korea) in India's total trade has almost doubled during FY01-FY11, while the share of developed markets such as the US, Germany, France and the UK either remained same or decreased to half of their respective levels during the same period[9].
3. **Changes in Cargo Handling:** The Indian maritime sector has been witnessing the following major changes in cargo handling:

- In terms of overall cargo handled in tonnes, the traditional dominance of eastern major ports has been overtaken by western major ports. During FY05-FY10 the traffic handled at western major ports have increased at a CAGR of 9.5 percent, while the traffic handled at eastern major ports increased at a CAGR 6.2 percent.[10]
- Within these overall cargo trends, the container traffic, however, has been witnessing a different growth story. In terms of absolute traffic (million tonnes), container traffic is estimated to account for approximately 15 percent in FY10-11 of the overall commodity pie of around 885 million tonnes. This share is expected to increase to 18 percent by FY15-16 of the total projected pie of 1,357 million tonnes[6].

6 Seventh to Eleventh Five Year Plans, Planning Commission
7 Crisil research
8 Crisil research; KPMG in India analysis
9 Ministry of Commerce, KPMG in India analysis
10 Indian Ports Association, Crisil, KPMG in India analysis

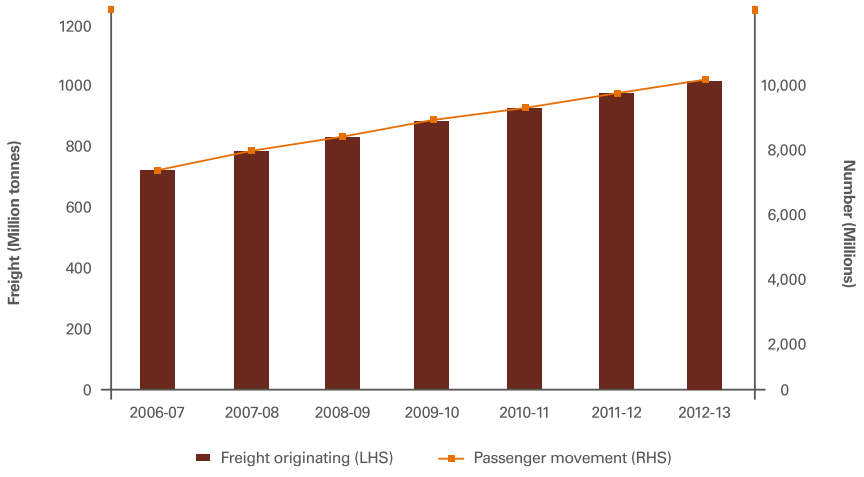
Railways

- Railways is the principle mode of transportation for freight and passengers
- Indian Railways enjoys a near monopoly position in the country
- Highly congested network and frequent Government interventions are some of the key challenges.

Sector Overview

- The number of passengers moved has been increasing from about 6.2 billion in 2006-07 to 8.5 billion in 2012-13, growing at CAGR of 5.3 percent[1].
- The freight movement has been increasing from 728 million tonnes in 2006-07 to 1,007 million tonnes in 2012-13, growing at CAGR of 5.6 percent[1].
- Coal is the leading commodity transported through railways and in 2010-11 its share in total rail freight is around 46 percent[2]. Other commodities include steel, fertilizers, cement, etc.
- The railway is planning to add 25,000 kms of new lines in the period 2010-2020[3].

Rail freight and passenger movement



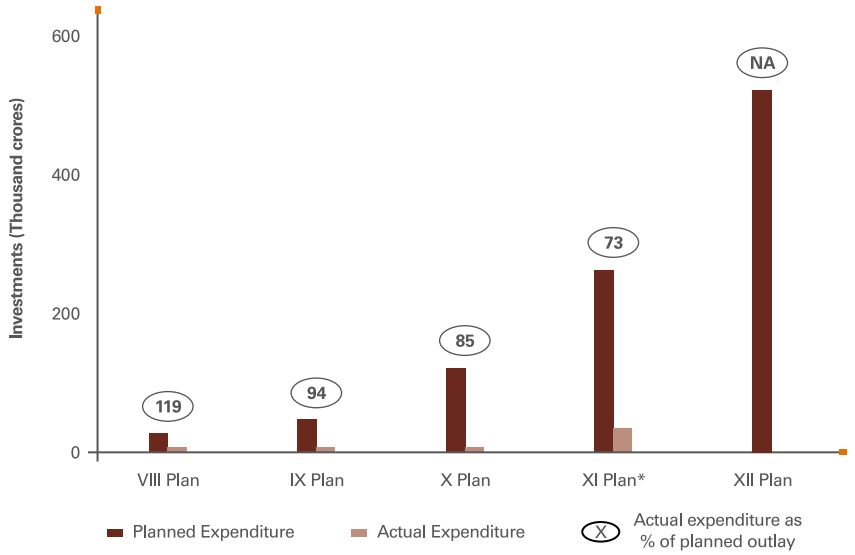
Source: Ministry of Railways

1 Ministry of Railways, KPMG in India analysis
2 Crisil research; KPMG in India analysis
3 Indian railways, web search

Five year plans performance

The investment target achievements in the railways sectors have been very bleak in the past five year plans. In the Tenth plan the percentage achievement has decreased to 85 percent from 134 percent in the Seventh Plan. In the mid-term appraisal of the Eleventh Plan the total expenditure target is reduced to INR 2,00,802 crore which is 23.3 per cent lower than the earlier projection of INR 2,61,808 crore. Both Central sector and private investments are below the original projections. In Twelfth Plan, the investment envisaged in railways is INR 519,221 crores[4].

Planned expenditure vs Actual expenditure



* XI plan actual expenditure is only for first two years, 2007-08 and 2008-09

Source: Planning commission

Key Challenges

1. **Infrastructure challenges:** Railway infrastructure is highly congested, especially in areas that are critical from freight perspective. Though traffic management is gradually being updated, a large chunk of the network is not modern yet.
2. **Lack of reliable freight transportation services:** Lack of tracks dedicated to freight transportation and low priority accorded to freight trains vis-à-vis to passenger trains have been resulting in rail being usually considered as slow and unreliable transportation option. This has negatively impacted the competitiveness of railways.
3. **Regulatory challenges:** Increasingly frequent interventions by Indian railways in determining pricing for containerized rail services has hindered the business potential that private players have been envisioning in the last 2-3 years. Similar has been the case with private investors. Though a number of opportunities for private investors exist within the wider area of freight carriage, the policy governing private participation is still evolving.

Emerging Trends

1. **Role of PPP:** With the entry of private players in containerized freight movement by rail, the increased competitiveness among public versus private player, as well within the private players is gradually resulting in competitive offering to end users.
2. **Focus on metro rail:** While currently very few cities such as Delhi and Kolkata boast of metro rail availability, over 10 cities including Bangalore, Mumbai, Chennai, Ahmedabad, Hyderabad and Lucknow are currently envisioning development of metro rail, the projects being either in planning, designing or execution stages[5].
3. **Increased focus on freight-specific infrastructure:** Keeping an eye on the future, the Government is developing two Dedicated Freight Corridors (DFCs) spanning over 2,700 kms, expected to be completed by 2017[6]. In terms of expected (non-containerized) traffic along the Western and Eastern DFCs, about 86.5 million tons annually is expected to be carried by the two DFCs in 2016-17; this traffic is expected to increase to about 108 million tons annually by 2021-22[7].

4 Seventh to Twelfth Five Year Plans, Planning Commission
5 Indian railways, city metro authorities, web search
6 Ministry of Railways, web search
7 DFC website, KPMG in India Analysis

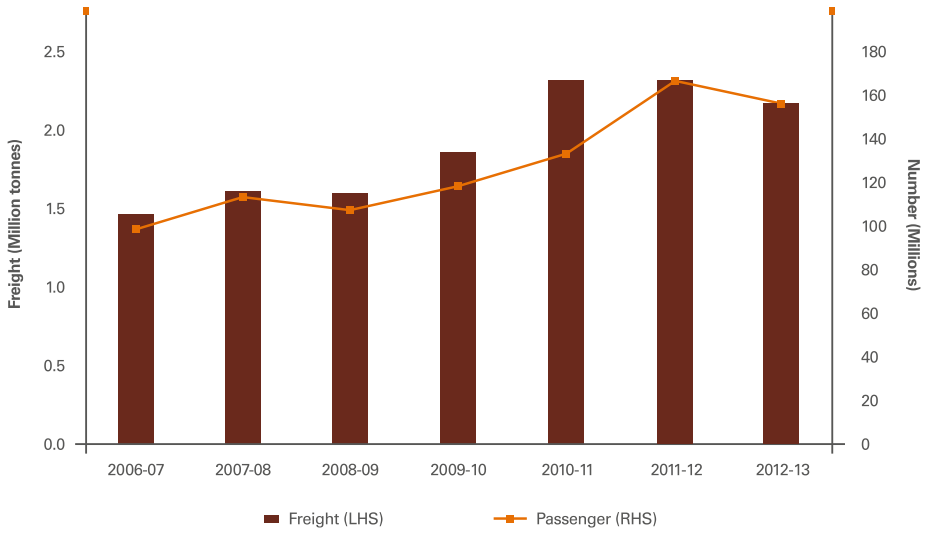
Civil Aviation

- Civil aviation in India has witnessed significant growth in recent years both in terms of passenger and freight traffic
- Major airport developers are AAI, GVK, GMR[1]
- High capital requirements, increasing security concerns, lack of skilled manpower are some of the key challenges.

Sector Overview

- The civil aviation sector in India has been playing an increasingly critical role in the overall scheme of air-based movement, be it freight transportation or passenger movement.
- The freight has been growing from 1.6 million tonnes in 2006-07 to about 2.2 million tonnes in 2012-13 (CAGR 5.9 percent), the number of passengers has increased from about 96 million to 159 million during the same period (CAGR 8.7 percent)[2].
- The major constituents of the bulk freight are telecom - IT products, pharmaceuticals, hi-value garments/ accessories and perishable items.
- Changes in regulatory space have been offering new opportunities: the currently discussed policy guidelines on allowing foreign carriers to take equity in Indian airlines, if implemented, would open up a plethora of investment opportunities.

Air freight and passenger movement



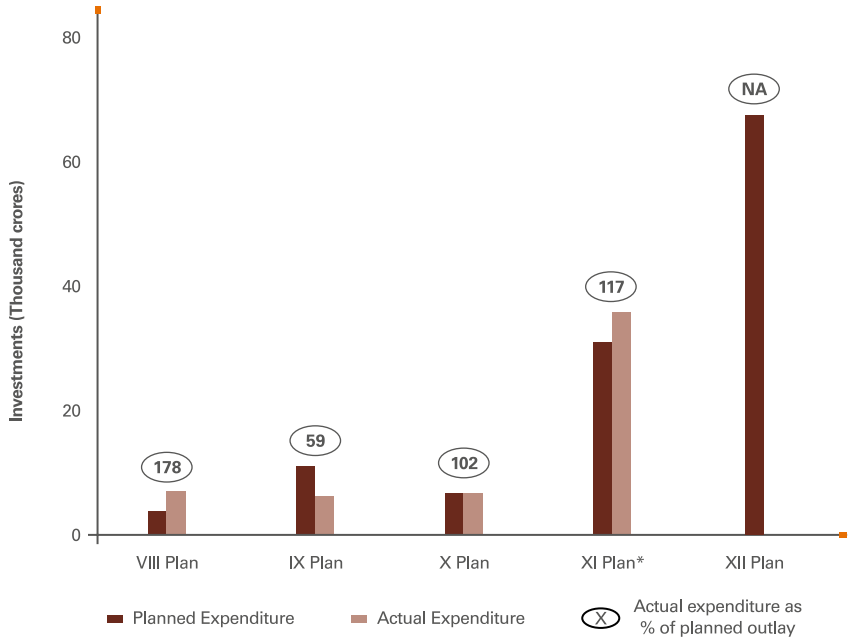
Source: CRISIL, AAI, KPMG in India analysis

1 India airport sector, BMI, accessed 3 January 2013
2 Crisil, Airports Authority of India, KPMG in India analysis

Five year plans performance

The civil aviation sector in India is the only segment within transportation infrastructure that has witnessed consistently excellent performance in terms of actual planned expenditure versus the planned allocation. With the only exception of the Ninth Plan, all of the last 5 five year plans have seen the actual expenditure being more than what was envisaged at the commencement of the plan, this being despite the fact that the allocation has been increasing manifold in absolute terms. For instance, the planned allocation increased from less than INR 1,000 crore in the Seventh Plan to over INR 36,000 crore in the Eleventh Plan. In the Twelfth Plan, share of private sector is expected to be around 74 percent of total investment in airport infrastructure. With several Greenfield and Brownfield projects in progress, such an expenditure scenario is along expected lines[3].

Planned expenditure vs Actual expenditure



* XI plan actual expenditure is only for first two years, 2007-08 and 2008-09

Source: Planning commission

Key Challenges

1. **Lack of skilled professionals:** Shortage of skilled manpower in specialized sub-sectors such as maintenance, repair and overhaul (MRO) poses a challenge within the civil aviation sector.
2. **Financial constraints:** With increasing level of security threat, there is a need for latest technologies and infrastructure at the airports and related set ups. Thus, creating financial pressure on the sector.
3. **Infrastructural constraints:** Civil aviation operations being asset-intensive and expensive, keeping the capital cost under control is an immense challenge. Lack of long term (30-50 year) view ensuring additional land availability for further large expansions may negatively impact the prospects of civil aviation infrastructure as demand grows and cities expand. The issue of land acquisition and environmental concerns are likely to become all the more critical in the years ahead.

Emerging Trends

1. **Increase in infrastructure investments:** To overcome the rising traffic, infrastructure companies are expected to invest INR 245 billion over the next five years. Almost 60 percent of the investments would be aimed at infrastructure expansion and modernization of metro airports[4] .
2. **Increase in traffic at non-metro airports:** Airlines' route diversification to meet route – dispersal guidelines, is likely to increase the traffic at non-metro airports. These guidelines require airlines to dedicate a fixed percentage of their services to routes covering non-metro airports. Further, a surge in leisure and medical tourism is expected to increase traffic at non-metro airports as carriers expand internationally and provide direct connectivity to non-metro tourist centers. Also, increase in business travel will also support traffic growth.
3. **Increase in Other Growth Avenues:** Opportunities in general aviation (choppers, business jets, charter services) are also likely to increase at a fast pace with growing bottom-line of corporate and high net worth individuals.

3 Seventh to Twelfth Five Year Plans, Planning Commission
4 Airport Authority of India, Crisil Research

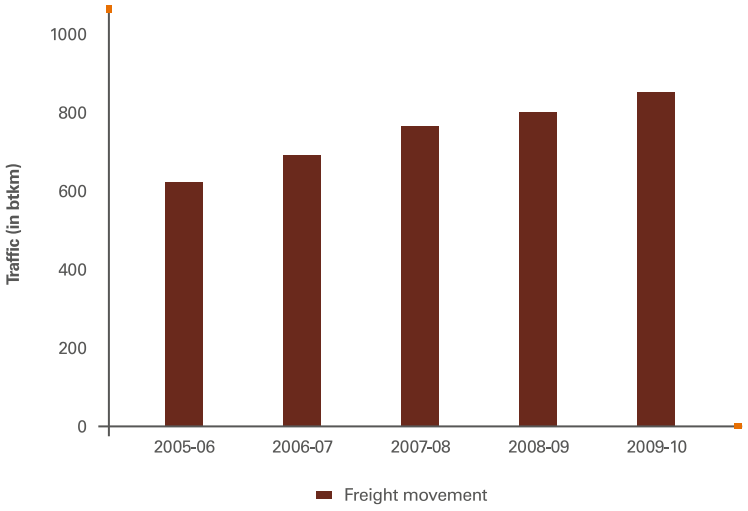
Roads

- With expansion of highways and rural roads, the demand for road freight has increased
- Major players in road construction sector are NHAI, L&T, Reliance[1]
- Delays in project execution and sub-optimal infrastructure for maintaining roads are some of the key challenges.

Sector Overview

- The road sector forms the backbone of domestic infrastructure in India, given that the share of highways in domestic freight movement has jumped from a low of 11 percent of 82 million tonnes in 1950-51 to 61 percent of 2,555 million tonnes in 2007-08[2].
- In the recent years, road freight has been growing from 621 btkm in 2005-06 to 853 btkm in 2009-10 at a CAGR of 8.3 percent[3].
- While the National Highways constitute a meager 2 percent of the overall road network, they carry close to about 40 percent of the total road freight[4]. This highlights the pressure on India's highway infrastructure, thus underlining the need for constant maintenance and addition of new highways.
- States of Rajasthan, Madhya Pradesh, Karnataka, Gujarat and Maharashtra are taking several majors measures to promote private participation in construction/maintenance of State roads.

Road freight



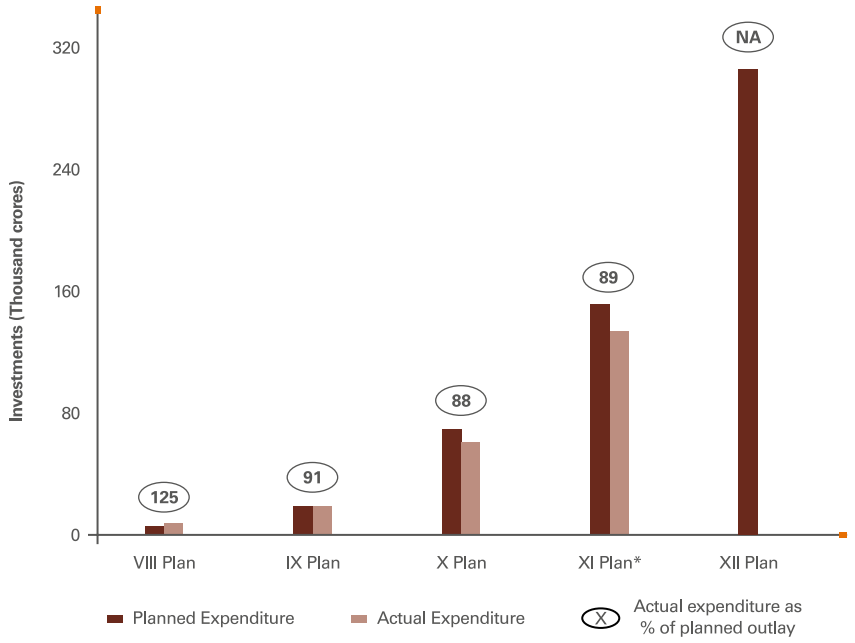
Source: CRISIL, KPMG in India analysis

1 India road sector, BMI, accessed 4 January 2013
2 IDBI Capital's Railways Sector report 2010, KPMG in India Analysis
3 Crisil, KPMG in India Analysis
4 KPMG in India's report — 'Adding Wheels'

Five year plans performance

The performance of the road sector with respect to the five year plans has been fluctuating: among the last 5 five year plans, while initial few plans saw actual expenditure more than what was planned, this trend got reversed in the last latest the Ninth and Tenth plans. Notable is the fact that planned investment in the Eleventh Plan as envisaged at the beginning of the plan was over INR 3,14,152 crore – almost 60 times of what was planned for the Seventh plan. However, during mid-term appraisal this target is significantly reduced to INR 2,78,658 crore a 11 percent decline from original projections[5]. The decline in investment is due to a shortfall in the award of road projects by NHAI during the first three years of the plan.

Planned expenditure vs Actual expenditure



* XI plan actual expenditure is only for first two years, 2007-08 and 2008-09

Source: Planning commission

Key Challenges

1. **Delay in execution of projects:** Persistent issues in land acquisition and environmental clearance have been causing execution delays in majority of cash contract project. Average time overrun has been about 22 months[6].
2. **Sub-optimal infrastructure:** Factors such as lack of timely and quality maintenance of road infrastructure, integrated-cum-automated toll collection mechanism, traffic congestions and frequent violation of rules such as maximum weight to be carried by a truck result in sub-optimal road infrastructure and freight transportation. This in turn results in reduced average speed of trucks and other commercial vehicles.

Emerging Trends

1. **Focus on development of expressways:** The sector is witnessing increased focus on construction of expressways in an attempt to provide dedicated road connectivity between near-placed important cities. A total of around 18,600 km of Greenfield national expressways is planned till 2022.[7]
2. **Increase in opportunities:** Most of the projects under Phase III (approximately 9,100 km) of the National Highway Development Program are expected to be awarded on Build-Operate-Transfer (BOT) basis during 2010-15[6].
3. **Increasing demand for extensive road network:** Increasing demand in tier 2 cities is creating multiple consumption hubs instead of the conventional 'demand islands' in select metropolitan cities, thus resulting in the need for improved and efficient road transportation. Additionally, the uptrend in organized retailing is increasing the need for last mile reach which is feasible only via extensive road networks. This has been driving the development of State and rural roads.

5 Seventh to Twelfth Five Year Plans, Planning Commission
6 CRISIL Report on Road Sector, 2010
7 Seventh to Eleventh Five Year Plans, Planning Commission

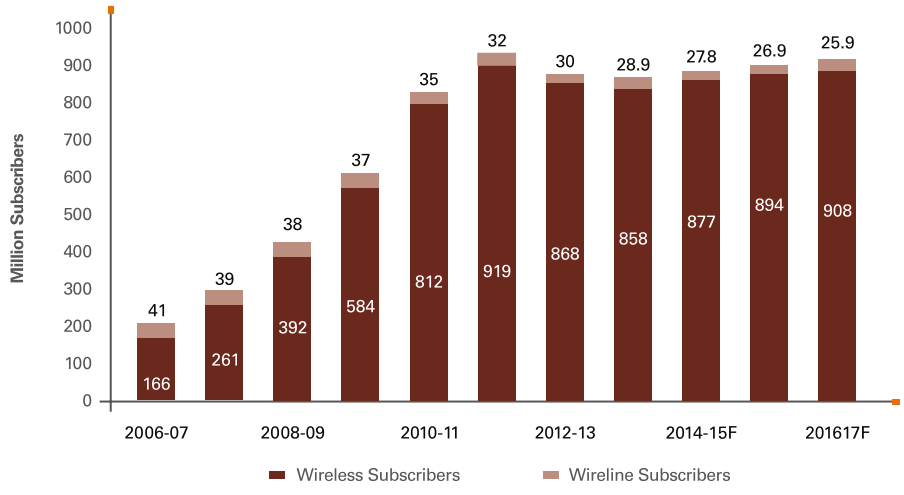
Telecom

- Indian has witnessed significant growth in telecom subscriber base, though the average revenue per user (ARPU) remains at a low level compared to global average
- Major sector players are BSNL, MTNL, Airtel, Vodafone, Idea[1]
- High competition, infrastructure bottlenecks and Government regulations are some of the key challenges.

Sector Overview

- The Indian telecommunications market has continued to show consistent growth with total subscribers reaching more than 898 million by March 2013[2]
- Wireless subscribers contribute more than 867 million with a tele-density of more than 70 percent[2]
- Urban wireless market is reaching saturation with a tele-density of more than 140 percent, however rural market has lot of potential with a tele-density of 40 percent only[2]
- Indian telecom service revenues are expected to reach INR2,106 billion by FY18 from INR1,391 from 2011-12[3].

Telecom subscriber base



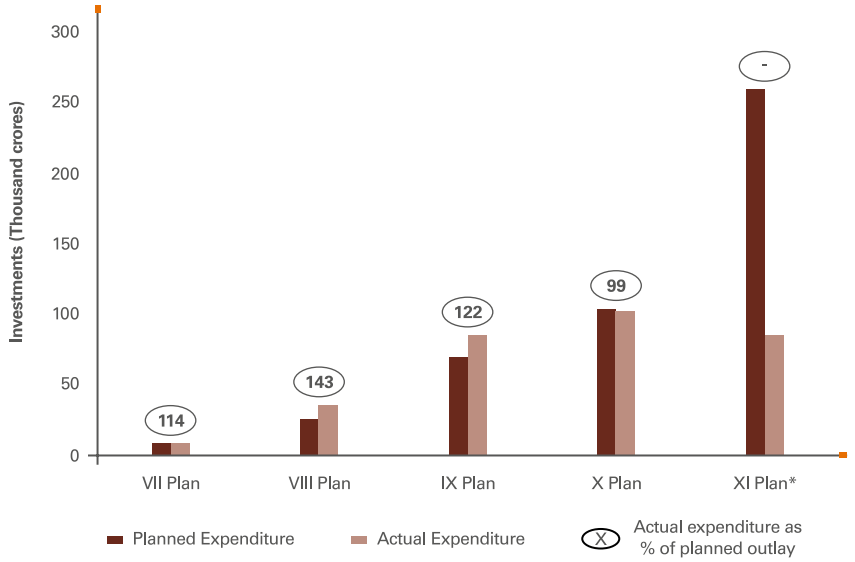
Source: DOT - Annual Report, 2010-2011; Economic Intelligence Unit, 2012

1 India telecommunication sector competitive landscape, BMI, 18 December 2012
2 Telecom Subscription Data, TRAI, March 2013
3 Telecom outlook, Crisil Research, April 2013

Five year plans performance

The growth in telecom sector has been phenomenal and this sector mostly outperforms its investment targets as laid out in five years plans. Even during the mid-term appraisal of the Eleventh plan, Government revised it expenditure target to INR 3,45,134 crore which is 34 percent higher than the actual target of INR 2,58,439 crore. This over-achievement is due to a 60 percent higher level of investment by the private sector as compared to the original projections[4]. Competition in this sector has been quite intense, resulting in benefits accruing to the economy and the users through improved quality of service at lower costs.

Planned expenditure vs Actual expenditure



* XI plan actual expenditure is only for first two years, 2007-08 and 2008-09

Source: Planning commission

Key Challenges

1. **Intense Competition:** Presence of 15 operators has led to price wars, resulting in very low ARPU levels. Voice ARPU continues to decline, affecting the profitability of the players.
2. **Regulation:** Delay in revision of policies pertaining to spectrum, licensing and M&A, has led to uncertainty in the sector.
3. **Infrastructure Bottleneck:** Network capacity is nearing saturation; network infrastructures in rural areas remain limited.
4. **Low Broadband Subscriber base:** Despite huge investments in the infrastructure, the internet and broadband subscriptions remains very low at 22.39 million and 13.35 million (as of December 2011), respectively, compared to the target of 40 million and 20 million by 2010[5].

Emerging Trends

1. 3G will be a growth driver in the medium term; incremental 3G revenue is expected to constitute 5-7 percent of mobile revenue by FY13, contributing to ARPU uplift[6].
2. Mobile Number Portability has recently been implemented , it is expected to accelerate excellence in service quality.
3. CAPEX is likely to decline in the short term on account of the high 3G spectrum charges paid by the telecom players as well as the relatively slower traffic growth in the wireless segment. This decline in investment is not likely to stunt growth with leading operators having the requisite 3G technology in place.
4. Telecom players in India has recently started the price war over tablets and other mobile smart phones, which is expected to increase the uptake of 3G services and hence the data services.

4 Seventh to Eleventh Five Year Plans, Planning Commission
5 Performance Indicator Report , TRAI, December 2011
6 India Strategy, Motilal Oswal, January 2011

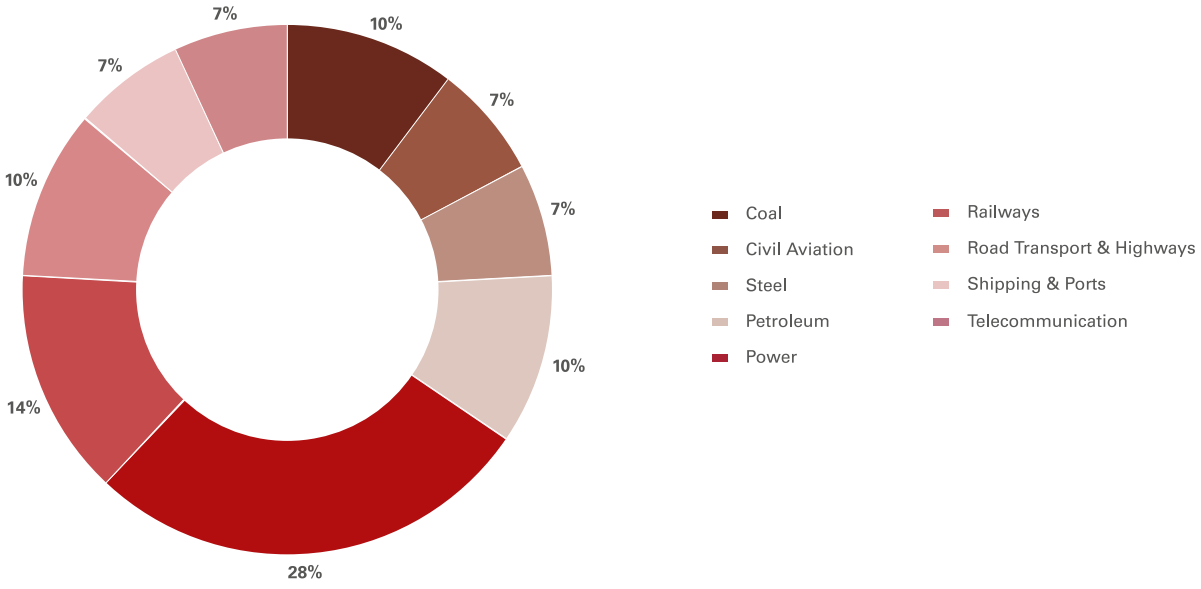
SECTION 13

Participant profile and study methodology

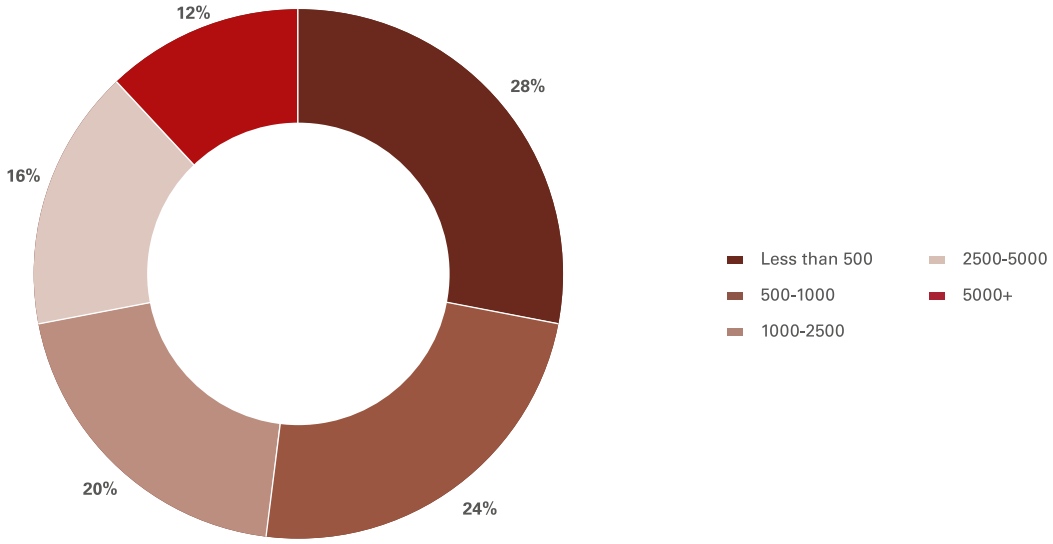
Survey responses were gathered through a face-to-face interview followed by a detailed questionnaire with senior personnel of 25 public sector projects from leading companies in infrastructure space, between September 2011 and January 2012. The projects are from nine sectors – Power, Petroleum, Coal, Steel, Railways, Road and Highways, Civil Aviation, Ports and Shipping, and Telecom.

The interviews were conducted by senior representatives of KPMG in India specializing in the infrastructure industry, with the questions reflecting current and ongoing concerns expressed by the industry and clients.

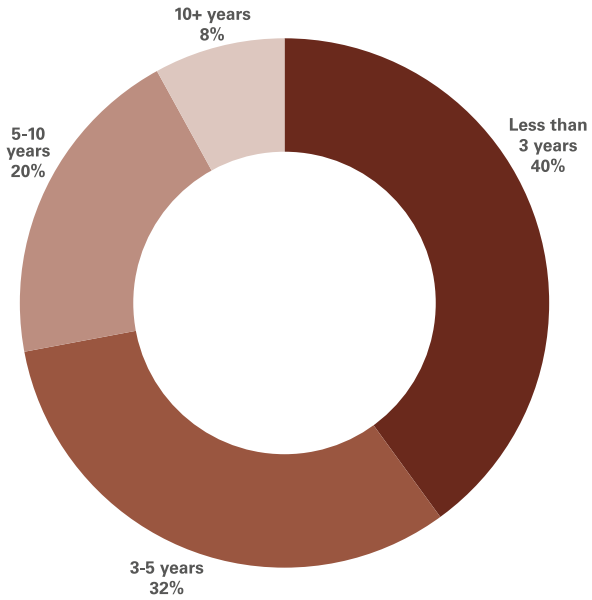
Percentage of respondents across sectors



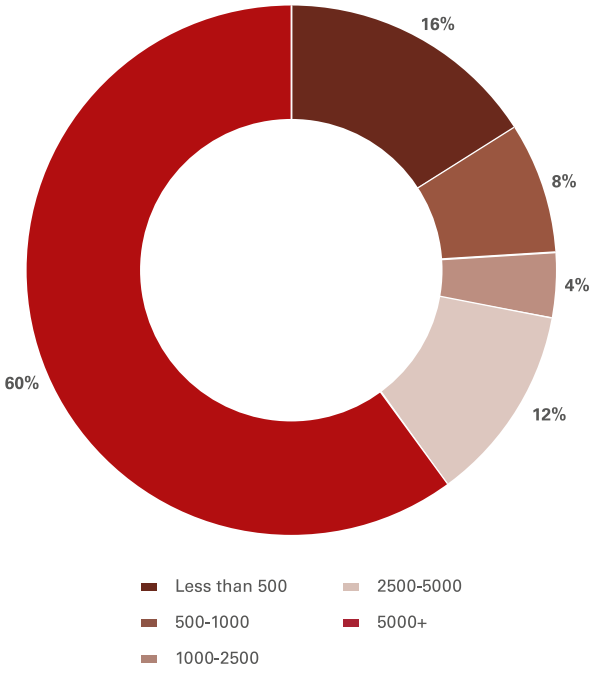
Project Capital cost (INR Crore)



Project duration (years)



Participant's company turnover (INR crore)



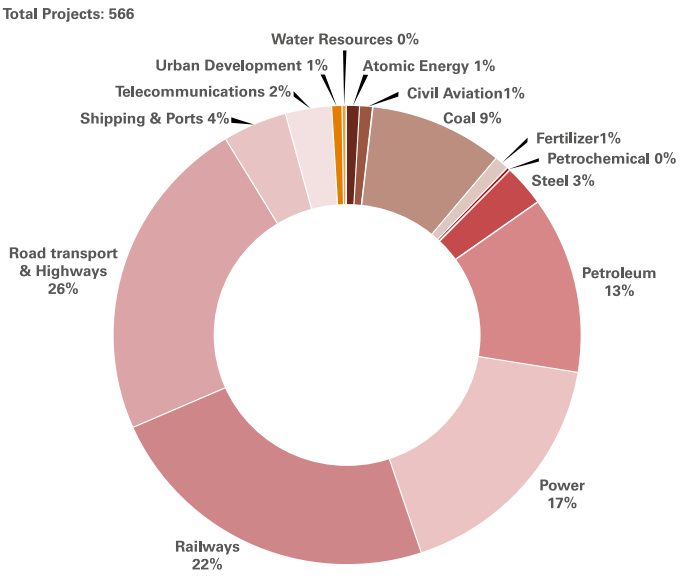
SECTION 12

Appendix

Summary of Projects - Sector Wise

Road trasport and highway have maximum number of ongoing projects

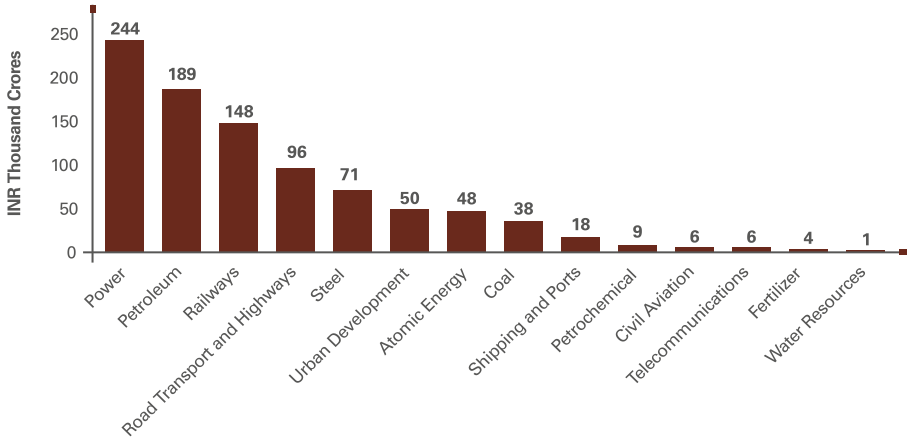
Sectoral break up of on-going infrastructure projects in India



Source: MOSPI, December 2012 Flash Report

Power sector projects have highest value

Value Wise breakup for all ongoing projects



Source: MOSPI, December 2012 Flash Report

Sector level Schedule and Cost overruns

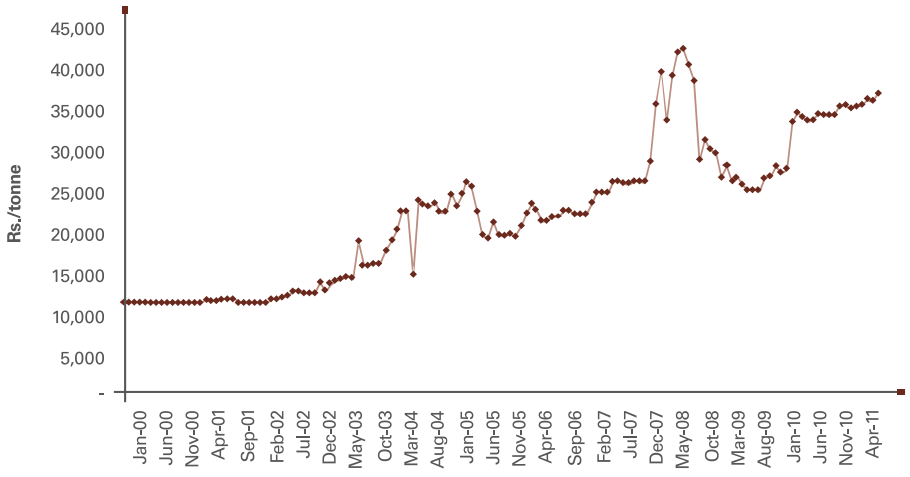
Sr. No.	Sector	Number of Projects	Projects with Schedule over-run	Original Cost (in Rs. Crore)	Anticipated cost (in Rs. Crore)	Cost overrun percentage
1	Atomic Energy	5	3	41,548	47,832	15
2	Civil Aviation	6	2	5,474	6,063	11
3	Coal	51	21	36,057	37,511	4
4	Fertilisers	3	0	4,066	4,066	0
5	Steel	17	10	65,286	71,443	9
6	Petrochemical	1	0	5,461	8,920	63
7	Petroleum	73	34	1,77,448	1,88,692	6
8	Power	99	52	2,27,823	2,43,653	7
9	Railways	126	35	61,394	1,48,132	141
10	Road Transport & Highways	146	85	94,418	96,357	2
11	Shipping & Ports	20	6	15,908	18,175	14
12	Telecommunications	14	8	5,965	5,906	-1
13	Urban Development	4	1	44,245	49,518	12
14	Water Resources	1	1	543	1,187	119

Source: MOSPI, December 2012 Flash Report

Steel Price Trends

Steel Prices has triple in last 10 years

Average Monthly prices of Steel Billet 2000-2011

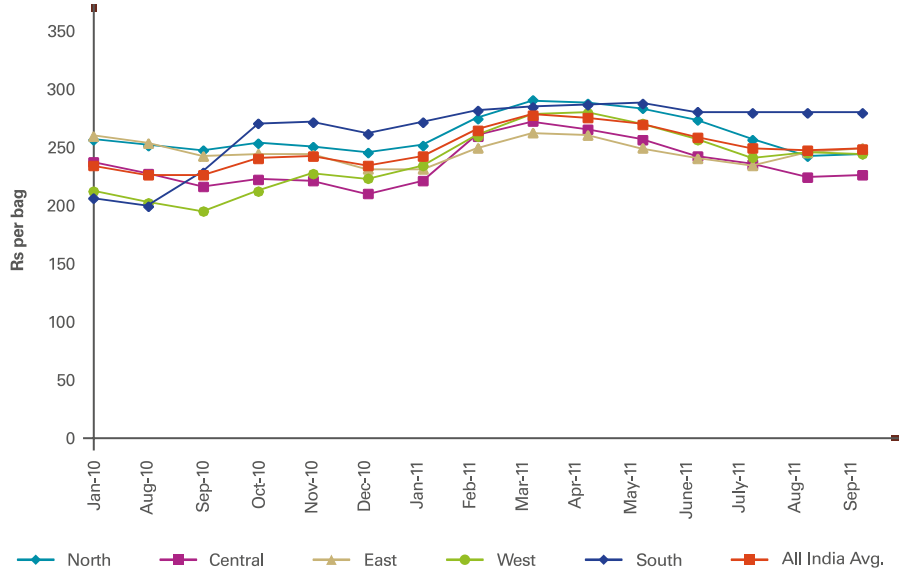


Source: Crisil

Cement Price Trends

South India has highest cement prices

Monthly Cement Price trends

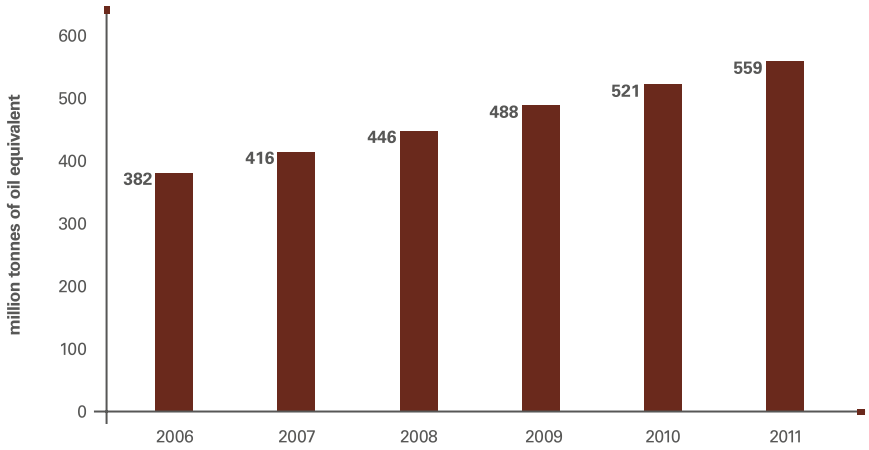


Source: Embay cement report

India Energy Demand

India Energy demand is growing at a CAGR of 7.9 percent

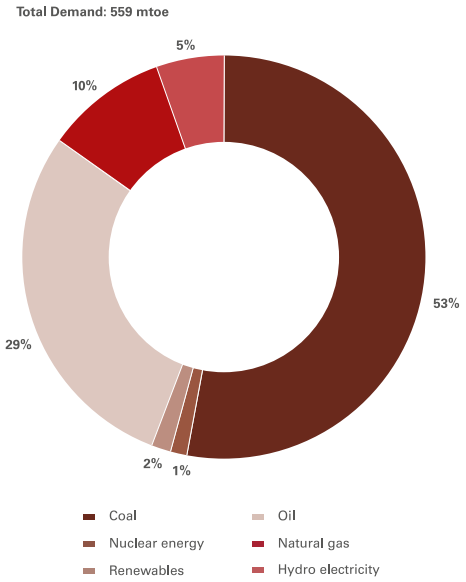
India Primary Energy Demand



Source: BP Statistical Review, 2012

Coal has more than 50 percent share in India's total primary energy consumption

Primary Energy Consumption by fuel

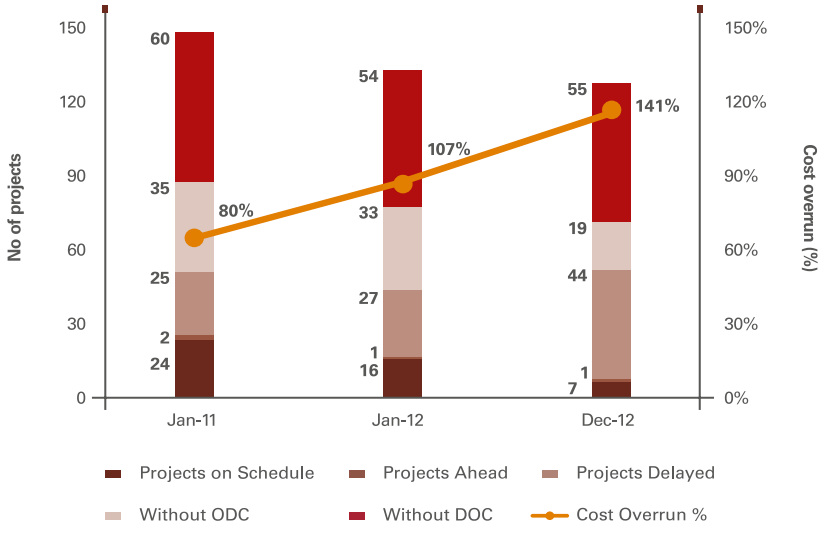


Source: BP Statistical Review, 2012

Railways

Most of the railways sector projects do not have fixed date of commissioning

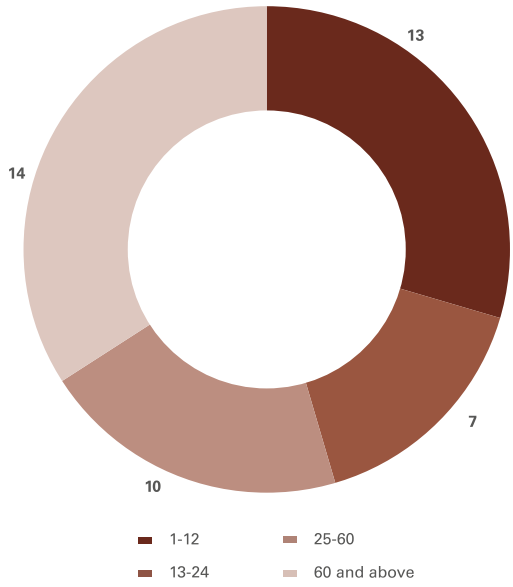
Railways Sector: Project schedule and cost overun trends



Source: MOSPI, December 2012 Flash Reports

Railways sector break up of 44 delayed projects in December 2012

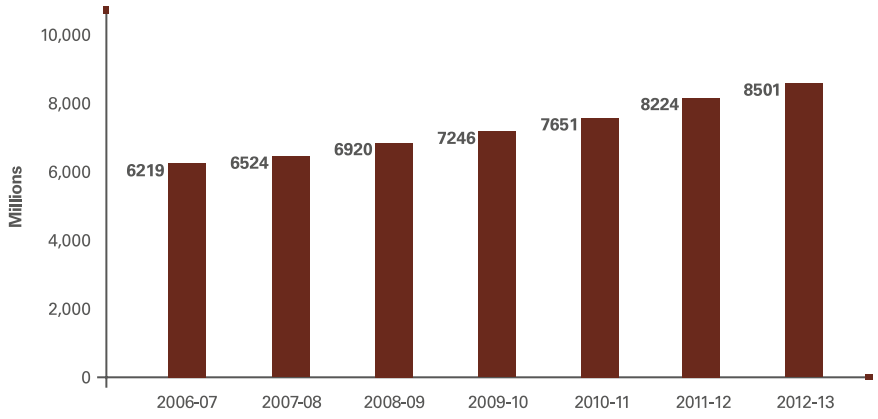
Railway Sector: No of projects delayed (in months)



Source: MOSPI, December 2012 Flash Report

Railway passenger traffic is growing at a CAGR of 5.6 percent p.a

Railway Sector: Distribution of pessanger Traffic



Source: Statistical Summary, Indian Railways

Railways Rolling Stock

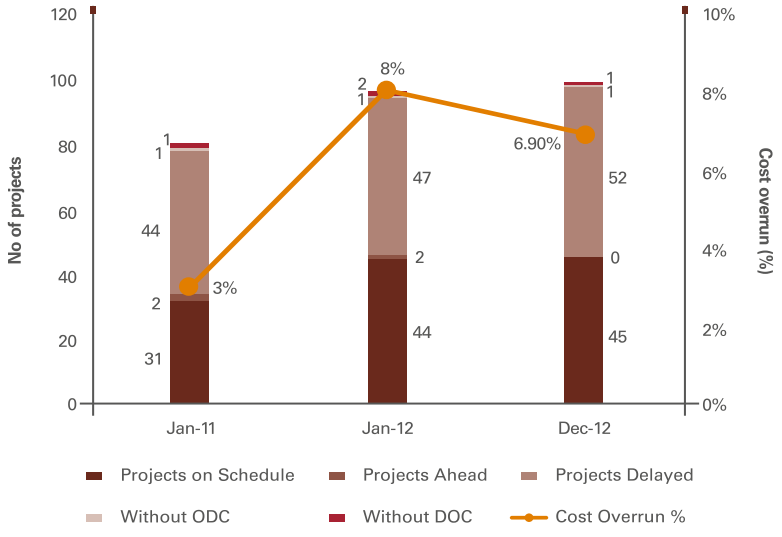
Sr. No.	Year	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
1	Stem locos	43	44	43	42	43	43
2	Diesel Locos	4,816	4,843	4,963	5,022	5,137	5,197
3	Electric Locos	3,294	3,443	3,586	3,825	4,033	4,309
4	Passenger carriages	38,855	40,696	42,079	43,526	45,048	46,688
5	EMU/DMU/DHMU	6,454	6,641	6,984	7,487	8,053	8,617
6	Rail cars	41	38	38	37	34	34
7	Other coaching vehicles	5,905	6,180	5,985	6,477	6,500	6,560
8	Wagons	2,07,723	2,04,034	2,12,835	2,20,549	2,29,997	2,39,321

Source: MOSPI, December 2012 Flash Report

Power Sector

Around 50 percent of the power sector projects are delayed

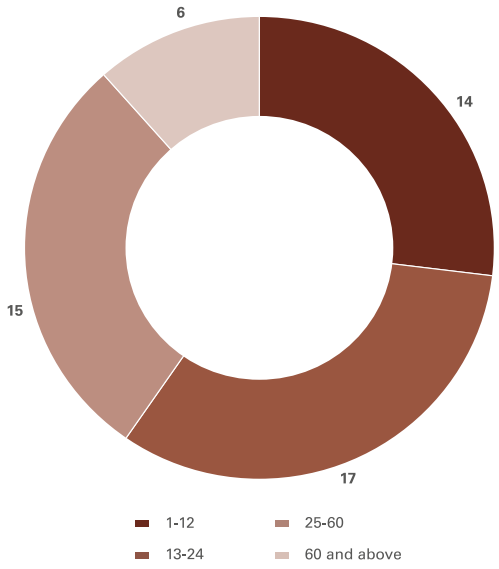
Power Sector: Project schedule and cost overun trends



Source: MOSPI, December 2012 Flash Reports

Power sector break up of 52 delayed project in December 2012

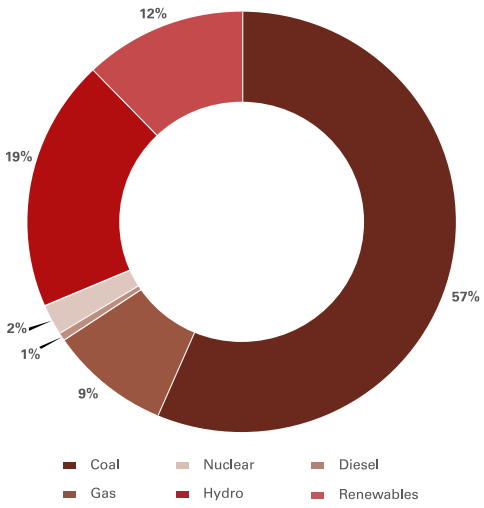
Power Sector: No of projects delayed (in months)



Source: MOSPI, December 2012 Flash Report

57 percent of installed electricity generation capacity is coal-based

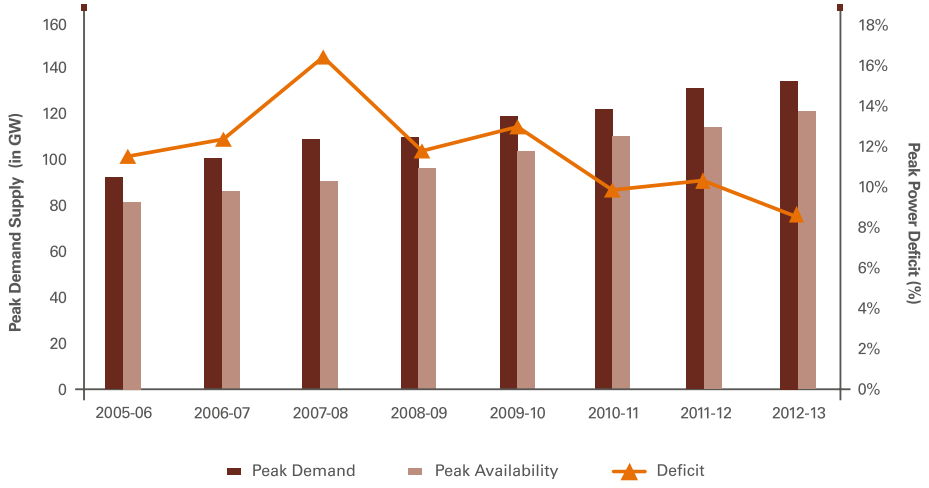
Breakup of installed electricity capacity source wise (as on 30 January, 2013)



Source: CEA

India has peak power deficit of about 9 percent

Peak Power Demand Supply in India



Source: CEA

State-wise estimated Average rate of electricity (updated up to March 2010)

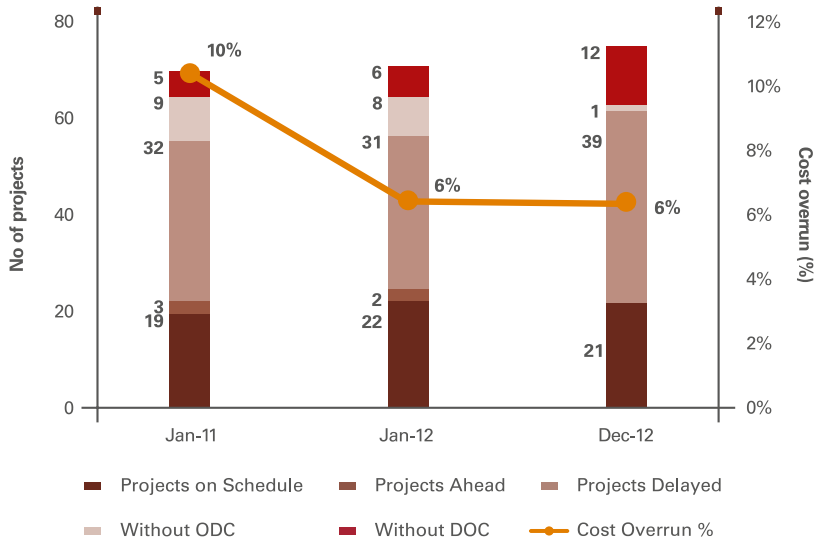
State	Domestic 1KW (1000KWh/ Month)	Domestic 10KW (1000KWh/ Month)	Commercial 2KW (3000KWh/ Month)	Commercial 30KW (4500KWh/ Month)	Agriculture 2HP (4500KWh/ Month)	Agriculture 10HP (2000KWh/ Month)
Andhra Pradesh	238.5	492.25	593.5	623.83	33.75	29.75
Assam	340	475	558.33	564.18	271.19	373.65
Bihar	243.8	395.38	515.87 U	500.08	124.00 U	124.00 U
	140.45	-	166.07 R	-	74.00 R	74.00 R
Chattishgarh	187.4	368.9	403.35	460.2	110	110
Gujarat	437.83	617.83 U	660.66	703.72	55	55
	353.83	526.53 R	-	-	-	-
Haryana	367.4	463.44	481	481	25	25
H. P.	221.45	307.71	486	488.88	210.38	204.88
J & K	129.86	234.93	242.4	380.07	61	61
Jharkhand	161	180	436.67 U	436.67	52	52
	107	-	136.33 R	-	-	
Karnataka	292.43	570.52 D	688.63 D	710.68 D	0	0
	292.43	527.47 E	683.38 E	705.43 E		
	281.93	507.52 F	639.63 F	656.78 E		
Kerala	187	517.61	775.83	952.17	73.74	73.74
Madhya Pradesh	386.2	592.24 U	601.04	602.69	217.5	
	374.8	555.85 R	541.75	543.24		247.5
Maharashtra	277.94	598.72	530.88	781.58	133.44	133.44
Orissa	135.2	286	384.8	452.75	102	102
Punjab	320.2	483.22	550.1	550.1	0	0
Rajasthan	417.5	392.75 U	556.67	555.78	126.5	116.5
	390.25	358.53 R	-	-	-	-
Tamilnadu	120	269.5	602	608.53	0	0
Uttarpradesh	369	393.00 U	505.67 U	505.67 U	224.00 U	224.00 U
	124	124.00 R	232.33 R	232.33 R	91.50 R	91.50 R
Uttarakhand	230	216.5	375	436.76	85.00 U	85.00 U
West Bengal	272.59	556.06 U	471.41 U	645.99 U	164.15	162.19
Ar. Pradesh	345	345	410	410	265	265
Goa	138	232.5	383	429.67	118	118
Chadigarh	179	304	387	387	165	165
Delhi NDMC	159.6	329.7	463.4	526.4	-	-

Source: CEA Annual Report, 2010-11

Petroleum Sector

Around 45 percent of the petroleum sector projects are delayed

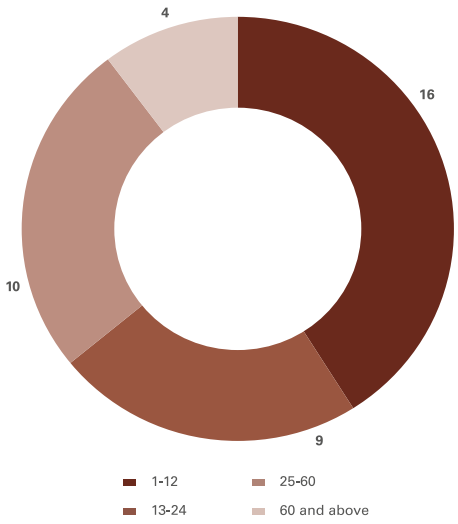
Petroleum Sector: Project schedule and cost overun trends



Source: MOSPI, December 2012 Flash Reports

Petroleum sector break up of 39 delayed projects in December 2012

Petroleum Sector: No of projects delayed (in months)



Source: MOSPI, December 2012 Flash Report

India Refinery Capacity

Company	Location	Capacity (mtpa) 01.04.2013
IOC	Digboi	0.7
	Guwahati	1.0
	Barauni	6.0
	Baroda	13.7
	Haldia	7.5
	Mathura	8.0
	Panipat	15.0
CPCL	Chennai	10.50
	Narimanam	1.0
BRPL	Bongaigaon	2.4
Total - IOC		**65.8**
BPCL	Mumbai	12.0
KRL	Cochin	9.5
NRL	Numaligarh	3.0
Total - BPCL		**24.5**
HPCL	Mumbai	6.5
	Vizag	8.3
	HMEL, GGSR	9.0
Total - HPCL		**23.8**
MRPL	Mangalore	15.0
RIL	Jamnagar	33.0
RIL (SEZ)	Jamnagar	27.0
ONGC	Tatipaka	0.1
Essar Oil	Vadinar	20.0
BORL	Bina	6.0
Total		**215.1**

Source: PPAC

Note : Capacity as on April 2013

Petroleum Products for 2011-2012 (MTPA)

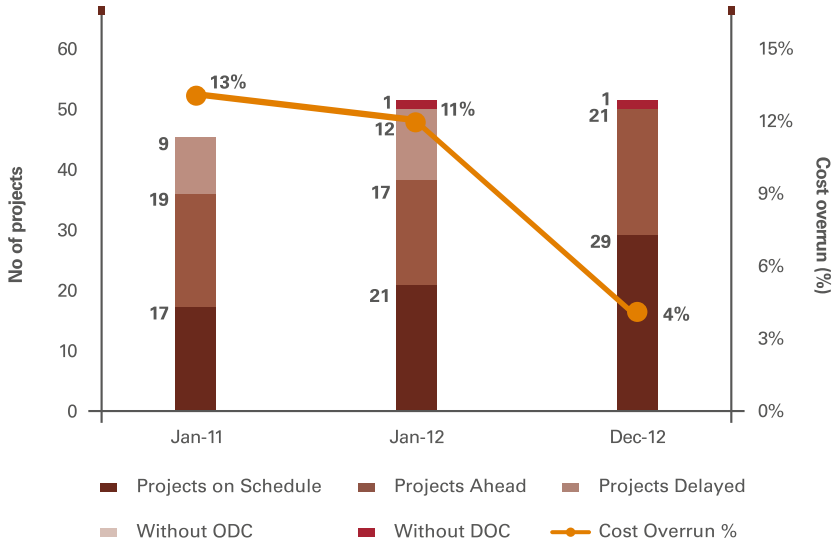
Distillates	Product	Production	Consumption	Imports	Exports
Light distillates	LPG	9.6	15.4	5.0	0.2
	MS	27.2	15.0	0.7	14.3
	Naphtha	18.8	11.2	1.9	10.2
Sub Total		**55.6**	**41.5**	**7.5**	**24.7**
Middle distillates	SKO	8.0	8.2	0.6	0.0
	ATF	10.1	5.5	0.0	4.6
	HSD	82.8	64.8	1.1	19.9
Sub Total		**100.9**	**78.5**	**1.7**	**24.5**
Heavy distillates	FO/LSHS	19.4	9.2	0.9	7.9
	Bitumen	4.6	4.6	0.1	0.0
	Others	23.4	14.1	4.7	3.1
Sub Total		47.4	27.9	5.7	11.0
Total		**203.9**	**148.0**	**14.9**	**60.2**

Source:PPAC

Coal Sector

One-third of coal sector projects are delayed

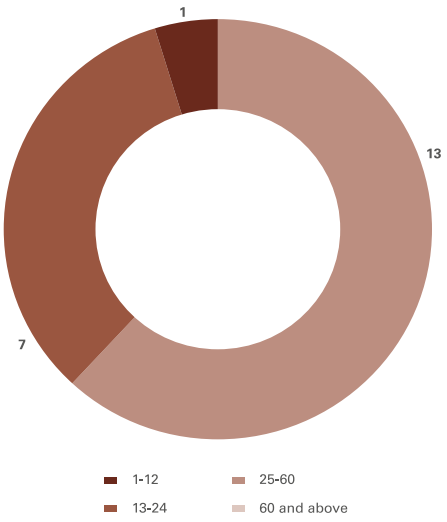
Coal Sector: Project schedule and cost overun trends



Source: MOSPI, December 2012 Flash Reports

Coal sector break up of 21 delayed projects in December 2012

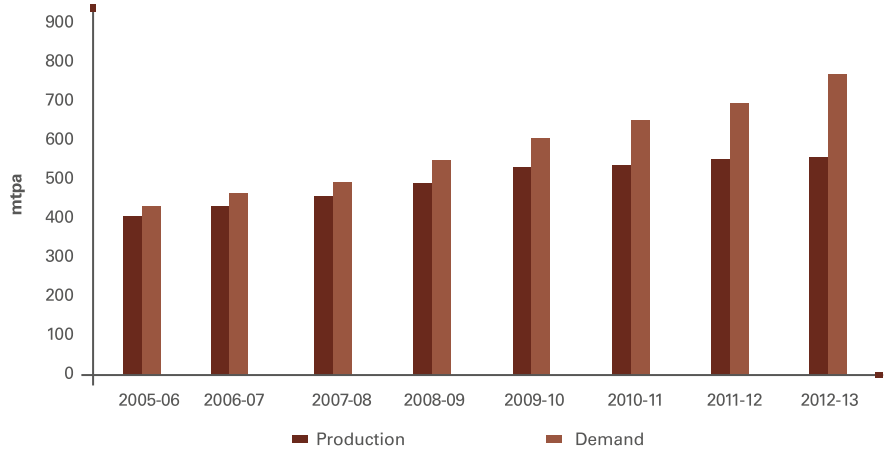
Coal Sector: No of projects delayed (in months)



Source: MOSPI, December 2012 Flash Report

Coal production and consumption have grown at a CAGR of 4.9 percent and 8.6 percent respectively

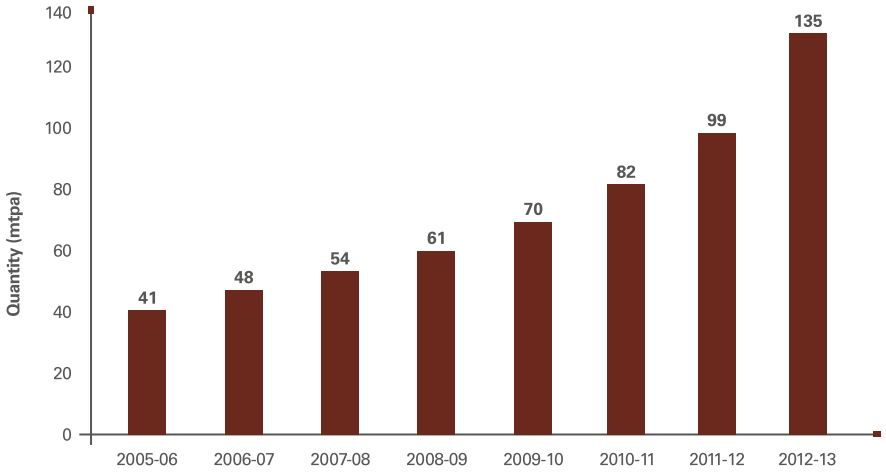
Coal Sector: Production and Consumption



Source: Annual Report, Ministry of Coal

Coal imports are increasing at a CAGR of 18.6 percent

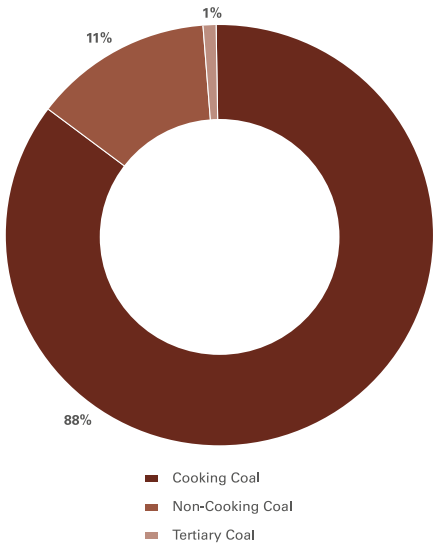
Coal Imports Trends



Source: Annual Report, Ministry of Coal

Majority of India's coal reserves are non-coking coal

Coal Sector: Coal Reserves by type as on April, 2012

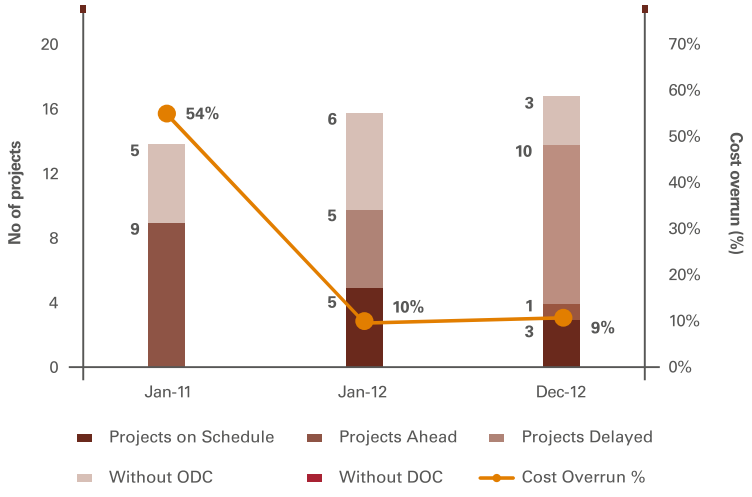


Source: Ministry of Coal

Steel Sector

Cost overrun has decreased in steel sector

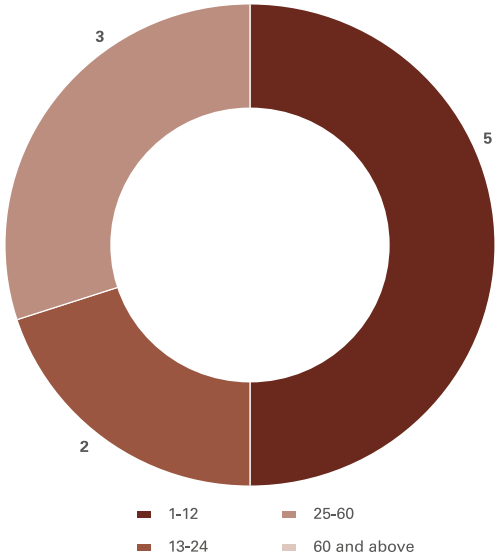
Steel Sector: Project schedule and cost overrun trends



Source: MOSPI, December 2012 Flash Reports

Steel sector break up of 10 delayed projects in December 2012

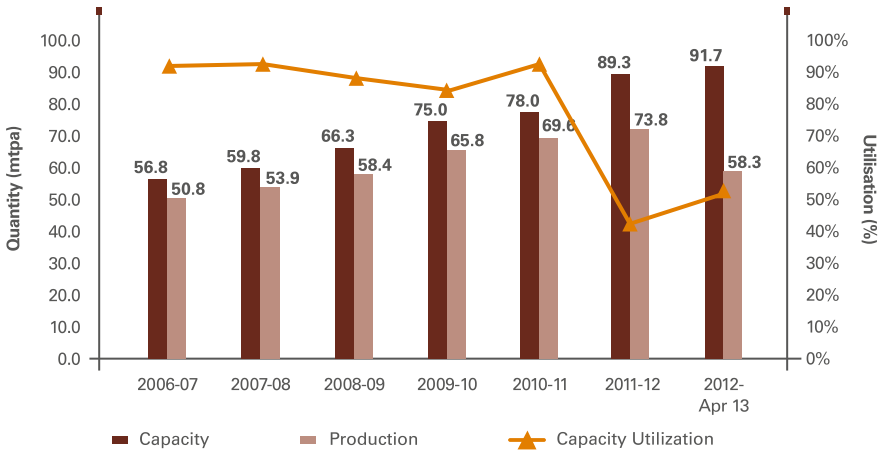
Steel Sector: No of projects delayed (in months)



Source: MOSPI, December 2012 Flash Report

Steel capacity utilization is consistently high at 85-90 percent

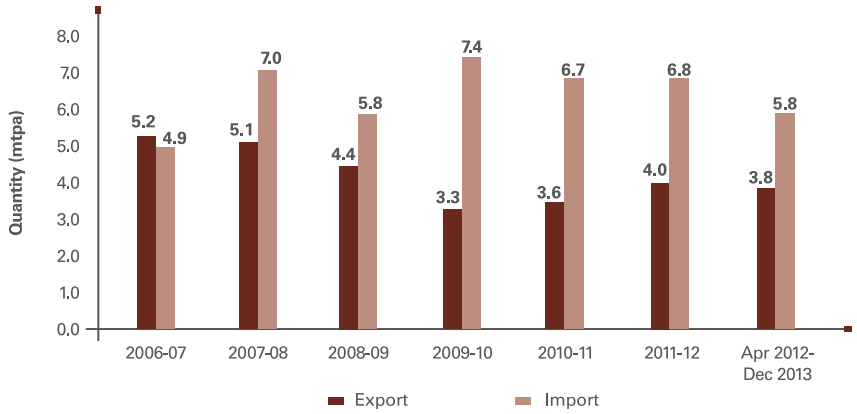
Crude Steel Production, Capacity and Capacity Utilization



Source: Annual Report 2012-13, Ministry of Steel

Steel imports are increasing and exports are decreasing

Export Import Trends for Finished Steel

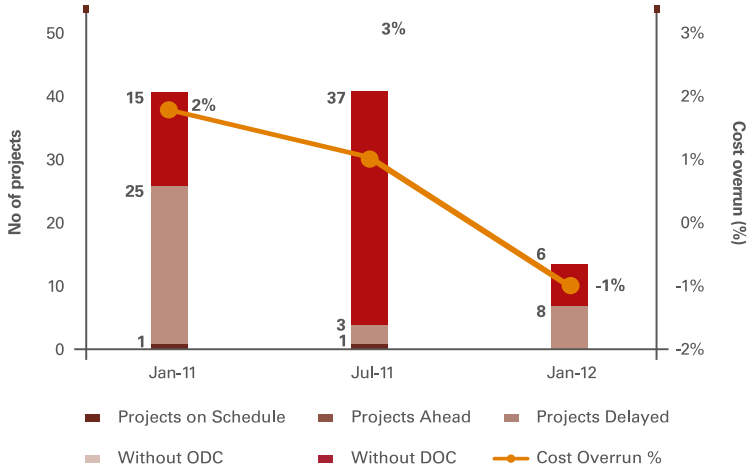


Source: Annual Report 2011-12, Ministry of Steel

Telecom Sector

In last year several telecom projects were completed

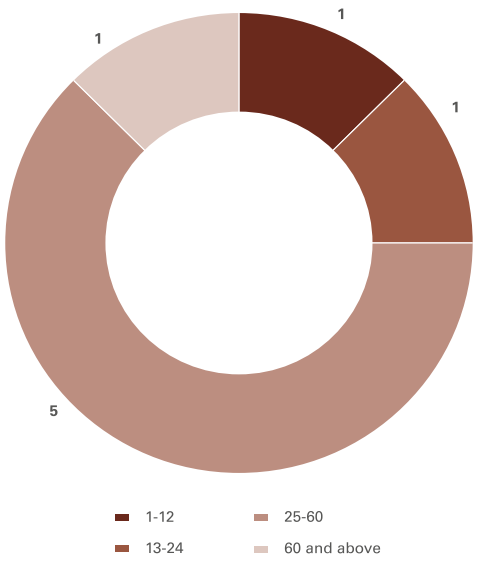
Telecom Sector: Project schedule and cost overun trends



Source: MOSPI, December 2012 Flash Reports

Telecom sector break up of 8 delayed projects in January 2012

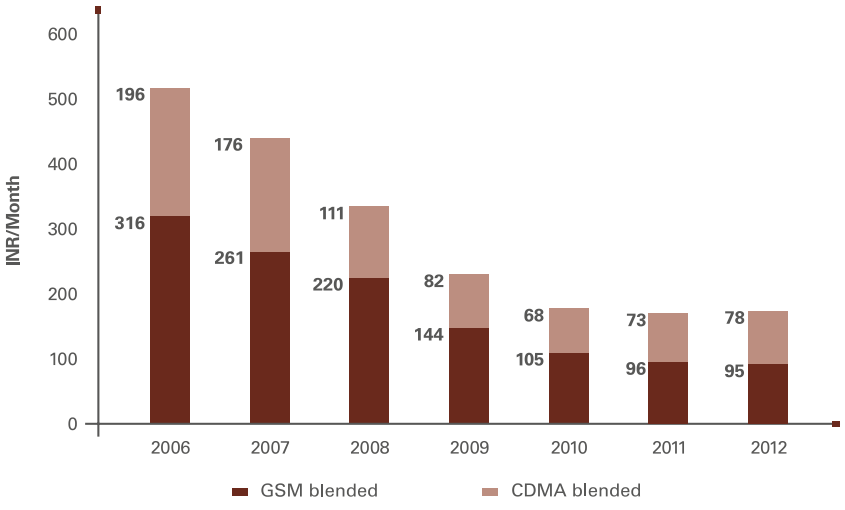
Telecom Sector: No of projects delayed (in months)



Source: MOSPI, December 2012 Flash Report

Wireless ARPU have stabilized in last few years

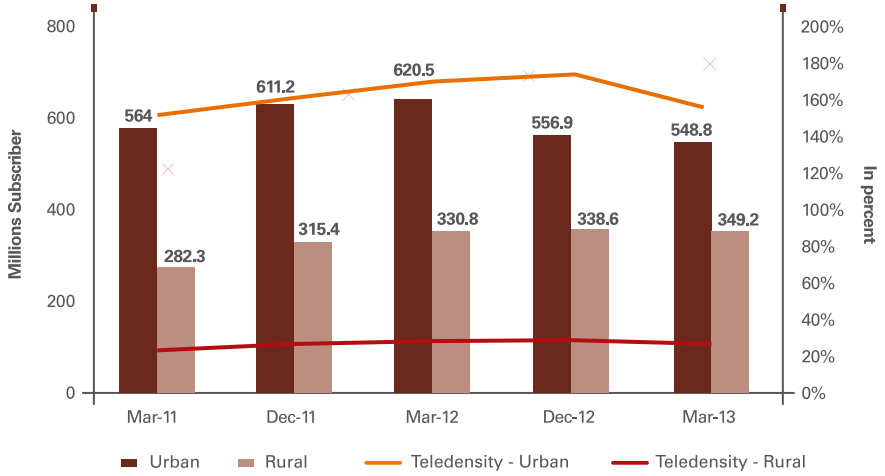
Wireless ARPU



Source: Department of Telecom

Subscriber base and teledensity has started declining

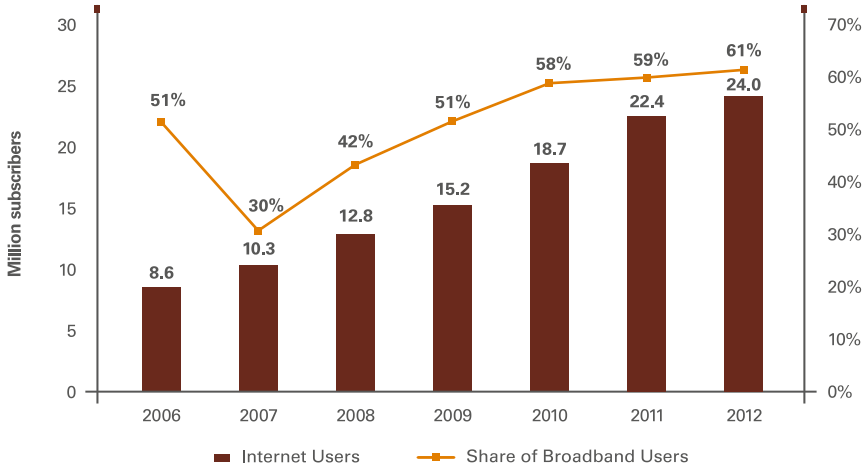
Total Subcriber base and Teledensity



Source: Department of Telecom

Internet users are increasing at a CAGR of 19 percent p.a

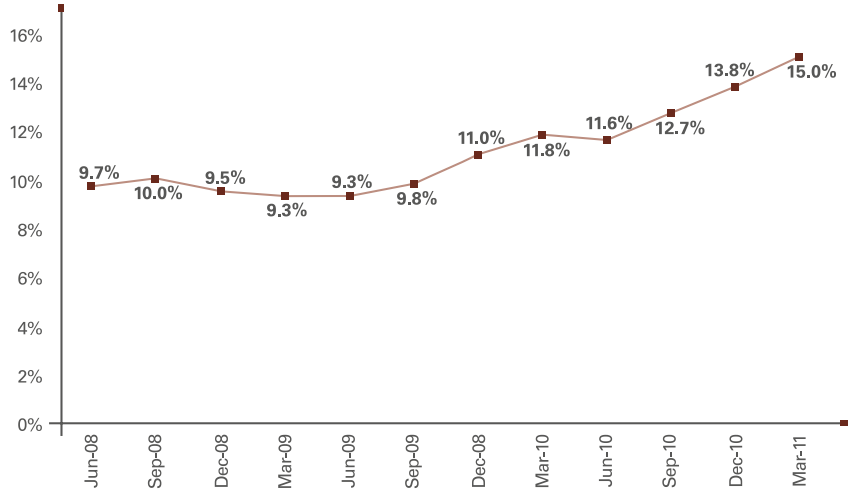
Internet and Broadband User



Source: TRAI; Crisil

Data revenue's share in the total revenue is increasing

Data Revenues as % of Total revenues

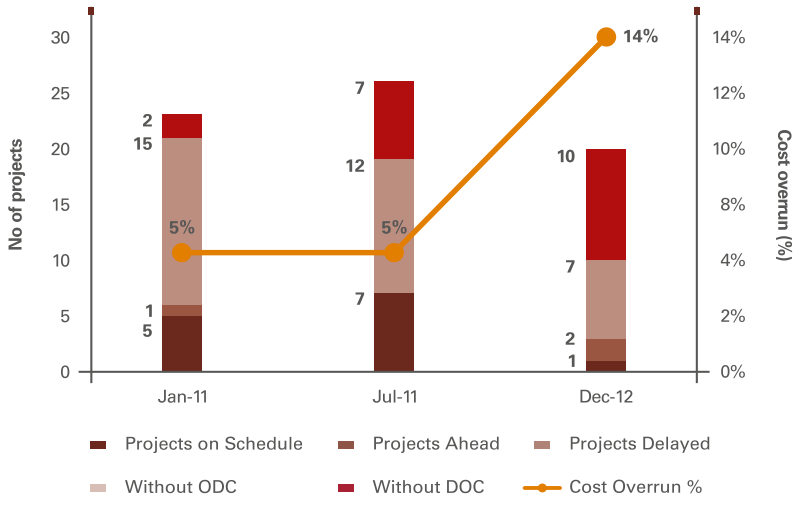


Source: Department of Telecom

Shipping & Port Sector

Around 40 percent of shipping and port sector projects are delayed

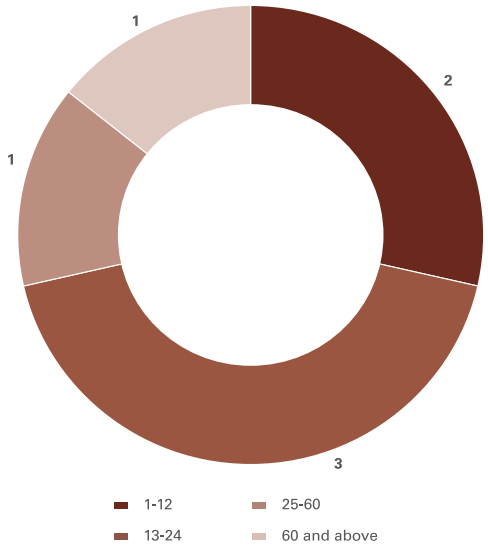
Shipping & Port Sector: Project schedule and cost overun trends



Source: MOSPI, December 2012 Flash Reports

Shipping & port sector break up of 7 delayed projects in December 2012

Shipping & Port Sector: No of projects delayed (in months)



Source: MOSPI, December 2012 Flash Report

Cargo Traffic at Major Ports Commodity Wise for the year 2012-13

('000 tonnes)	POL	Iron ore*	Fertilizers		Coal		Container		Others	Total
			Finished	Raw	Thermal	Coking	Tonnage	TEUs		
Kolkata	700	158	64	29	-	37	6,957	463	3,855	11,800
Haldia	6,196	1,715	109	278	1,976	4,502	2,869	137	10,439	28,084
Paradip	16,466	1,834	142	4,004	21,394	4,912	171	13	7,629	56,552
Visakhapatnam	15,021	12,279	2,018	565	2,951	6,820	4,554	248	14,752	58,960
Ennore	1,124	-	-	-	14,240	685	-	-	1,836	17,885
Chennai	13,425	52	190	231	-	-	29,708	1,539	9,798	53,404
Tuticorin	792	-	487	564	6,661	-	9,372	479	10,384	28,260
Cochin	13,896	-	22	331	28	-	4,607	326	961	19,845
New Mangalore	24,301	2,616	519	17	2,553	4,357	692	48	1,981	37,036
Mormugao	823	7,421	78	0	768	6,605	213	20	1,785	17,693
Mumbai	34,784	-	156	356	4,210	-	829	58	17,702	58,037
JNPT	4,286	-	-	-	-	-	57,909	4,259	2,306	64,501
Kandla	54,355	1,006	3,678	946	4,064	374	1,934	118	27,265	93,622
Total	186,169	27,081	7,463	7,321	58,845	28,292	119,815	7,708	110,693	545,679

Note: Notes: POL: Petroleum, oil and lubricants; TEU: Twenty-foot equivalent unit; JNPT: Jawaharlal Nehru Port Trust

Source:IPA, CRISIL

Capacity at Major Ports

(million tonnes)	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
Kolkata	12.6	13.4	14.6	15.8	15.8	16.4	16.4	17.1
Haldia	42.2	43.5	46.7	46.7	46.7	50.7	50.7	50.8
Paradip	51.4	56.0	56.0	71.0	76.5	76.5	76.5	106.3
Visakhapatnam	55.0	58.5	61.2	62.2	62.2	64.9	72.9	67.3
Ennore	48.8	50.0	53.4	55.8	69.4	79.7	79.7	83.2
Chennai	13.0	13.0	13.0	16.0	16.0	31.0	31.0	31.0
Tuticorin	20.6	20.6	20.8	22.8	22.8	27.0	33.3	33.3
Cochin	19.4	20.2	28.4	28.4	29.9	41.0	41.0	44.7
New Mangalore	38.0	41.3	43.5	44.2	44.2	45.6	51.0	69.0
Mormugao	29.5	30.0	33.1	33.1	37.1	41.9	41.9	41.9
Mumabi	43.8	44.7	44.7	43.7	43.7	44.5	44.5	44.5
JNPT	36.1	52.4	54.3	58.0	58.0	64.0	64.0	64.0
Kandla	46.0	61.3	63.5	77.3	77.2	86.9	86.9	91.2
Total	**456.2**	**504.8**	**533.0**	**574.9**	**599.4**	**670.1**	**689.8**	744.3

Source:IPA , CRISIL

Traffic of Vessels at Various Ports Category wise 2011-2012

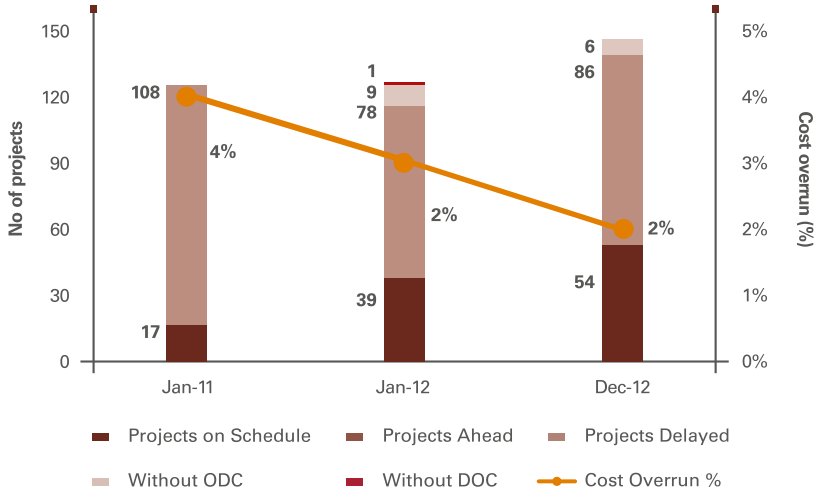
(Nos.)	Dry Bulk	Liquid Bulk	Break Bulk	Containers	Others*	Total
Kolkata	60	239	319	577	27	1,222
Haldia	761	853	57	291	-	1,962
Paradip	904	317	75	30	16	1,342
Visakhapatnam	1,147	715	219	351	38	2,470
Ennore	241	92	-	-	52	385
Chennai	223	507	524#	789	-	1,519
Tuticorin	425	226	430	365	46	1,492
Cochin	50	359	37	389	547	1,382
New Mangalore	206	693	157	80	19	1,155
Mormugao	547	153	37	48	-	785
Mumabi	333	1,102	568	14	40	2,057
JNPT	66	445	45	2,233	127	2,916
Kandla	715	1,318	456	225	-	2,714
All Ports	**5,678**	**7,019**	**2,924**	**5,392**	**912**	**21,401**

Source:IPA , CRISIL

Roads and Highways

Over the year, schedule overrun in road sector projects has decreased

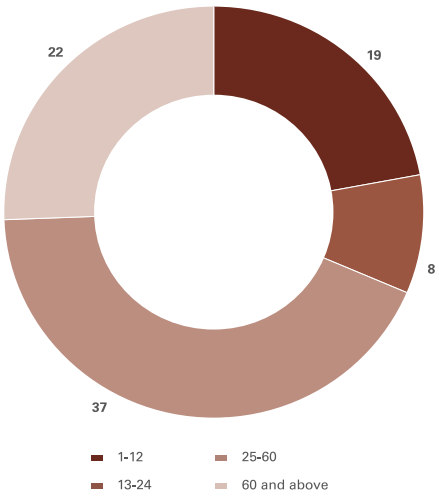
Road Transport & Highway Sector: Project schedule and cost overrun trends



Source: MOSPI, December 2012 Flash Reports

Road sector break up of 86 delayed projects in December 2012

Road Transport & Highway Sector: No of projects delayed (in months)



Source: MOSPI, December 2012 Flash Report

State-wise Road length in relation to area and population

States	Totla Roald Length (kms)	Road Length	
		Per 1,000 sq kms of area	per 1,000 of population
Andhra Pradesh	3,45,012	1,254.4	4.2
Arunachal Pradesh	16,494	197.0	13.8
Assam	2,30,334	2,936.5	7.8
Bihar	1,20,127	1,275.7	1.3
Chhattisgarh	74,434	550.6	3.2
Goa	10,569	2,854.9	6.6
Gujarat	1,46,630	748.0	2.6
Haryana	29,726	672.4	1.2
Himachal Pradesh	36,298	652.0	5.5
Jammu & Kashmir	22,323	100.5	2.0
Jharkhand	17,531	219.9	0.6
Karnataka	2,55,454	1,331.9	4.4
Kerala	2,04,757	5,268.7	6.1
Madhya Pradesh	1,65,740	537.7	2.4
Maharashtra	2,23,322	725.8	2.1
Manipur	16,502	739.1	7.0
Meghalaya	9,839	438.7	3.9
Mizoram	6,158	292.1	6.4
Nagaland	22,304	1,345.3	10.3
Orissa	2,15,404	1,383.4	5.4
Punjab	45,178	897.1	1.7
Rajasthan	1,71,479	501.1	2.7
Sikkim	1,873	264.0	3.2
Tamil Nadu	1,81,213	1,393.3	2.7
Tripura	31,733	3,026.2	9.1
Uttar Pradesh	2,84,673	1,181.6	1.5
Uttarakhand	41,041	767.4	4.3
West Bengal	2,11,770	2,386.1	2.4

Source: MOSPI ,MORTH

Capacity of National Highways

Width of carriageway	National Highways length (2007-08)		National Highways length (2008-09)		National Highways length (2009-10)		National Highways length (2010-11)		National Highways length (2011-12)	
	(km)	(per cent)	(km)	(per cent)	(km)	(per cent)	(km)	(per cent)	(km)	(per cent)
> Four - lane	9,325	14.0	12,053	17.1	16,314	23.0	16,187	22.8	17,700	24.7
Two - lane	39,079	58.5	37,646	53.4	36,886	52.0	36,995	52.2	38,536	53.7
One - lane	18,350	27.5	20,849	29.6	17,734	25.0	17,752	25.0	15,536	21.6
Total	66,754	100.0	70,548	100.0	70,934	100.0	70,934	100.0	71,772	100.0

Source: MOSPI ,MORTH

Road Network in India as in year 2011-2012

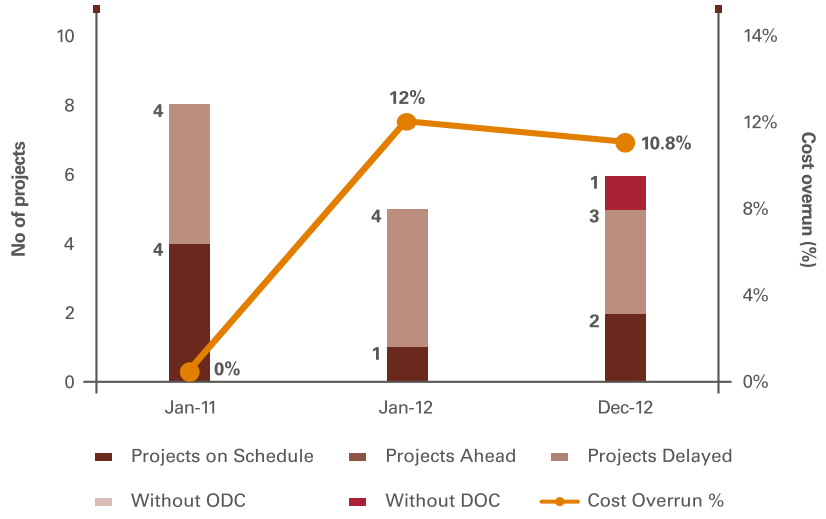
Road Network	Length (Kilometers)	Percentage of Toatal	
		Length	Traffic
National Highway	71,772	1.7	40
State Highway	154,522	3.8	40
Major and other District Roads	266,058	6.5	
Rural roads	3,617,240	88	20
Total	4,109,592	100	100

Source: MOSPI ,MORTH

Civil Aviation

50 percent of the civil aviation projects are delayed in December 2012

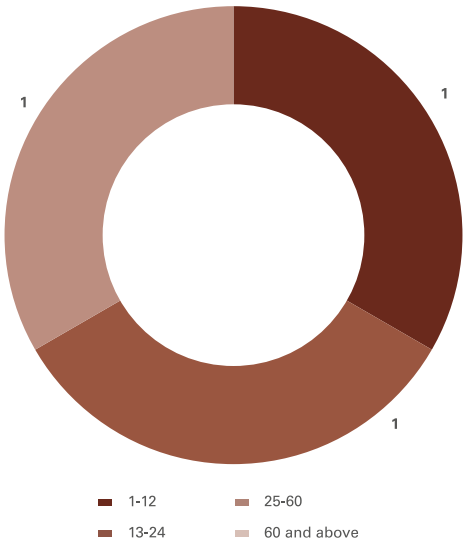
Civil Aviation Sector: Project schedule and cost overrun trends



Source: MOSPI, December 2012 Flash Reports

Civil aviation sector break up of 3 delayed projects in December 2012

Civil Sector: No of projects delayed (in months)



Source: MOSPI, December 2012 Flash Report

Domestic freight (tonnes)

Airports	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Metro Airports						
MUMBAI	1,52,159	1,59,724	1,51,328	1,74,184	1,99,831	190288
DELHI	1,16,027	1,30,904	1,28,332	1,63,913	2,09,113	200525
CHENNAI	42,969	41,918	52,806	71,246	93,336	84730
BANGALORE	67,642	70,011	58,310	71,893	87,515	83256
KOLKATA	47,144	49,989	47,305	70,168	84,861	81703
HYDERABAD	22,934	27,119	24,580	30,164	36,390	34472
Total	4,48,875	4,79,665	4,62,661	5,81,568	7,11,046	6,74,974
Non - metro Airports						
AHMEDABAD	16,868	12,739	11,018	15,060	19964	15,060
GOA	4,181	3,289	3,460	4,247	4016	4,247
TRIVANDRUM	1,413	1,415	1,442	1,540	1449	1,540
CALICUT	602	363	368	282	191	282
GUWAHATI	1,919	1,642	5,276	8,520	7761	8,520
AMRITSAR	111	376	2,290	161	89	2,299
SRINAGAR	1,918	1,501	1,815	2,016	2361	2,016
JAIPUR	2,539	2,142	5,763	8,177	6475	8,177
NAGPUR	4,058	3,773	4,717	9,145	4588	9,145
COCHIN	6,166	5,934	7,857	8,610	8533	8,610
PUNE	9,983	11,653	17,845	27,828	24134	27,828
COIMBATORE	3,617	4,616	6,285	6,637	7281	6,637
LUCKNOW	1,653	1,873	3,407	3,492	3690	3,492
MANGALORE	410	311	382	305	267	305
VARANASI	352	315	363	422	356	422
PATNA	1,768	1,957	1,928	3,279	3425	3,279
TRICHURAPALLI	12	20	25	0	0	-
VADODARA	1,962	2,198	1,745	2,099	2282	2,099
JAMMU	1,167	1,094	1,157	1,371	1265	1,371
INDORE	3,378	4,952	5,301	5,380	4734	5,380
VISAKHAPATNAM	535	766	938	1,107	1046	1,107
AGARTALA	4,737	5,979	6,755	7,105	6889	7,105
BHUBANESWAR	1,258	1,287	1,998	2,667	2286	2,667
UDAIPUR	-	-	-	0	0	-
BAGDOGRA	568	636	869	1,114	1672	1,114
PORTBLAIR	1,962	2,139	2,290	2,299	2386	2,299
MADURAI	655	572	574	580	842	580
BHOPAL	744	1,028	924	1,175	890	1,175
RAJKOT	812	666	635	933	738	933
AURANGABAD	1,058	963	1,247	1,841	1227	1,841
RAIPUR	1,600	1,444	1,593	2,356	2870	2,356
IMPHAL	568	636	4,719	6,002	4984	6,002
CHANDIGARH	395	413	219	1,013	3042	549
LEH	902	842	1,368	1,426	1336	1,426
JUHU	334	412	383			311
JODHPUR	101	90	n.a	27	41	n.a.
RANCHI	336	449	677	1,306	1650	1,306
SILCHAR	338	319	342	480	497	480
TIRUPATI	-	27	23	12	26	13
DIBRUGARH	-	299	331	322	343	322
Other Airports	-	-	1,057	1,279	1491	995
Total	**80,980**	**81,130**	**1,09,386**	**1,41,615**	**1,37,117**	**1,43,290**
Grand Total	4,82,457	5,32,191	5,60,645	5,43,791	6,90,954	8,54,336

Source: Airport Authority of India

International Passenger traffic for the last six years (millions)

Airports	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Metro Airports						
MUMBAI	7.35	7.98	8.12	8.23	9.08	9.70
DELHI	6.65	7.34	7.77	8.31	9.28	10.75
CHENNAI	2.90	3.41	3.66	3.86	4.25	4.31
BANGALORE	1.26	1.54	1.64	1.94	2.22	2.35
KOLKATA	0.81	1.00	1.00	1.19	1.43	1.57
HYDERABAD	1.21	1.44	1.57	1.72	1.89	1.93
Total	20.17	22.73	23.76	25.25	28.14	30.61
Non - metro Airports						
AHMEDABAD	0.40	0.70	0.68	0.85	0.83	0.74
GOA	0.40	0.43	0.39	0.43	0.58	0.58
TRIVANDRUM	1.19	1.40	1.47	1.70	1.84	1.84
CALICUT	0.90	1.08	1.52	1.66	1.83	1.98
GUWAHATI	-	-	0.01	0.01	0.01	0.03
AMRITSAR	0.49	0.20	0.44	0.50	0.47	0.40
SRINAGAR	0.02	0.02	0.02	0.02	-	-
JAIPUR	0.19	0.08	0.22	0.26	0.25	0.23
NAGPUR	0.08	0.55	0.09	0.05	0.04	0.04
COCHIN (CIAL)	1.43	1.77	2.01	2.23	2.36	2.59
PORT BLAIR					0.00	-
PORT BLAIR	-	-	-	-	0.00	0.00
PUNE	0.05	0.03	0.03	0.04	0.06	0.06
COIMBATORE	0.01	0.05	0.09	0.09	0.10	0.10
LUCKNOW	0.13	0.17	0.17	0.28	0.34	0.36
MANGALORE	0.03	0.16	0.21	0.28	0.25	0.26
VARANASI	0.03	0.05	0.05	0.05	0.06	0.06
BAGDOGRA	-	-	-	0.02	0.02	0.02
TRICHURAPALLI	0.16	0.30	0.38	0.59	0.67	0.79
GAYA	0.05	0.05	0.05	0.06	0.05	0.08
PATNA	-	-	-	-	-	-
Total	5.56	7.07	7.81	9.10	9.75	10.17
Other Airports					0.02	0.02
Grand Total	**25.73**	**29.79**	**31.57**	**34.36**	**37.91**	**40.80**

Source: Airport Authority of India

International freight for the last six years (in tonnes)

Airports	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Metro Airports						
MUMBAI	3,27,507	3,73,770	3,78,610	4,08,452	4,70,402	4,67,182
DELHI	2,74,801	3,01,959	2,97,931	3,33,473	3,90,932	3,67,830
CHENNAI	1,95,197	2,27,958	2,19,562	2,49,522	2,95,497	2,72,461
BANGALORE	97,847	1,07,701	99,690	1,02,751	1,35,263	1,41,693
KOLKATA	36,379	41,004	40,743	40,088	45,098	43,890
HYDERABAD	21,715	24,059	29,665	36,295	42,170	43,627
Total	**9,53,446**	**10,76,451**	**10,66,201**	**11,70,581**	**13,79,362**	**13,36,683**
Non - metro Airports						
AHMEDABAD	4,126	6,708	10,294	11,657	12,980	11,793
GOA	964	775	688	917	2,535	2,154
TRIVANDRUM	30,465	30,673	30,169	31,708	37,795	46,753
CALICUT	10,691	8,747	12,556	17,132	21,964	25,400
GUWAHATI	51	6	2	-	-	-
AMRITSAR	1,744	1,252	1,798	2,784	5,834	6,998
SRINAGAR	-	-	-	-	-	-
JAIPUR	728	395	340	446	398	235
NAGPUR	1	4	217	279	346	388
COCHIN	17,009	18,987	25,219	32,779	32,198	34,173
PUNE	7	1	-	-	-	-
COIMBATORE	1,615	1,300	917	702	390	467
LUCKNOW	158	134	49	378	586	839
MANGALORE	-	-	-	-	-	-
VARANASI	-	13	3	-	-	1
PATNA	-	-	-	-	-	-
TRICHURAPALLI	868	1,153	904	1,349	1,775	2,012
GAYA	-	-	-	-	-	-
Total	68,427	70,148	83,156	1,00,131	1,16,801	1,31,213
Other Airports					76	-
Grand Total	10,21,873	11,46,599	11,49,357	12,70,712	14,96,239	14,67,896

Source: Airport Authority of India

Domestic Passenger traffic for the last six years (millions)

Airports	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Metro Airports						
MUMBAI	14.90	17.88	15.32	17.37	20.00	21.04
DELHI	13.79	16.63	15.07	17.81	20.67	25.13
CHENNAI	6.08	7.21	6.18	6.67	7.80	8.62
BANGALORE	6.86	8.58	7.12	8.00	9.37	10.34
KOLKATA	5.19	6.46	5.99	6.86	8.20	8.74
HYDERABAD	4.54	5.54	4.65	4.80	5.71	6.52
Total	51.36	62.30	54.33	61.51	71.75	80.39
Non - metro Airports						
AHMEDABAD	2.09	2.46	2.14	2.68	3.22	3.95
GOA	1.81	2.14	1.83	2.20	2.50	2.94
TRIVANDRUM	0.60	0.70	0.48	0.64	0.68	0.98
CALICUT	0.23	0.23	0.16	0.21	0.23	0.23
GUWAHATI	1.07	1.34	1.37	1.58	1.92	2.22
AMRITSAR	0.11	1.14	0.13	0.20	0.30	0.49
SRINAGAR	0.68	0.76	0.72	0.91	1.04	1.63
JAIPUR	0.60	0.77	0.98	1.27	1.41	1.60
NAGPUR	0.58	0.13	0.71	0.76	1.20	1.38
COCHIN	1.13	1.57	1.35	1.65	1.98	2.13
PORTBLAIR	0.50	0.33	0.48	0.52	0.58	0.61
PUNE	1.53	1.64	1.74	2.21	2.75	3.23
COIMBATORE	0.85	1.01	0.92	1.01	1.14	1.24
LUCKNOW	0.48	0.54	0.65	0.91	1.24	1.66
MANGALORE	0.45	0.55	0.49	0.56	0.59	0.63
VARANASI	0.32	0.40	0.36	0.43	0.50	0.68
PATNA	0.31	0.39	0.34	0.55	0.84	1.02
TIRUCHCHIRAPPALLI	0.05	0.09	0.09	0.10	0.09	0.12
GAYA	0.00	0.00	0.00	0.00	0.00	0.02
VADODARA	0.40	0.50	0.44	0.50	0.60	0.67
JAMMU	0.47	0.55	0.40	0.52	0.69	0.89
INDORE	0.36	0.50	0.60	0.70	0.88	1.11
VISAKHAPATNAM	0.33	0.55	0.60	0.63	0.71	0.96
AGARATALA	0.32	0.41	0.37	0.50	0.75	0.84
BHUBANESWAR	0.35	0.41	0.67	0.83	1.04	1.25
UDAIPUR	0.24	0.29	0.26	0.36	0.37	0.37
BAGDOGRA	0.26	0.37	0.44	0.53	0.65	0.71
MADURAI	0.26	0.41	0.35	0.37	0.39	0.51
BHOPAL	0.17	0.29	0.23	0.26	0.32	0.42
RAJKOT	0.16	0.15	0.13	0.19	0.23	0.26
AURANGABAD	0.17	0.20	0.19	0.22	0.27	0.40
RAIPUR	0.25	0.41	0.40	0.44	0.53	0.80
IMPHAL	0.21	0.32	0.32	0.41	0.56	0.73
CHANDIGARH	0.15	0.23	0.36	0.47	0.65	0.80
LEH	0.14	0.17	0.20	0.23	0.26	0.37
DIBRUGARH					0.23	0.23
TIRUPATI					0.17	0.24
JUHU	0.14	0.14	0.15	0.15	0.00	0.00
JODHPUR	0.11	0.14	0.08	n.m	0.18	0.21
RANCHI	0.15	0.11	0.25	0.27	0.36	0.49
SILCHAR	0.12	0.15	0.14	0.15	0.16	0.21
Total	18.16	22.52	21.54	26.12	32.22	39.24
Other Airports				1.41	1.55	1.87
Grand Total	69.52	84.81	75.87	89.04	105.52	121.51

Source: Airport Authority of India | n.m: Not Meaningful

About KPMG in India

KPMG is a global network of professional firms providing Audit, Tax and Advisory services. We operate in 156 countries and have 152,000 people working in member firms around the world. The independent member firms of the KPMG network are affiliated with KPMG International, a Swiss cooperative. Each KPMG firm is a legally distinct and separate entity and describes itself as such.

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The Real Estate & Construction (RE&C) practice is a focus group set up under the infrastructure line of business in India. This practice offers a customized approach at different stages of the value chain to meet the unique challenges faced by industry and company. Some of the offerings include PMO& Model Business Processes, Accounting Advisory Services, Tax Planning & Structuring, Internal Audit, M&A, PE, Restructuring Advisory and others.

The practice has a large team of over 100 professionals who specialize in advising on Real Estate & Construction in India. The team includes professionals ranging from Finance & Tax specialist, IT & Construction specialist and Fraud Investigators who have significant experience of working with some of the industry leaders and high growth enterprises both in India and Internationally.

The RE&C practice has partnered with some Indian Real Estate companies in their pursuit for operational excellence and strengthening of control environment.

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