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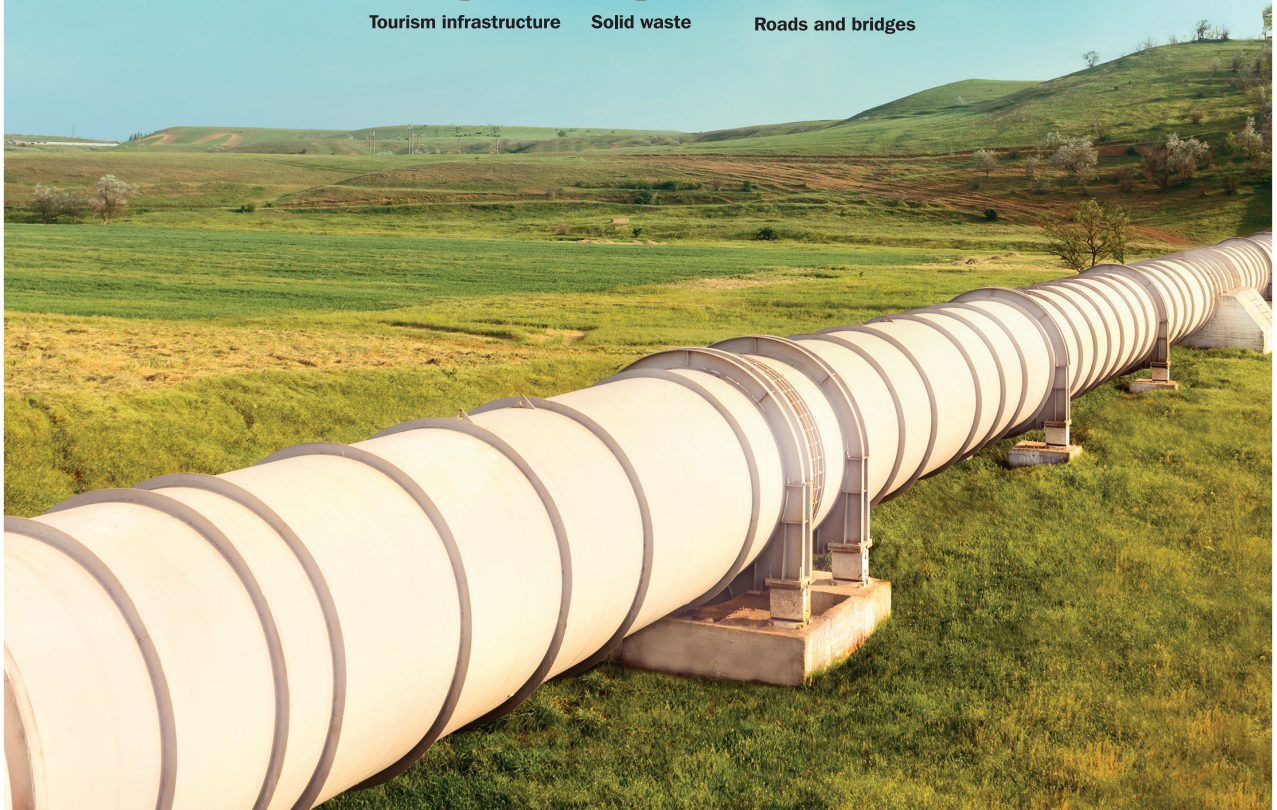
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Message from Chief Editor

Dear Fellow Consulting Engineers & Readers,

It's over six months since a new regime of life was enforced on account of the pandemic. There have been ups and downs but on the whole people adjusted to the new way of life. One fervently hopes that all the positive learnings get engrained as a routine since many outdated systems had to be done away with and replaced by more encompassing and less obstructive ones that IoT technology could provide. It decidedly has been an adoption of those advancements at a fast pace. One earnestly also hopes that such transformational changes that have occurred for the good in the public projects have cascaded to each and every stakeholder. In fact, with the spread of mobile telephony and IoT, keeping all stakeholders abreast of the status of a project has become easier and faster. It also automatically gets documented, hence record keeping also reduces. In fact, the ubiquitous Apps enable keeping large numbers in the loop and also seek feedback via online forms.

This issue of ViewPoint was considered as being important to communicate with one and all of the immense interplay of human aspirations that need to be addressed in a project affecting the community at large for the Project to be a success. There can be no two views that the proponents of a public project need to keep all the stakeholders informed while planning a Project and also while formulating, executing and thereafter while operating it, right upto the end of its design life. The articles seek to cover different aspects of stakeholder management across all these stages.

In all this it is necessary that the consulting engineer maintains the right balance between the stakeholders and also communicate with one and all so that everyone concerned is aware of what is going on. While this would take care of the non-physical aspects the consulting engineer should pay equal attention, if not more, to those who carry out the physical tasks. It is ultimately they in the unregulated sector who deliver the desired results. They need to be brought into the main stream by being trained in their choice of work. At the start of a project, the Consulting Engineer must apart from just meetings with the Contractor's representative also hold meetings with the Contractor's workmen

so that each trade is explained as to what is desired and how it is to be achieved. Its only then that they will understand as to why, how and when of the sequence, tolerance and finish requirements. Where these practices are adopted the results are remarkable, since then the labourers also feels that they are contributing constructively.

Many non-funded public projects are carried out from budgetary allocations and they are planned and executed by non-engineers on an atomistic basis. The interaction with other factors is not considered and even where they are known they are disregarded. Most of these projects invariably end up creating more problems in the area rather than solving them. Just as a person who is not a Surgeon is not authorized to perform an operation or advise on post-operation care why should non-engineers be allowed to plan, execute and maintain what is the rightful prerogative of Engineers.

Another alarming pandemic like factor that is spread all across the country is of the floods, failures, blasts, etc. which are being reported day in and day out. They are in the news for a few days and then forgotten since public memory is short. The loss of lives, property, etc. all gets wiped out of the discussion and serious considerations. Could not these have been avoided? Could not these have been anticipated? With the IoT making inroads in all sectors monitoring of potentially dangerous conditions has become much easier. Added to that are remote monitoring and automation/ robotics. When planned, designed, constructed and maintained correctly by qualified, experienced and competent Engineers, such instances would be far far less. It is for these reasons that Engineers have been calling upon the Government to bring in legislation for the Engineering profession so that there is accountability and responsibility for all works that are done.

Happy Reading & Learning for Better Stakeholder Management



A P Mull



Message from Guest Editor

Dear Readers,

The crucial need of good public infrastructure is being realised due to the impact of the Covid-19 pandemic. It has led to a change in the overall thinking of the needs, the planning process and the way that the planned requirements, nay necessities need to be realised. Most of the public infrastructure such as roads, bridges, street lights, water supply and wastewater systems and related infrastructure, educational institutions, hospitals, places of worship, crematoria, community halls, shopping complexes, municipal buildings, railways, airports, ports, and now digital infrastructure are made available to the public for their use on a nominal fee or even free of cost.

In almost all these infrastructure development, operation and maintenance is extremely important so that they remain fit for the purpose intended. It is only when this aspect is fully addressed and implemented accordingly, that the prime objective is met and the project can be called a success. For an Engineer involved in infrastructure development, an airport terminal is as important as a community building or a health unit in a small town as far as the delivery and output is concerned. However, it is generally found that some of the infrastructures do serve well as per initial intent and some not.

A general understanding is that shortage of funds is the prime reason for unsatisfactory performance of an unsuccessful project. That is not always true. There are a number of examples where the project has not been useful simply due to the reason that expectations of the users were not properly understood and accounted for in design or the created assets were simply left to the mercy of the operator with no effective checks and controls on the performance. Now with IoT a lot of this can be easily done remotely. All this goes to show that apart from the project proponents, engineering team and users, however there are a number of other stakeholders whose role is very important for the success of a project.

In this issue of Viewpoint, professionals have contributed their thoughts based on their experiences, as to how critical it is to plan in detail and keep communicating with all the stakeholders at all stages. The term 'guest workers' have been used for the first time for one of the key stakeholders of public infrastructure projects – the migrant workers.

The articles on one hand, present the significance of stakeholder management for a project, while on the other hand they navigate through the real life success story of identifying key stakeholders and addressing their requirements for project success.

We will be happy to receive your feedback thru' email (ceai.ceai@gmail.com) or share your experience through our social media platform [@CEAI_INDIA](#).

Enjoy Reading the Experiences



Jitendra Kumar Singh



Message from President

Dear Readers,

I welcome you to our quarterly publication, View Point, September 2020 issue.

CEAI has been trying to enhance the status of Engineers in the society and augment the quality of services rendered by Consulting Engineering fraternity. Consulting Engineers enable and add value to the development efforts of the country by preparing appropriate engineering solutions and overseeing their implementation, maintaining safety, quality and integrity at all stages.

View Point is the most important publication of CEAI, and acts as the link between the association and the Engineering community at large. It has now acquired a most sought-after status among the Engineering Journals, thanks to the relentless effort of the Editorial Board, chaired by Mr. A P Mull, our Past President.

View Point publications are theme based and the next issue will have the theme of Digitalisation in Engineering Industry. We welcome all of our readers, irrespective of your status of membership of CEAI, to contribute to this issue of importance to the engineering fraternity. Pandemic has taught Engineers across the globe the need for faster pace of Digitalization, and exchange of knowledge and experience on this theme is an urgent necessity. Please come forward and share your experience in this area to enhance the quality of the next issue.

CEAI is in the midst of celebrating its Diamond Jubilee, having completed sixty years of service to the profession of Consulting Engineering. A series of webinars, on topics of importance to the Engineering Industry, are being held, and you will find details of those events inside this volume. We look forward to your effective participation in the celebratory events. We also urge, those of you, who are not yet members of CEAI, to join and help us achieve our goals faster.

The terms of the present Governing Council (GC) ends in December 2020 and a new GC will take over and pursue our collective goals, set forward in the carefully prepared Strategic Plan, with greater vigor.

We take this opportunity to wish all of you, in the Engineering Industry, a better future in the New Normal environment of the post pandemic era.

Warm Regards

Amitabha Ghoshal

Stakeholder Management in Public Infrastructure Projects



Pradeep Charurvedi

FNAE, FIE
Chairman
Inter Disciplinary Coordination Committee
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A project is successful when it achieves its objectives and meets or exceeds the expectations of the Stakeholders. But who are the stakeholders? Stakeholders are *‘individuals who either care about or have a vested interest in the project’*. They are the people who are actively involved with the work of the project or have something to either gain or lose.

As consultant of an infrastructure project, when they manage a project to add lanes to a highway, the motorists are the Stakeholders who are positively affected. However, the project negatively affect residents who live near the highway during the project (with construction noise) and also after the project with far reaching implications which include traffic noise and pollution. Sector specific stakeholders can also be mentioned for other infrastructure sectors.

The project sponsor, generally an Executive in the organisation with the authority to assign resources and enforce decisions regarding the project, is the main Stakeholder. The customers, sub-contractors, suppliers, and the governments, central, state and local are the other stakeholders. The Project Manager, project team members, and the managers from other departments in the organisation are Stakeholders as well. It's important to identify all stakeholders in the project upfront. Leaving out important stakeholders or their department's function and not discovering the errors until well into the project could be a project killer. Many other examples can be picked up from the projects of other sectors.

In his speech on Independence Day in 2020, the Prime Minister of India has stated that the future infrastructure development would not be done in silos but interlinked and multi-modal competencies would be required. That means the stakeholders would get a new definition and a new dimension.

Key stakeholders can make or break the success of a project even if all the deliverables are met and the objectives are satisfied. If the key stakeholders are not happy, nobody is happy.

Climate Change and Disaster Resilience

Resilient infrastructure is critical for people's well-being, quality of life, and economic prospects. It is as much about water-pipes withstanding an earthquake, as it is about people having adequate and safe access to their workplaces, schools, and hospitals. At macro level, physical infrastructure underpins the achievement of all 17 Sustainable Development Goals. An estimated US\$ 94 trillion is expected to be invested in infrastructure globally in the next 25 years to sustain economic growth. Meanwhile, recent disasters indicate that up to 66% of total public sector losses in weather and climate related extreme events are infrastructure damage. There is a clear need for ensuring that all new and existing infrastructure systems are climate and disaster resilient.

The National Building Code refers to sustainability and earthquake proofing but does not refer to 'climate

resilience'. This remains a grey area for the consultants. The funding agencies or banks give preference to projects defining climate resilience.

The Climate Disaster Resilient Infrastructure (CDRI) was conceived and conceptualized over 2018-19, through substantive consultations with over 35 countries including advanced economies, developing economies, small island developing countries and landlocked countries representing a range of development, climate, and disaster risks contexts. The CDRI was formally launched by the Prime Minister of India at the 2019 UN Climate Action Summit in September 2019.

Trends in Infrastructure Spending

As per the Global Infrastructure Outlook 2017, published by Oxford Economics the estimated global infrastructure requirement is US\$ 94 trillion during the period 2016-2040. Of this, half is required in Asia alone (primarily China, India and Japan), with roads and electricity sub-sectors constituting around 67% of these investment needs, followed by the telecommunication, railways and water sub-sectors. Another study has estimated that while the funds demand of infrastructure is growing at about US\$ 4 trillion per annum, the supply of funds for infrastructure is growing at only US\$ 2.7 trillion annually, leading to a deficit of about US\$ 1 to 1.5 trillion on a per annum basis.

It is estimated that India would need to spend US\$ 4.5 trillion on infrastructure by 2030 to sustain its growth rate. The endeavour of the National Infrastructure Pipeline would be to make this happen in an efficient manner.

Importance of Infrastructure Sector given India's Demographic Shift

The pandemic has set aside the positive aspects of cleaning-up of the balance sheets of financial institutions about a year back. However, the Government has cautiously taken bold step of restructuring of loans for once for all stressed projects and entities due to the

pandemic. Most of the investment would come from the Government sources. In other words, the Government is taking over the responsibility and saving the financial institutions. On the other hand, due to the necessity for allocating funds for mitigating measures to fight the adverse effects of the pandemic, the Government has to divert large funds from various sectors into healthcare to assist the large population to fight the Pandemic. In other words, there is a strong possibility of projects being pushed forward by one to two years for need of base funding and policy support. However, as the economy is expected to pick up by the end of this year, there is a possibility that funds are made available from private sources. As of now private sector banks hesitate to fund long term infrastructure projects.

As per estimates, India's infrastructure investments for fiscal 2017-2018 and 2018-2019 are approximately Rs.10.2 lac crore and Rs.10 lac crore respectively. During this period infrastructure investment was predominantly made by the Public sector -Centre and State Governments, with a share of approximately 65%, while the share of the Private sector was 35%.

Capacity Utilization in Industry is Expected to Catch-up resulting in an Improvement in the Investment Cycle.

Some of the manufacturing units of leading companies like, Maruti, Mahindra & Mahindra, Hero Motors and TATAs have announced that they have brought forward their programme of automation and AI by almost three years. Results are already showing and with one-third of the labour force most companies are already able to achieve 75 to 80% of their production levels. This is true for the manufacturing sector but there are no similar examples from the construction sector which are involved largely in creating infrastructure. However, this performance has resulted in higher FDI flows into the country in terms of equity investment. That would have a cascading effect on the infrastructure sub-sector of the industry. However, the Consultants will have to re-skill their manpower.

In order to improve India's global competitiveness, creating new and upgrading existing infrastructure would be critical along with introducing a number of supply side reforms. Infrastructure development is labour intensive leading to increase in employment opportunities and thus, fuelling domestic demand. All of this together can aid in initiating a virtuous cycle of higher investments, growth and employment generation in the economy.

Make in India Programme

Quality of infrastructure is among the biggest hurdles facing the Indian Government's ambitious programme "Make-in-India", which aims to improve the nation's manufacturing capabilities and support higher growth and employment generation. The corporate growth and investments can also be hampered if the government fails to close the infrastructure deficit, which some experts estimate costs about 4% to 5% of GDP due to inefficiencies. Infrastructure development can not only help remove some of these inefficiencies contributing immediately to economic expansion but also support stronger long term growth. India's infrastructure bottleneck is a primary constraint to improving its global competitiveness.

Delicate Situation of Large Projects

The Consulting Engineers Association of India is deeply involved with all sectors and especially the infrastructure sector. A shift in government's programmes and related policy changes and regulatory regime can create new challenges for its constituent members. One of the challenges that may be specifically mentioned is in the renewable energy sector. India has installed renewable energy based power generation - installed capacity of about 90 GW, out of a total power generation capacity from all sources at about 356 GW. India has a challenging programme of installing 450 GW of renewable power by 2030. That means in next 10 years India has a programme of installing almost 360 GW of renewable power. This capacity equals the total power generation capacity created in the country over the last 70 years. The consultants, manufacturers and suppliers of the

equipment can understand the challenge lying ahead of them.

Even if one looks at the road sector, the port sector or any other infrastructure sector including the rural infrastructure, the challenges are quite substantial and need solutions based on appropriate use of conventional technologies as well as introduction of new technologies at a fast pace.

Large scale infrastructure project implementation needs careful handling of the stakeholders who may have direct interest or indirect interest in the project or they are politically or socially important and therefore wish to have a say in the project implementation. A Consultant's job is extremely complex and requires delicate balance amongst various stakeholders including the top management of the client; the coordinating executive and external stakeholders who may be the government, suppliers or funding agency. It is extremely necessary that the Consultants make clear through well defined objectives leaving no place for misunderstanding or complacency in approach. The outcomes should not be over-committed and there is need to have clear explanations for each action and its outcome. The Consultant has at every stage to convince the client that he is working only with his interest in mind in terms of meeting the physical targets with qualitative approach and inclusive of the latest technological advancements with achievements within the original financial layout and time lines.

Some of the challenges encountered by the project team include the following:

- i) Some of the project team members may have been hired only for the specific project and do not have a clear understanding of the ideology of the consulting firm.
- ii) Some of the experts may be hired on a part-time basis and may have divided loyalty and thereby leading to difficulty in meeting deadlines.
- iii) Personality conflicts may also arise.

- iv) Any communication gap between the client and the consulting firm would prove disastrous. A Coordinator with inter-personal communication skills, should be in the team.

In most of the cases the clients also have their own peer reviewers for ensuring timely outcomes. The consultant relationship with the peers can be impeded by any of the following:

- i) Political manoeuvring or sabotage.
- ii) Personality conflicts or technical conflicts.
- iii) Envy because the peer may like to be seen as the executive boss interfering into the consultant's day-to-day work.
- iv) Conflicting instructions from the client.

Consultant's working in certain heavily regulated environment (for example pharmaceutical, banking, or military industries) would have to deal with Government's regulators and departments. These can include all or some levels of government from municipal, regional, central or international agencies. It is extremely important that local, state and central government laws and regulations related to the activities are fully understood. These are changing by the day and the regulations are becoming much more stricter. This means the flexibility of operation is reduced to almost zero. One has to be extremely careful about compliances which may add to the cost of the project execution to the Consultant. Managing contractors or suppliers requires many of the skills different from what are needed for office work.

The Way Ahead

Stakeholders' management for any consulting group is a difficult assignment. On one hand the consultant has to maintain confidence and trust of the client that the performance would be as per the contracted schedule, on the other the consultant also has to maintain diplomatic relationship with a number of stakeholders so that no one creates an obstacle. The consultant has to ensure that the client is totally satisfied with quality of the work, costs of

operations and the schedule. Besides that, the consultant has to manage the politics of the project and keep external stakeholders satisfied that the project outcome would be in their interest. The culture of stakeholders varies from place to place and as a consultant moves from one project to another project, they have to learn and unlearn the cultural ethos of the sites. Experts have identified the three major aspects of cultural difference that can affect the project: Communications; Negotiations; and Decision Making.

Communication is the most visible manifestation of culture. Therefore, preparation in terms of local language must be done in advance so that the interpretation of information is appropriately communicated.

The Prime Minister's announcement on the Independence Day that future execution of infrastructure projects would not be in silos but in a multi-modal form would multiply the number of stakeholders for any particular project, and expectations of such stakeholder would be diverse. Therefore, it is necessary to identify potential stakeholders in the new format of project execution and conduct a Stakeholder Analysis in advance so that the conflicts of interest can be managed.

Stakeholder management would have to be clearly defined in the Project Risks which may be different from Enterprise Risk Management. All future infrastructure projects in India would have to carefully consider the management of the stakeholders as the major Project Risk.

Conclusion

Future infrastructure projects are going to be of much larger sizes, both physically as well as financially, and every component of theirs would have pronounced adverse impact on any risk. Besides, in future the project owners would seek competitive project cost with higher quality standards as per the international benchmarks and proper Stakeholder Management. Any loss through mismanagement of Stakeholders could mean a big loss to the project. The future belongs to appropriate in time Stakeholder Management.

Stakeholder Engagement in PPP Projects



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Abstract

Public Private Partnership arrangements are expected to play a significant role in meeting India's need for infrastructure services and finance in the coming years. Several studies of PPP projects from different stakeholder perspectives, such as the public sector and private sector (contractor/ financier) indicate a complex set of relationships between the government, contractor, and financier and influences the project outcomes. Understanding their respective degree of collaboration/ conflict, legitimacy, interests, and power provides pointers for configuring and delivering successful projects. Stakeholder engagement should be handled with significant communication, trust, and transparency with due care for the persons affected due to a project.

Introduction

In the coming years, the Government of India and various State Governments are expected to invest significant sums of money in the infrastructure sector. Indicators for infrastructure availability in India, including services in the urban sector particularly in drinking water, are often disappointing in relation to international best-in-class comparisons. Low spending on infrastructure and inordinate delays in implementation/ operations and maintenance (O&M) of ongoing projects, lack of capacity of the public and private partners, lack of technical expertise of government stakeholders have contributed to suboptimal levels of service delivery¹. According to the

recently released National Infrastructure Pipeline (NIP) Dashboard, the India Investment Grid has aggregated information provided by various stakeholders and put together a harmonized master list of infrastructure projects with an estimated investment of Rs. 111 lakh crores for FY 2020-25. Out of this, projects worth nearly Rs. 44 lakh crores (40%), are under implementation, Rs. 33 lakh crores (30%) are at a conceptual stage, Rs. 22 lakh crores (20%) are under development and the remaining Rs. 11 lakh crores (10%) are unclassified. As of August 2020, a total of 3145 opportunities will be on offer for investment, development, operations, and maintenance and service delivery to the consumers. But given the fiscal constraints of most state governments, state-owned enterprises, parastatal agencies, and cities, they are looking for the private sector to contribute towards these infrastructure projects. While the private sector is active in the regular business where they acquire the resources required and conduct the business (for example manufacturing units, hotels, etc.), the participation in the infrastructure sector is typically through Public Private Partnership (PPP) route.

PPP arrangements in infrastructure are quite common across the world across many infrastructure sectors such as transport (roads, ports, airports, railways to a limited extent), urban services (water, municipal solid waste management, civic amenities, etc.), energy, tourism, social sectors (education, health, etc.) and other industrial infrastructure sectors. According to the Department of

Economic Affairs, Government of India *"PPP means an arrangement between government or statutory entity or government-owned entity on one side and a private sector entity on the other, for the provision of public assets and/or related services for public benefit, through investments being made by and/or management undertaken by the private sector entity for a specified period, where there is a substantial risk-sharing with the private sector and the private sector receives performance-linked payments that conform (or are benchmarked) to specified, pre-determined and measurable performance standards"*². Initially, PPPs were being considered for efficiency that the private sector brings to the table (savings in time and cost, better delivery of services, etc.), but increasingly the reasons for adopting such mechanisms have shifted to financial considerations. There is a huge amount of academic literature on the role of PPPs, factors that affect the success or failure of these arrangements, risk management challenges, project development process, structuring, and procurement aspects. Development Financing Institutions and other multilateral/ bilateral organizations such as The World Bank, Asian Development Bank, European Bank for Reconstruction and Development actively support many member

countries in thinking about the adoption of PPPs in their respective projects. To measure the success or failure of PPP projects, the key features include continuous engagement of stakeholders, equitable regulatory frameworks, joint development of monitoring protocols, mutual trust, and integrity³. Stakeholder management is an essential component of all PPP projects and has a substantial impact on the outcome.

Role of Different Stakeholders in a PPP process

The categories and classes of stakeholders in all of the existing and future opportunities of NIP would be many. They would include elected representatives, bureaucracy, private investors (equity and debt), contractors, manufacturers, project-based consultants, manufacturers and technology providers, NGOs, and finally the end-users of the built infrastructure asset – the consumers i.e. the people.

In the implementation of a PPP project, right from the planning and design stage, consultation with various stakeholders is a crucial aspect. The key stakeholders and their role are given in Table 1.

Table 1 – Stakeholders and their Role

Stakeholder	Role
Political decision-makers	- Establish and prioritize goals and objectives of PPP and communicate these to the public - Approve decision criteria for selecting a preferred PPP option - Approve recommended PPP option - Approve regulatory and legal frameworks
Company set up to implement the project	- Identify the company-specific needs and goals of PPP. - Provide company-specific data - Assist in marketing and due diligence process and implement change
Consumers	- Communicate ability and willingness to pay for service - Express priorities for quality and level of service - Identify existing strengths and weaknesses in service
Investors	- Provide feedback on the attractiveness of various PPP options - Follow the rules and procedures of the competitive bidding process - Perform thorough due diligence resulting in competitive and realistic bidding
Strategic Consultants	- Provide an unbiased evaluation of options for PPP - Review existing framework and propose reforms - Act as a facilitator for cooperation among stakeholders

Source: Heather Skilling and Kathleen Booth. 2007. (Public Private Partnership Handbook, ADB)

The stakeholder engagement in PPP projects need to be reviewed in relation to the following:

- a) What are the expectations, motivations, and degrees of participation of various stakeholders in PPP projects?
- b) How does the attitude and involvement of citizens impact the overall implementation of the project? and,
- c) What are the factors/ set of conditions that promote greater compatibility amongst the stakeholders?

The typical constraints for successful implementation of PPP projects are identified as its complexity, lack of long-term planning, and institutional capacity. The role of the community and its participation in the project design and implementation is also a critical aspect. Conflicts could be between different stakeholders of a particular project regardless of the fact as to how it has been initially planned and designed. It could be between the financier and the contractor, between the contractor and the supplier, contractor and the consumers, etc.

The bureaucracy i.e. the administration works with the elected government. It is the requirements of the consumers conveyed through the elected representatives that the bureaucracy has to translate into public policies and implement them for the ultimate benefit of the consumers. As a result, the bureaucracy has to closely work with the elected representatives on the one side and on the other side with the service providers (private enterprises), consultants, NGOs, and also the citizens, who are the end-users of the services rendered by an infrastructure asset under a PPP arrangement. The expectations, motivations, and degrees of participation of all the stakeholders are to be taken into consideration right from the planning and design stage of a project. It also needs to be seen as to how the attitude and involvement of citizens impact the overall implementation of the project and what are the factors/ set of conditions that promote greater compatibility amongst the stakeholders.

Stakeholder Engagement Characteristics

Several studies of PPP projects from different

stakeholder perspectives, such as the public sector and private sector (contractor/ financier) indicate a complex set of relationships between the government, contractor, and financier. The construction industry views the risks and returns of a PPP project quite differently than the other stakeholders, particularly the financiers. While the construction contractor perceives risks such as availability of raw material, workforce, transportation of material, unforeseen environmental issues that may be confronted at the project site, timely payments from the employer, etc. the financiers consider the risky nature of large scale public projects, risk in the context of PPP contractual design, allocation of risks between the public and private sector, risk transfer, and pricing, techniques, and strategies in the management of identified risks, risks of refinancing, etc.

One of the approaches to understanding the stakeholder engagement is to identify the various stakeholders and map their degree of involvement generically across four parameters of collaboration/ conflict, legitimacy, interests, and power (CLIP)⁴. The degree of a parameter is assessed on a three-grade scale - Low, Medium, and High.

Based on the work done by Swamy and Tiwari⁵, the following observations are made.

- Infrastructure projects in India are typically configured and developed by Government agencies. They draw their mandates from the Constitution of India and respective state municipal laws and statutes.
- For urban projects, politicians, and local communities have the highest participation and influence levels in any project amongst other stakeholders.
- Government (both at national and state level), although they have a high degree of power, their influence in a project is low.
- Consultants and contractors, on the other hand, have the lowest influence on the project outcome.

This framework, in an ideal case, provides the basis

for developing an engagement plan. Involvement of stakeholders across four distinct phases in project life cycle namely project preparation stage (period corresponding to conceptualization, the conduct of surveys, and investigations, designing and structuring of implementation framework), transaction stage (comprising procurement activities of a private operator, execution of an agreement between the government and private sector), construction (including rehabilitation works) stage and Operations & Maintenance stage also provides insights into their engagement.

- Community participation/ influence seems to be dynamic and varies across project phases. However, the attitude of citizens seems to have the highest impact during the project implementation, especially when the perspective is negative. Even a lower intensity negative perception hurts the project outcome.
- Contrary to the popular perception that the Government is the biggest stakeholder and exerts the largest influence on civil infrastructure projects, it turns out that the national Government has a limited role when it comes to the implementation of urban infrastructure at the city level. It can at best be an enabler by providing the necessary policy and regulatory environment for PPP projects.
- An important stakeholder is the financing institutions. Their involvement during construction and O&M phases is high but are often not engaged with during the project preparation stage.

The multiplicity of stakeholders and the complex way they interact has a significant impact on project outcomes). The traditional planning and implementing of projects by a public agency are done by complying with prescribed guidelines, rules, and standards specified by the Central or State Government. The focus is on following the set procedures on the implementation of a program or a scheme. The evaluation also is focused on inputs such as money spent, and measurable civil works undertaken. This approach though adequate in satisfying the compliance of the regulation and processes, however,

fails to indicate the results achieved as a result of activities carried out by a public agency and deployment of human resources and budgetary funds in particular. To fix the responsibility and accountability of the bureaucracy, it would be important to assess the results achieved in a particular project by developing measurable indicators which are displayed prominently on the public agency website for the information of all the stakeholders.

During the construction, operation, and maintenance phase of a PPP project, the public agencies as per the PPP contract engage with an Independent Engineer or a third-party Inspection Agency to monitor and report to the government agency the compliance by the developer/contractor with the contract conditions. Presently, the information provided by such an Independent Engineer/Third Party Inspection Agency is internally used by the government agency for analysis and reporting to higher-level officials and elected representatives. To indicate greater transparency in the management of the field level records, the public agency may not only upload the information related to the progress of the project construction, operation and maintenance on its website but may also conduct periodic and structured workshops to keep the stakeholders updated on the progress. This platform can also be used to get the stakeholder assessment of the progress and the ultimate benefits of a project. Thus, it will ensure a harmonious relationship between the public agency and the end-users. With the advent of social network platforms like Facebook, Twitter, WhatsApp, etc., the public agency can employ suitable methods for timely and constant communication on the project's progress.

A few other factors that need to be taken into account include public consultation and the requirements of public disclosure.

Public Consultation

End-user consultation is seen as an increasingly important aspect for various reasons. Lack of consultation or inadequate consultation leads to opposition by the people, late commencement of the project may sometimes lead to cancellation of a project if public support is not given.

For instance, in 2016, nearly, 8,000 people protested in Bengaluru against the construction of a 6.7 km steel bridge at a cost of about RS. 1,721 crores connecting Basaveshwara Circle (Chanakya Circle) to Hebbal to provide smooth access to the traffic towards the new international airport. Nearly 800 trees were to be uprooted for this project. The government proposal was that once the bridge is constructed, the travel time will get reduced by a few minutes. The public consultation was not held by the Government before launching the project. Finally, the matter was taken up before the High Court of Karnataka which observed that the elected governments should not take up projects without public consultation in the garb of providing essential infrastructure and mass transport solutions.

During the stage of construction, operations, and management of a project, it is crucial to keep all the stakeholders concerned informed about its progress and the benefits that have been achieved. For instance, both during the implementation of JNNURM projects and subsequently during the implementation of the Smart City Projects, there has been no structured framework to keep the stakeholders informed of the progress of the projects.

There could also be a case where a set of stakeholders do not get the perceived advantages of a project. For instance, when a flyover is built opposite a row of small shopkeepers, they may lose their existing business due to narrow road space and inadequate parking facilities for the customers. Similarly, if a bye-pass road is built around a small town resulting in the existing traffic moving outside of the main business area, it may impact the livelihood of small shopkeepers and have a lasting impact on the economy of the town. In such cases, constant communication with the shopkeepers concerned may facilitate the co-creation of solutions between multiple stakeholders (who may have their grievances vis-à-vis the benefits accrued by a project). This may help re-shape the benefits of the project and also ameliorate the difficulties faced by such stakeholders. Systematic stakeholder management would, therefore, be important in the future.

Public Disclosure Law

One of the reforms suggested by the Government of India as part of the JNNURM program was that the States should enact a public disclosure law to provide transparency and accountability in the functioning of Urban Local Bodies (ULBs). Under this law, it was envisaged that ULB should make available in the public domain, information on various aspects of municipal governance including its personnel, administrative structure, finances, and operations. That would also include details of the various projects that were undertaken by the ULB and the progress thereof. This would enable the dissemination of information in a structured, regular, and standardized way. Strict enforcement of this law may need to be ensured.

International Best Practices in Stakeholder Management

Facilitating Community Participation

To engage the community for the common goal of overall economic development of the region, the World Business Chicago under the leadership of the Mayor of Chicago had come up with a plan known as the Chicago Plan for Economic Development and Jobs under which ten strategies were evolved. One of the strategies was to enable investments for the creation of next-generation infrastructure. The plan envisaged being implemented through a coordinated effort by the community to manage the existing as well as new public assets in the region. It was also envisaged that the city would write down the cost of the land with the help of Federal block grants and provide infrastructure as well as improvement of the project sites. Six local banks were to form the consortium to facilitate debt funding towards the development of the land. Besides, the Federal government's funding under the Comprehensive Employment and Training Act (CETA) would also be available to the business firms set up in the region. Under CETA, funding would be available for on-the-job training programs and first-year salary subsidies for the local people in Chicago who would be offered jobs in these firms. Under this plan, it was envisaged that five new industrial parks would be developed.

Alliance Contracting

Australia is a pioneer in embarking upon alliance contracting in infrastructure development. Initially adopted in the early 1990s essentially by the North Sea offshore oil industry, these types of contracts envisage closer collaboration between the parties to the contract, design consultants and construction contractors. Under this contractual arrangement, the parties would always consider what is best for the project. It means that the collaboration is not between groups of individual organizations but depends on the success of a given project. It is no longer based on individual interest or agenda. Decisions are collectively taken in the interest of the project.



Under construction Grafton Gully, Auckland, New Zealand



Grafton Gully, Auckland Motorway

For example, in one of the first highway construction projects in New Zealand under an alliance contract known as the Grafton Gully, the New Zealand Transport Authority set up a project team consisting of the project owner, designers, and construction contractors. The project team was expected to discuss and share the risks, rewards of the project, and find solutions for any problems that were confronted during the project period. The team was called as Freeflow Alliance. The Freeflow Alliance was responsible to deliver a new major motorway link in a congested section of the highway. There were several other stakeholders and utility companies involved in the development of the motorway link. Nearly, 40,000 vehicles were using the highway which was alongside residential and commercial areas. The Freeflow Alliance had to ensure completion of the motorway without making a significant impact on the environment or noise issues on account of the construction activity. The Freeflow Alliance was able to finish the motorway six weeks ahead of schedule and within the budget allocated. This was made possible through extensive cooperation and collaboration between the stakeholders of the project.

Global Centre for Public Service Excellence

With assistance from UNDP, the Singapore Government has set up a Global Centre for Public Service Excellence in the year 2012. The key achievements of the Centre include dissemination of information to stakeholders on various government programs and schemes besides conducting research activities and advocacy. In partnership with leading think tanks, business houses, universities, etc., the Centre has created an Evidence Hub to explore newer trends and innovation in public service. Quality of public service delivery can be improved through effective adaptation of mobile applications, social media platforms to provide information to the key stakeholders.

Conclusion

Involving various stakeholders, with the common shared

interest of a sustainable infrastructure service delivery, is increasingly being recognized as important in PPP arrangements. The States of Gujarat and Andhra Pradesh have been successfully implementing urban projects through the Land Pooling system by involving the landowners to part with their land parcels for the creation of public assets. This has been effectively achieved by government-private sector negotiations. An early and transparent collaboration can provide an efficient framework for identification of local/ project-specific challenges, preparation of an inventory of resources easily available and accessible, formulate mutually beneficial project structures, facilitate equitable contractual and procurement systems. Finally, stakeholder engagement should be handled with significant communication, trust, and transparency with due care for the persons affected due to a project.

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Stakeholder Management in Streamlining Safe Sanitation Solutions in Small Towns

- Case Study of Lalsot, Phulera and Khandela (Rajasthan)



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Abstract

Stakeholder management needs considerable planning to ensure a participatory framework in decision making, both during the development as well as the operations of the infrastructure. The Interest and Influence matrix is one of the popular tools to collate and understand various stakeholder groups and help in selection of the right audience for a range of thematic discussions. Three towns in Rajasthan where non-sewered infrastructure has been successfully developed and is also operational currently, has been taken as a case study in this paper. The non sewered initiative in these pilot towns, is now also acknowledged as one of the best practices, at the national level.

Some of the key considerations in stakeholder management with reference to the project experience includes:

- Stakeholder mapping across the thematic area of the project,
- Stakeholder ‘ranking and selection’ – based on key Informants, Interests and possible Influence,

- Developing a matrix on stakeholder’s issues and challenges and drawing inferences thereon for designing project recommendations,
- More focus on larger benefits of the proposed reforms during target group discussions, to ensure momentum and interest of the stakeholders,
- Upfront understanding of the critical success factors in a project and planning for mitigation measures,
- Consensus building through a series of discussions and meeting,
- Ensuring stakeholder engagement/ management which is a continuous process throughout the project (planning – development and operations), and
- Embedding the stakeholder engagement framework in the relevant municipal regulations for future considerations.

Some example of the key project challenges and outline of resolution method, reveal how only contextual solutions render desired results in sanitation solutions and can also

provide a framework on interlinking challenges with opportunity areas across the target groups. This project experience may also help develop an understanding of the consultation dynamics and optimum intensity of engagement required (though this again depends on the severity of issue and the area in question), to ensure a success story is created throughout the value chain of similar infrastructure projects.

Key Words: Conflict Resolutions, Consensus Building and Level of Engagement

Background

Rajasthan is emerging as one of the front-runners in urban sanitation reforms in the country and has successfully achieved open defecation free (ODF) status in both its urban and rural areas, under the national Swachh Bharat Mission. The results have been phenomenal with huge performance jump in terms of availability of toilet containment systems (from Census year 2011 – 82% urban household to almost 100% households by October 2019). In rural Rajasthan, the program has performed even better and the household coverage has increased exponentially from 20% to 100% including toilet containment systems within the same time frame.

With loan assistance from the Asian Development Bank (ADB), the Government of Rajasthan (GoR) has successfully implemented 2 multi-sector urban investment projects - RUIDP 1 and 2. The Rajasthan Urban Infrastructure Development Program (RUIDP), a dedicated entity established for implementing these projects has become one of the most successful SPVs in the country. The investments in sanitation and sewerage have made substantial improvements in the living standards of the residents of the 34 Project Towns (6 in Phase – I, 15 in Phase – II and 13 in Phase – III). However, these investments have mostly been targeted towards larger cities and towns and the service delivery in the remaining smaller towns of the state remained a challenge.

The Program

To address this gap, Phase-III of the program was

conceived to include a grant component contributed by the Bill and Melinda Gates Foundation (BMGF), channelled through the RUIDP's existing framework to focus on non-sewer areas, those that were unlikely to be provided with a centralized sewerage system in the foreseeable future either due to financial or technical unviability. The project's aims were to find innovative solutions for pertinent sanitation issues across the value chain during the planning, design, implementation and monitoring processes. The solutions envisioned under the grant component are expected to be participatory, people-centric and gender-responsive, through a combination of:

- Technological interventions,
- Institutional & regulatory reforms,
- Inclusive community engagement strategies,
- Sustainable financing & revenue models, and
- Capacity building in sanitation service delivery for the government and private sector.

Under the BMGF grant component, various initiatives pertaining to Faecal Sludge and Septage Management, (FSSM) have been undertaken and are at different stages of completion. Some of the key highlights from the FSSM initiatives in Rajasthan include preparation of a State FSSM policy and guidelines, end to end support from preparing the comprehensive FSSM Plan, strengthening of town level regulatory and institutional framework, construction, supervision and operations of three Faecal Sludge Treatment Plants (FSTP), robust capacity building and Information, Education and Communication (IEC) program during the several stages of project implementations. The whole process involved series of consultations with different types and levels of stakeholders and exposure visits resulting in favourable environment conducive for collective efforts on streamlining the existing sanitation situations.

The Pilot Location: Sambhar -Phulera, Lalsot and Khandela

The most significant outcomes of the program have materialized from the pilot project for city wide FSSM in all the three project towns: Phulera-Sambhar, Lalsot and Khandela. The management of faecal sludge was largely unorganised in terms of safe collection, transportation, treatment and further complete lack of any re-use mechanism. In absence of any regulatory mechanism and standard operating procedure (SOP); the private operators (they are not registered with any ULBs and are not provide with any safety gears for desludging operations) were serving based only on user request and disposing the collected waste mostly in open drain or at solid waste open dumping yard (imposing serious health and environment risk). The operators engaged in the work, did not considering it as a reliable round the year business operation and hence they tended to keep higher margins on desludging services (especially during rainy seasons).



Photographs 1&2: Existing Sludge Collection, Disposal and Treatment in the Pilot Towns

Private operators were called from remote towns with tariff ranging from Rs. 2500 to 5500/trip (USD 35 -75/trip) for round the year operations. The process involved unsafe practices of collection without PPE, incidences of leakages during transportations and further open dumping in town drain/ vacant land. That was causing serious health risk to the entire town population and also degrading the overall community hygiene and the local environment.

“There is no such designated location for disposal of faecal sludge in the town. Earlier it was disposed at solid waste dumping yard but due to protest by the nearby residents we are forced to dispose faecal sludge outside the town (drains of nearby villages). – Sanitary Inspector, ULB Khandela

“Every monsoon or during overflow, we open the valve of the septic tank and the accumulated faecal sludge flows into open drains. On rainy days, the valve sometimes opens by itself due to pressure and sludge flows into the drain” –A local resident, Sambhar

The objective is to streamline the entire operations and transform these towns as replicable models for safe and effective faecal sludge management for all small and medium towns of Rajasthan. The Pilot Project interventions not only covered the context of specific technical/ infrastructure solutions in terms of dedicated faecal sludge treatment plant but also included ULB-level robust institutional & regulatory reforms, sustainable financing for O&M of the FSSM process (including the FSTP) training, exposure visits and capacity building measure for relevant stakeholders in the pilot towns.

The project team proceeded with the public interactions, meetings with ward councillors and one-on-one interaction with private desludging operators in both the pilot towns. Meetings were held with officials/ staff of both cities for data collection, as well as discussing

sanitation issues and possible interventions. Regular inputs were also taken from RUIDP officials throughout the planning process, especially about the treatment technology options, scheduled desludging, modalities of user charges for desludging, communication with other state & city level departments, and financing of FSTP.

Six landmark resolutions were prepared in both English and local language (for better understanding by locals). These were approved as ordinance in the municipal board meetings of all the three towns. The resolutions for sanitation ordinance include:

- Land allocation for FSTP and making it mandatory for septage to be disposed at the FSTP,
- Licensing of Desludging Operators – with eligibility criteria, format for application & Job Card,
- Scheduled desludging in 3-5 years interval through the ULB,
- Adopting city-wide Septage Management Regulations,
- Changes in the Building Bye-laws – model septic tank specifications & building plan approval, and
- Institutional Structure & Responsibilities for FSSM – Constituting a City Sanitation Committee & Cell.

These resolutions have been discussed with wide range of key stakeholder groups and have been brainstormed with Municipal Councilors in series of discussion. Municipal Board meeting participants consists of Mayor, all Ward Councilors and Executive Officers. The final Sanitation Ordinance (both English, Hindi) was passed by the Municipal Board Members and is now followed and implemented in all the three towns.



Photograph-3: A Municipal Board meeting for seeking approval on FSM Resolutions

The FSSM consultation with diverse group led to adopting phased implementation for the interventions through short term and long-term action plans. The construction of the FSTPs in the three towns was completed in December 2019 and are now successfully operating and also adopting the provisions of the Sanitation Ordinance that was approved. These three pilot towns are expected to become a pioneer destination in Rajasthan to showcase the best practices of Faecal Sludge Management.

Project Learning Experience as Key Considerations for Stakeholder Management

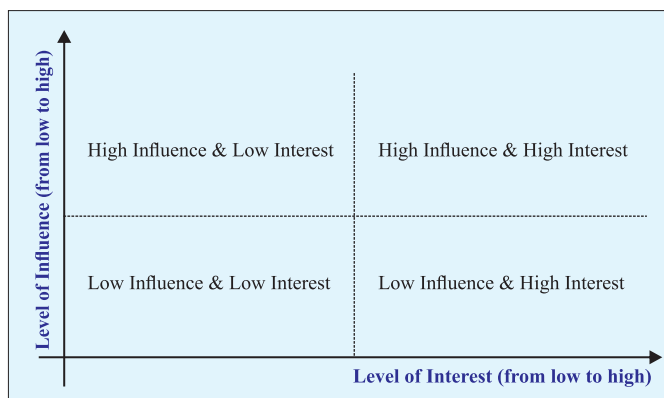
I. Stakeholder mapping across the thematic area of the project

The project commenced with exhaustive stakeholder mapping during the inception stage and selection of individual representatives was largely based on inputs received from the field staff. It was also ensured that representation from all categories i.e. operations, management, regulators, decision makers, communication platform, related economic/ business activity, service users, service providers, etc, was ensured in the overall stakeholder mapping. Some of the key stakeholders in the project included ULB officials, elected representative at city and regional level, local media agency, desludging operators, city waste management service providers, households from various economic status and settlement types, nearby farmers and nursery, operators of city green spaces, and sanitation workers. An all-inclusive categorization and selection of stakeholder representation from each category was primarily based on the Interest and Influence Matrix. A comprehensive

list of stakeholders and upfront understanding of their opinion/ issues on the project, gave a good start and momentum to the project.

II. Applying the principle of stakeholder ‘ranking and selection’ – Informants, Interest and Influence

Mapping of stakeholder groups in a project is largely based on an individual’s/ group’s interest and possible overall influence on the project. As a part of the Rajasthan project, a comprehensive Interest and Influence Matrix was prepared to understand the need and importance of stakeholders also in terms of their anticipated level of engagement in the project. Priority was given to stakeholders falling in ‘High Influence’ and ‘High Interest’ category. Selection of key informants from each category was based on their field understanding and level of involvement in related activities. Clear understanding of stakeholder groups on the basis of Interest, Influence and level of Information, helped to understand the required level of engagement and further also guide formation of various target groups for FGDs and inter group discussion.



III. Developing a comprehensive matrix of stakeholder’s issues and challenges and drawing inferences for designing project recommendations

Based on individual consultations with key stakeholders, a list of key issues and challenges were identified. The ground report on stakeholder challenges were discussed at length, with the project expert team and brainstorming led to arranging and linking issues of similar nature. An internal workshop, with the project team helped to reach

out to a possible solution and opportunity areas, against all key issues. That turned out to be a good base to start the interactive group meetings with key stakeholders to get their feedback and gauge the level of acceptance, on the suggested recommendations. Through that interaction, stakeholder aspirations could also be linked to possible solutions. Project recommendations were then finalized through a set of designed consultations.

IV. Start with big picture of proposed reforms for target group discussion

Project consultations can be made more participative if the audience is apprised about the expected benefits from the project; that was especially visible in case of Rajasthan.

An example of the benefit showcased, was about the non-sewer plant of the state and project town which would turn out to be a big attraction for all small and medium towns, with a possibility to also get evolved as a research centre and study site for university students. However, the expected benefits of the project need to be presented and designed based on the interest of the target groups. The end-user’s would largely be interested in reduced tariffs for tank cleaning, for farmers affordable and easily available compost would be a major attraction, whereas for elected representative the 1st non-sewer plant of Rajasthan is a major milestone and ULB officials would be more concerned about an organised system for collection and treatment of septage. These background research and engagement strategy for each stakeholder needs to be brainstormed in the team and should be clearly articulated in the consultation strategy document. Exposure visit to some of successfully operational module with series of pictorial documentation of best practices had been of immense help in getting the confidence of stakeholder in proposed solutions. Town parishads and ULB officials had been taken to Karnataka, Odisha and Maharashtra to understand the overall benefits and operational advantage of similar projects. Involving stakeholders from high interest and influence groups in some of the state level key meetings and workshops can have positive impacts in maintaining the momentum and their confidence level which in turn

had been really helpful in organising town level meetings and discussions.

V. Understand the critical success factor of the project, areas of possible conflicts and mitigation measures

Project issues and challenges lead to identification of some critical areas under consideration. These are termed as Critical Success Factors (CSF) of the project and require preparation of detailed road maps to overcome the challenges. Stakeholders play an immense role in both identifying the CSFs and also helping to develop more contextual solutions and a road map as mitigation strategy.

Some of the CSFs and resolutions' approach employed in the Rajasthan project are given in the Table - I.

VI. Consensus building may need a series of discussions and meetings

Consensus building is not only about negotiations, but also involves progressing through rational decision making and also exploring the possibility of including stakeholder suggestion without impacting the overall project objectives. There have been instances where the project's technical experts were also a part of the stakeholder discussions and were instrumental in explaining the technical aspects of the project. However, it is important to circulate clear discussion agenda in advance to the target audience and prior confirmation of their availability should be ensured in advance. There had been a situation in the Rajasthan project where some discussions were not leading to a conclusion and despite several meetings, the desired objective was not achieved. In such a case, it would be advisable to take a rational and collective decision as a group, and arrive at the required customisation in the proposed solutions or approach higher influence groups for final approval.

VII. Stakeholder management is not a one stop solution but a continuous process

Stakeholder management is not limited to only setting up of infrastructure, but is also vital for successful and smooth operations and maintenance of the entire system. The engagement process in the Rajasthan project started at the inception stage itself and even now it has been instrumental in implementing the scheduled emptying operations and also streamlining the private sector to encourage use of the developed services. There have also been recent discussions on involving self-help groups to run relevant components of the infrastructure. Strong relations with local stakeholders and local know-how of socio-economic conditions was immensely helpful in arriving at the decisions for adopting a type of service. It is important to have continued dialogue as part of the system operations and keep all key stakeholders informed on project progress and related challenges. It is important to reflect the lessons learned through stakeholder engagements in the Detailed Project Report (DPR) and also include the detailed planning of stakeholder management - both during construction and operation of the project. Stakeholder management plan helps to provide key inputs in developing a capacity building strategy as well.

VIII. Embedding the stakeholder engagement framework within city regulations

Sanitation committee and cell has been proposed as part of institutional reforms through approved city sanitation regulations in all the three pilot towns of Rajasthan. The Committee have participation from a mix group, including representatives of elective Ward Councillors, Executive and Sanitary officer of ULBs and also any three independent nominated personal from Committee Members. The Committee has a role of overseeing the overall progress and provide intermittent inputs and feedbacks, and taking some key decisions on important measures to be taken in sanitation reforms. Linking the stakeholder engagement with Municipal legislations has increased the possibilities of enforcement and has paved way for participatory decision making for improving the overall system.

Table-1: The Challenges and Resolution Approach

Sl. No.	Challenges	Resolutions
1.	Consensus on the monthly sanitation tariffs and approval from Municipal Board	With consultation it was observed that fluctuating emptying demand throughout the year was a big issue in the business. In case of assured service demand, operators were happy to reduce the cost and get associated with a ULB. Scheduled desludging was also important to reduce the level of water contaminations in the community and thus inter-linking the situations of stakeholder groups (i.e. user, desludging operators and elected representative) led to development of solutions while serving the needs of the mixed group of stakeholders.
2.	Mainstreaming the private desludging operators with municipal license	
3.	Land allocation by ULB for setting up of the treatment infrastructure	Ownership transfer ran in to a deadlock and thus as advised by the Municipal Board, a No Objection Certificate (NOC) for plant construction was issued to the executing agency. Finding alternative solutions through consultation with the right target groups is important to move the process.
4.	Proposing the non-sewered solutions instead of sewerage network for towns	Exposure visit to some of the successful cases to show as an example and also highlighting the cases of operational failure because of huge operational cost and skills mismatch.
5.	Creating interest of farmers for buying the co-compost manure and using in agriculture activities	Identifying the related linkages and connecting with each group to understand the process flow of both organic and chemical fertilizer. Arranging visit of local farmers to plant and showcasing the process of manure production and highlighting the scientific testing, were immensely useful to establish the string dialogue with the farming community.
6.	High motivation for operators to run the plant successfully even with small profit margin	The 1 st of its kind in Rajasthan and amongst the few in the country is great branding initiatives for the service providers. Moreover, further linking with immense market opportunity have created that sense of responsibility to maintain the infrastructure and operate the services. The success story of the Service Providers needs to be showcased and the credit due to them should also be acknowledged.
7.	Encouraging user (households) to follow the schedule desludging and emptying of the truck in every three years	Through a series of Information, Education and Communication (IEC) activities focused on a range of subjects and communicated through various platform. Awareness was largely focused on health (both family and local community) related advantages.
8.	Timely delivery of project and smooth asset ownership transfer from RUIDP to ULB	Local town level Work Monitoring Committee was constituted. It was formed by some volunteers, who were individuals with high interest in the works. Training was done for work monitoring, related communication medium and methods.



Photographs 4, 5 & 6: Constructed and Operational FSTP in Rajasthan

Images from top to bottom: FSTP Lalsot, FSTP Phulera and FSTP Khandela.

All three plants are in operation and serving the community by providing safe treatment and sludge collections needs of all three Municipalities including the nearby Gram-Panchayats within 10-15 km proximity. Small scale pilot plant of co-composting with municipal solid waste was also made operational so as to be utilised by the local farmers on much more affordable rates. That has been a good learning experience for other small and medium municipalities of Rajasthan which currently do not have sewerage infrastructure in place. All the three FSTP have turned into research centres for various relevant educational institutes and helping many students including those pursuing PHDs in waste water treatment. Further they have started offering exposure visits to other ULBs and learnings are expected to be translated in a greater number of such treatment plant in the near-future. The successful construction and operations of treatment facility have been a big boost in confidence to the key stakeholders, who with a good sense of pride, have now turned as vocal brand ambassadors of the success story.

“Improper faecal Sludge Management is severely impacting the health outcomes of small-scale towns. The losses incurred due to diseases in residents, arising out of poor sanitation, is simply unacceptable. The three pilots of Phulera, Lalsot and Khandela have got an opportunity to resolve this problem with the help of Government of Rajasthan. If interventions in these pilot towns proven successful, this will not just be a model for Rajasthan but also for the Nation.”

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Conclusion

Stakeholder engagement across the various stage of a project has been one key reason for the successful project delivery in all the three pilot towns of Rajasthan. The projects showcased in various National and International platform have been good branding initiatives and have also been able to create a sense of pride in the core stakeholder groups including the service providers. Interestingly one of the success indicators of project was also a significant shift towards high interest and high influence stakeholder group from all levels. The big picture of the project helps to attract the attention of key stakeholders but delivering and managing the infrastructure in-line with evolved expectations are even a bigger challenge as part of stakeholder management. Generally, it has been observed that there is fluctuation in the curve of engagement intensity in various infrastructure project. Engagement is high during the project baseline and formulations of recommendations. However, an effective stakeholder engagement would need to follow an exponential curve in graph of Engagement vs Project Timeline. Rajasthan non-sewered projects have been trying to build the relations with constant flow of activities including training, exposure visits, workshops, exhibitions, storytelling and have been able to create a strong, large and dedicated stakeholder

team across the various project dimensions. This in turn also creates an opportunity of a smooth exist plan for the Project Technical Consultants in the near future. There is need to realise and always remember that stakeholder management is not a one stop interaction opportunity but a continuous process.

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Importance of Stakeholders – Municipal Wastewater Management of Towns



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Preamble

In India, collection, treatment and safe disposal of domestic wastewater of a town is the responsibility of the Municipal body¹. Quite often, the Municipalities find it difficult to manage due to want of funds and technical expertise. State level and Centre level programs like JNNURM, AMRUT and other programs as well as Project loans and grants from multilateral banks help the towns get a sewerage infrastructure to build and maintain the facilities. These mega Projects are designed not only to create infrastructure but also for its operation and sustainability for the design period at least, normally 30 years.

It is often found that the sewerage infrastructure Projects do not meet the intended objectives, because under the group of water and wastewater Projects, everyone is more interested in water Projects and not in the wastewater ones. This is happening not only at users' end but also at the Project proponent and authority level who give it lesser priority. As a result, while on one hand, efforts are consistently being made to bring more and more piped water to citizens, on the other hand, generated wastewater is causing the land and water bodies unfit for use. Even, if at all the sewer network and treatment plants get constructed successfully as planned, the operation and maintenance are not adequately performed and thus the end result make the Project unsuccessful. In India, only a few towns can take pride of a good functioning sewerage infrastructure. The sector is generally un-noticed by

many for various reasons..

Amongst the professionals who contribute in delivering these Projects, the role of Engineers, especially Consulting Engineers is very prominent. They are effectively involved from the conceptualization of the Project to its commissioning and operation stage. From an Engineering point of view, one wonders what goes wrong that the Project becomes unsuccessful or less successful than as planned. What needs to be looked at beyond the routine technical design and drawing or planning and scheduling?

This paper dwells on the role of various stakeholders and related aspects which are often neglected but are vital and hence need to paid attention to by Project Engineers dealing with any stage of wastewater management of a town to make the Project a success.

Status of Sewerage Infrastructure in India

As per the Central Pollution Control Board (CPCB) records for the year 2016, the total sewage generation in the country was estimated as 61,754 Mld² whereas the available treatment capacity was 22,963 Mld leaving a gap of 38,791 Mld untreated sewage.

A more recent estimates by the National Mission for Clean Ganga (NMCG) in 2018 states that from nearly 100 towns in five states along the Ganga river bank, the estimated sewage generation was around 3,000 MLD

1. Article 243 of Indian Constitution, through 74th Amendment

2. Mld = Million Litres per Day

whereas the total capacity of treatment plants was 1,680 Mld and the NMCG approved Projects for bridging the gap. This was despite the fact these towns were on the priority of earlier river cleaning programmes as well. That gives an idea that overall situation of existing sewage treatment capacity in the country is generally not better than this.

The Sewerage System

A sewerage system consists of sewage outlets from houses connecting to sewers through manholes and these manholes connected to each other for taking sewage out to a place where it can be screened and treated. Since the flow is due to gravity, moving forward the sewers get deeper all depending on the topography of the town. The design is done to take advantages of ground slopes and obviate deep sewers. However, if a sewer goes too deep, say more than 7 metres, intermediate pumping stations are introduced to pump it to a next shallow sewer or directly to the sewage treatment plant (STP) at the end of the network system. Less the number of pumping stations means less operation and maintenance troubles and saving on recurring electricity charges.

Depending on the size of the town and the topography, there could be more than one STP in the same town. The STPs are designed considering the characteristics of the raw sewage so that the treated effluent from STP meets the prescribed norms before it is discharged to open land or a nearby water body. Reuse of the treated wastewater is sometimes practiced.

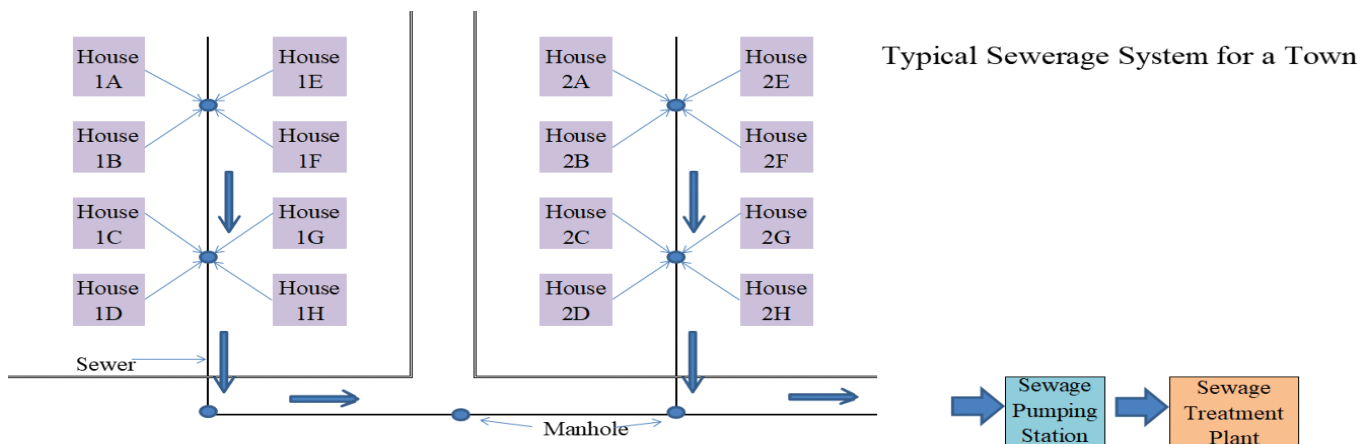
Sewerage Projects involve, among other activities,

cutting of roads, excavation of trenches to lay the sewer, manhole construction, backfilling, road restoration, civil construction of pump houses and treatment plant units, installation of pumping and other machineries, establishing a laboratory and safe disposal arrangement for treated effluent.

Identification of Stakeholders

It is important to identify all the stakeholders for the Project in the initial stage itself and keep on adding as some new situation develops. The list of stakeholders may vary on a case to case basis however, a typical list is produced here for general understanding and discussion:

- Central Government, State Government, as the case may be,
- Lending Agency (The World Bank, ADB, JICA etc.),
- Administrative Officers - District Collector, the Head of the Project executing body, Municipal Commissioner, as the case may be,
- The Municipal office, Mayor including Ward Councilors,
- Project Proponent (Executing Agency),
- Politicians representing the area under which the Project falls,
- Public (users) as well as adversely affected people due to Project activities,
- Media, Press,
- Consulting Engineers,
- Contractors and sub-contractors,
- Pollution Control Boards (Central/ State),
- Line agencies like PWD, Telecom, Railways etc. and
- Non-Governmental Organisations (NGOs),



Stakeholders Specific Issues:

1. Lending Agency (The World Bank, ADB, JICA, etc.)
 - Once the Project is sanctioned, lending agencies are interested in a Project's progress as well as ensuring that the compliances and loan covenants are being adhered to.
2. Administrative Officers (District Collector, Head of the Project executing body, Municipal Commissioner as the case may be)
 - a. Land availability for pump houses of treatment plants, land acquisition or transfer from one department to another
 - b. Permission for work in night, temporary traffic shifting
 - c. Coordination for Crossing of NHAI and railways
 - It has been experienced that sometimes a coordination at higher level is required to expedite the process, otherwise these crossings become bottleneck
3. Municipal Office (Project Owner)
 - a. Mayor including Ward Councilors are one of the key stakeholders. Irrespective of the Project executing body, the consultants need to collect the basic data of existing system from Municipality. Apprising the Municipality time to time of the design and drawings goes a long way in acceptance as well as support during implementation.
 - b. Generally, the data and drawings pertaining to existing system are not well maintained with a Municipal office. In that case, the old linemen from a Municipality are the best person to consult, since it is, they who possesses the best knowledge of the existing underground pipes, problematic stretches and also the year of laying the pipelines.
 - c. Budget for operation and maintenance of created assets – The Projects are conceptualized in a manner that they are financed for the construction phase and at times a few years of operation and maintenance. Beyond that, the Municipal office needs to chalk out the required fund for long term operation and maintenance. The fund generation in most cases is recommended either from water charges or sewage cess. It is advisable for a Project Engineer to keep continued communication and support them in gradual implementation of the proposals (like ring fencing of water accounts) towards their financial goals.
- d. Unwillingness to take over is another very critical factor for Project failure. Municipal officers if not taken on board during design and construction, hesitate to own the Project all of a sudden and look for loopholes in the construction when the Project is handed over. Since most of the created assets are buried underground, there should be meaningful involvement of their representatives during construction as well as commissioning activities, so that they are confident of the developed system.
- e. House Service Connections - In most of the Projects, the responsibility of house service connections is with the Municipal office. The slow progress of this activity hampers the fruits of the overall Project. Even if this cost is considered in the main Project, the role of Ward Councilors becomes important in driving the connection activity.
- f. Elected Representatives - They have a very important role in approval of the Concept Plan. Sometimes, the Elected Representative question as to why their Ward was not included for a Sewer system and instead provided only with Faecal Sludge and Septage Management (FSSM). At times there is resistance for STP construction in a Ward due to "Not in My Backyard" attitude. Effective communication is very important in all such cases.
4. Project Proponents (Executing Agency):
 - a. The Project Proponents should be advised on the merits of adopting sewer networks only in the areas where adequate piped water supply is established. Areas with smaller population density should be proposed for FSSM.
 - b. The existing sewer system in an area should be

incorporated into a new proposal to the extent possible.

5. Politicians representing the area under which the Project falls - Expectations of politicians and reporting of Project progress is to be balanced. Consider a case when the Project Engineer has reported some Project progress during review by higher authorities. If a politician pushes the Engineer to complete the work in lesser time so that the Project could be inaugurated before an election, it becomes a nightmare for the Engineer to finish the works in that smaller time frame and still maintain the quality of work. There is then a high chance of compromise with quality of the works in that case.
6. Public (Users) as well as adversely affected people due to Project activities
 - a. Correct communication from time to time of the inconveniences that would ensue and issuing updates on the Project is important.
 - b. Advocating the need for taking house service connections as per existing policy is also necessary.
 - c. Engineers during supervision may come across public resistance for using 200 mm diameter sewers as it is a common perception that they get choked very easily. With the help of NGOs and local Councilors, the message should be conveyed that sewers are not meant for solid waste and if that is not separated, even higher diameter sewers would be insufficient and would get choked.
 - d. Utilization of treated effluents – The agricultural and/ or industrial users of the treated effluent are other important stakeholders who should be identified while planning and consulted to incorporate their needs into the Project.
 - e. It has been observed that in the absence of data even for pipes laid in recent past, the Engineers end up ignoring that system and propose a new system altogether. This is not well received by the public and the Project draws criticism and non-cooperation.
7. Media, Press
People come to know by means of good coverage of

news through the print media when a Project is signed or inaugurated; however, no such coverage is usually done for sharing of Control Room number or stories related to successful commissioning of the plant. A change in mindset is necessary to communicate with the public and at greater frequency.

8. Consulting Engineers
 - a. Design stage
 - i. The Engineer should keep in mind all stages of the Project while proposing the building of public assets. The full Life Cycle Cost of the proposed assets (land, civil works, pipes, plant, equipment, etc.) needs to be considered in the initial stage itself so that during construction, operation, maintenance, replacement etc. the decisions are meaningful.
 - ii. Sometimes even a small investment/ proposal if ignored, proves detrimental for the Project. Issues like house service connections in Bill of Quantities or mandatory quality testing to be provided in the contractor's scope should be specified.
 - iii. Sewage Treatment Plant (STP) at higher elevation - One of the most critical issues with design is availability of land for construction of STP. While the Design Engineer would design the system but the Municipal authority have to identify the possible alternatives for the land for the STP. It has been observed that towns do not have land at the places which would be good as per the sewage pipe network. The network layout and design are thus suited to the road layout and the available land parcel. It is prudent to first identify the land available and then plan and design accordingly. This practice should be encouraged as the Design Engineer is the best person to decide topography based acceptable locations and can optimize the resources accordingly.
 - iv. The raw sewage characteristics should be considered while designing the sewage treatment process.
 - a. Construction Supervision stage- Consulting Engineer are at times also assigned Construction

Supervision if the executing agency does not have sufficient number of competent Engineers on their roll. At times the executing agency hire staff on a contract basis on a lower salary. It has been observed that the competency of these Engineers is limited and their supervision work is also affected if vehicle and related facilities are not provided to them.

- b. Network and critical junction connections - It has been observed that at times of commissioning of the sewer network, a number of junctions remain incomplete due to one reason or the other. These critical points should be brought forward in the regular review meetings so that timely action could be taken to complete them in time.
 - c. A common practice is placing the orders for supply and installation of electromechanical equipment, long before the sewage system is to be ready and the sewage would reach the STP. This leads to rusting and other issues with the machinery lying idle if supplied at site long in advance without proper packing. The orders are normally placed well in advance so as to obtain the structural loadings, anchoring & fixing, electrical power requirement, cable connection location, and other details of the equipment which are necessary for Civil and Structural Engineers, Electrical Engineers, Instrumentation & Control Engineers, et al. The delivery should be dovetailed so the equipment arrives when the civil works are ready to receive them. In any case the packaging should be such that even if there is delay in erection, the equipment is safeguarded from atmospheric corrosion, dust, etc. For equipment coming from abroad, the packing must be seaworthy.
9. Contractor/ Operator and Sub-contractors
- a. Tendering process- There are examples of a contractor winning the Contract for a Project based on the experience of an International partner. However, the personnel of International partner neither ever contribute any knowhow nor be physically present at the site of Project and be actively involved. Such practices should be carefully scrutinized and undertaking be obtained from all the parties concerned of their physical presence and active involvement at all times until completion of the Project work as per the Contract before awarding a Contract with the proviso that the Contract would stand automatically terminated for any violation of the above condition
 - b. Casualty during manhole cleaning - Safety is non-negotiable and Contractors/ Operators should be routinely sensitized for using PPEs. There have been a large number of deaths in the country due to persons entering manholes without adequate safety gears and even without airing the manholes and pipes.
 - c. If there are more than one operator in a city's sewerage system, there is possibility of blame game for non-performance of the system being proffered by them. The boundary limit of each operator, their accountability and responsibility together with regular measurement and reporting of critical parameters should be included in their scope.
10. Pollution Control Boards (Central/ State) - Application for "Consent to Establish" and "Consent to Operate" should be submitted timely, so that if the pollution boards have any objection to the proposal, there is time for corrective action.
11. Line agencies like PWD, Telecom, Railways, etc. - Identify the issues pertaining to permission or co-operation from these agencies in shifting of utilities or permission for work in their Right of Way zones. Issues should be identified in the very beginning of the Project and communicated. Some of the agencies require time to evaluate and grant permission for pipe laying. Such agencies need to be sensitised to the consequences of delaying conveying permission in writing.
12. Non-Governmental Organisations (NGOs)
- NGOs- They are brought into Project for meaningful consultations with the affected people, advocacy of the Project, etc. The effectiveness of their interaction needs to be evaluated from time to time - whether

the NGO's staff communicating with the public is adequately trained and able to convey the ethos of the Project effectively.

Solutions

Some suggestions towards successful Project were discussed in the previous section, however, a few more suggestions are given below:

- A. Meaningful consultations with public, affected people.
- B. Education - School students should be brought to STPs as a part of educational tour.
- C. Continuing Professional Education - Practicing Engineers should invest in upgrading knowledge, know-how and skills and keep themselves updated on developments in their sector. Leisure is not always waste of time, but important for free thinking.
- D. Imbibe additional parameters in Swachh Survekshan for assessing the performance of the town, e.g. percentage of sewage finding its way to STPs, quality of treated sewage, etc.
- E. Dynamic Project Scheduling to be adopted so as to avoid last minute glitches.
- F. STP construction should be coordinated with the sewer network so that there would be a certain minimum sewage flow to the STPs.
- G. Advocacy is required for adopting a balance of Sewer network and FSSM approaches in areas with high population density and low density of the town.
- H. 'One City, One Operator' approach – The Government has already started awarding contracts for single operator handling all the sewerage infrastructure of a town, irrespective of the fact that construction of those assets was at different times and by different agencies. This aims to address the issues of blame game among agencies and a holistic

approach in utilising the assets. The success from few sample towns like Kanpur (Shapoorji Pallonji group), Allahabad (Adani group) and Agra (Wabag) will pave the path for adoption or improvement of this approach in future.

Some Foods for Thought

After all, one may introspect and ponder these non-conventional points -

- How many times do we come across meaningful discussion/ consultation on Sewerage Projects through social media?
- How many know as to where the sewage from their house finally goes? What route it takes and to which STP? Is untreated sewage polluting some water body? Why is it difficult to find such information?
- Why is there laying of double sewers in some areas despite resource crunches?
- Qualification Criteria in Tenders- Should not be there qualifying marks for successful Operation too?

Conclusions

Nobody likes faeces in the neighbourhood; but cannot even a plan be evolved and acted upon effectively? In fact, many people would not like operating on a patient too, but still there are Doctors who love their work and serve mankind. That kind of dedication is required in the sewerage sector too for creating a better environment. India has already shown unprecedented approach and success towards *Swachh Bharat*. Taking up Sewage Management earnestly is the need of the hour. A Project Management Engineer may not be able to control all the issues discussed in this article but it is their responsibility to identify, highlight and flag the issues at the right time to the right stakeholder so that the concerned stakeholder can act upon that. Social media platforms and digital tools will certainly be useful once there is the will power to improve the system for the benefit of the citizens.

Yaapo divyaa utavaa sravanti Khanitrimaa utavaa Yaa Swayarn Jaa|
Samudraartha Yaa Soochayapaavakaasta aapo devi iha Maamvantu||
[Rig-Veda, VII 49.2]

(The waters which are from heaven, and which flow after being dug, and even those that spring by themselves, the bright pure waters which lead to the sea, may those divine waters protect me here)

The Nation Builders - Challenges faced by Guest Workers



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Introduction

“Labour is prior to, and independent of, the capital. Capital is only the fruit of Labour, and could never have existed if Labour had not first existed. Labour is the superior of capital, and deserves much higher consideration.”

Abraham Lincoln

The imposition of the strict lockdown, to counter the spread of the highly contagious COVID19 virus, brought the country to a sudden and grinding halt. All the repercussions could not be envisaged at that time, especially the plight that would befall the silent workforce that was engaged in building the Nation. Some studies have highlighted the large number of persons working mostly in the unorganised sector in places away from their native place. They are referred to by the term “migrant labour”. However, that itself is a misnomer. Many people working in white-collar jobs also work away from their native place, but the same terminology is not applied to that group. Using it only for the band of hapless workers, who have to move out for employment, mostly in the unorganised sector, under poor living and working conditions is somewhat derogatory. That too despite the fact that the contribution of this workforce to the overall economy is significant - more than 10% of GDP. The quote from Abraham Lincoln, given above aptly captures what is truly owed to them.

In this article, as a mark of respect to the people otherwise termed as “migrant labours”, the term “guest workers” has been used.

As per the 2011 census, the size of the workforce stood at 482 million and is estimated to have exceeded 500 million in 2016. It also reported that the total populace who moved within the country in search of work stood at 453.6 million (37% of the country’s population), including those who move within their native state of domicile (85%), outside of the state (13%) and the balance (2%) from other countries.



Based on the 2011 Census, the National Sample Survey Organization (NSSO) and the Economic Survey 2020, Professor Amitabh Kundu of Research and Information System for Developing countries, estimated that there are about 65 million inter-state migrating persons of which 33 per cent are guest workers. 'Casual workers' constitute 30 per cent of the workforce while another 30% work are 'regularly' but in the informal sector. His research further shows the regional distribution of the originating state of domicile of this 'guest workforce' - Uttar Pradesh 25%, Bihar 14%, Rajasthan 6% and Madhya Pradesh 5%.

As per the statement made by the Minister of State for Road Transport and Highways in the Lok Sabha on 22nd September 2020

"NEW DELHI, SEPTEMBER 22 AROUND 1.06 crore migrants left their cities of work and returned to their home states during the nationwide lockdown, the government said on Tuesday. This number includes those who travelled on foot, Minister of State for Road Transport and Highways V K Singh told the Lok Sabha.

As per official figures, 63.19 lakh passengers travelled to their home states in 4,621 Shramik Special trains between May and August, the Railway Ministry told Parliament recently."

- The Indian Express, 23rd September 2020

This article focuses on the 'guest workers' engaged in the construction industry in India. The list of stakeholders in a project mentions Contractors and Sub-Contractors but what about the actual doers - the workers especially the 'guest workers' who toil and sweat to deliver the results. The article examines the status of the construction industry in India, its contribution to the economy, its growth potential and what technology can do to overcome the situation. The last factor raises the question whether in a country like India can robotics and automation be considered to replace human labour. The answer would perhaps lie in considering the technological advancements to aid the labourer. Replacement by robotics and automation should be thought of for dangerous and hazardous operations or where labour is difficult to get or deploy.

Status of the Construction Industry in India

The construction industry ranks second in terms of its contribution to GDP and the number of persons employed after the agricultural sector, with the share currently at approximately 7%. In absolute terms it accounts for GDP of INR 2,670 billion out of total GDP at constant prices (2011- 2012 price) of INR 38,036 billion¹. The nominal GDP of India in 2019 stood at USD 2.94 trillion, equivalent to INR 205800 billion at an exchange rate of 1USD = INR 70². The Gross Value Added (GVA) from the construction sector in 2019-20 stands at USD 192 billion³.

Market research agencies had forecast good growth and 76.5 million workers were projected as being required in the construction and real estate industry by 2022⁴. However, due to the ongoing pandemic situation in the country, these figures have changed. Surveys after the pandemic crisis show that 50% to 80% workers left the worksites and many of them are unlikely to return to the



worksites in the future. The trend, coupled with changed construction practices through technology intervention and design alternatives, may alter the nature of workforce involvement in construction.

Regardless of these projections or forecast what has to be kept in mind is that for the economy to grow, mobility and connectivity are a must and hence infrastructure has to be developed and also maintained to provide unhindered facilities at all times in all climes.

Keeping all that in mind it is essential to examine the quantum of the ‘guest workers’ that form the backbone of the nation’s economy.

The Workforce in the Construction Industry

The proportion of ‘guest workers’ in the total workforce is high, especially among the urban population. Movement of the workforce across regions has an essential effect on socio-economic development of the country. This movement takes the human capital to the area of requirement, giving them a chance for better living and in turn help them learn new skills. The movement also includes rural to urban migration that increases the urbanization process. The pandemic has brought to the fore and made known the concerns of these ‘guest workers’ vis-à-vis their economic, social and political exploitations.

The ‘guest workers’ comprise, both short-term and long-term migrants, with the number of short term migrants being much higher. The construction sector comprises the largest share of short-term migrants that comprise 41.6% of rural migrants and 25.2% of urban migrants.

The composition of migrating construction workers as per studies by NSS and Periodic Labour Force Survey (PLFS) show an increasing trend of migration of both male and female workers from both rural and urban background. In the last three decades, their percentage in construction has increased from 1.7% to 14.5% for rural males, and from 4.2% to 11.7% for urban males. For the female workforce, the corresponding figures are 0.6% to 5.3% from rural and from 2.2% to 4.1% from an urban background⁵.

The study revealed that two mechanisms drive migration – “pull migration” applicable to people seeking better opportunity confined to the non-agricultural workforce in the urban area. The second is the “push migration” with people moving out due to lack of local opportunities, mostly in rural settings for people who do not have recourse to agriculture as an occupation. Push migrants face more significant hardships since they lack the required skill to find jobs requiring specific capabilities.

The data on workforce migration pattern through the various census periods segregated into streams of the reason of migration shows that the most significant proportion of movement from both rural to urban and urban to urban are for work opportunities⁶.

Review of the report by the Ministry of Housing and Urban Poverty Alleviation about the data on workforce migration brings out the following:

1. The migration pattern comparison between male and female shows that migration of male workers is dominated by work opportunities and is mostly inter-state in nature. Family reasons, particularly marriage, govern female migration.
2. The proportion of short duration male migration is higher than more extended duration migration suggesting the temporary nature of work engagement opportunities.
3. The relative proportion of migrant workers by work sector – rural migration of males, is far lower than that of urban migration because the construction industry requires skilled workers who are available more in urban areas. A higher proportion of female migration is due to movement with the family.
4. For the construction industry, the share of non-migrant and migrant workers is almost equal.
5. The relative proportion of short-term migrants in the construction sector is higher since construction projects have limited completion periods after which the workforce is no longer required at the site.

Two mechanisms drive migration – “pull migration” applicable to people seeking better opportunity confined to the non-agricultural workforce in the urban area; “push

migration” with people moving out due to lack of local opportunities, mostly in rural settings for people who do not have recourse to agriculture as an occupation. Push migrants face more significant hardships since they lack the required skill to find jobs requiring specific capabilities.

Source of Migration of Guest Workers in the Construction Industry

Data on the migration of the workforce from rural to urban areas show that 25% of out-migration across state boundaries occur from 17 Districts concentrated in eastern Uttar Pradesh and Bihar. That is followed by another 25% contribution from 37 other Districts from West Bengal, Odisha, Maharashtra, Rajasthan, Jharkhand and western Uttar Pradesh as shown in Figure 1. The Districts in Bihar, Jharkhand and eastern Uttar Pradesh also have the largest ratio of out-migrants to the local workforce, exceeding 10% and going up to 50%

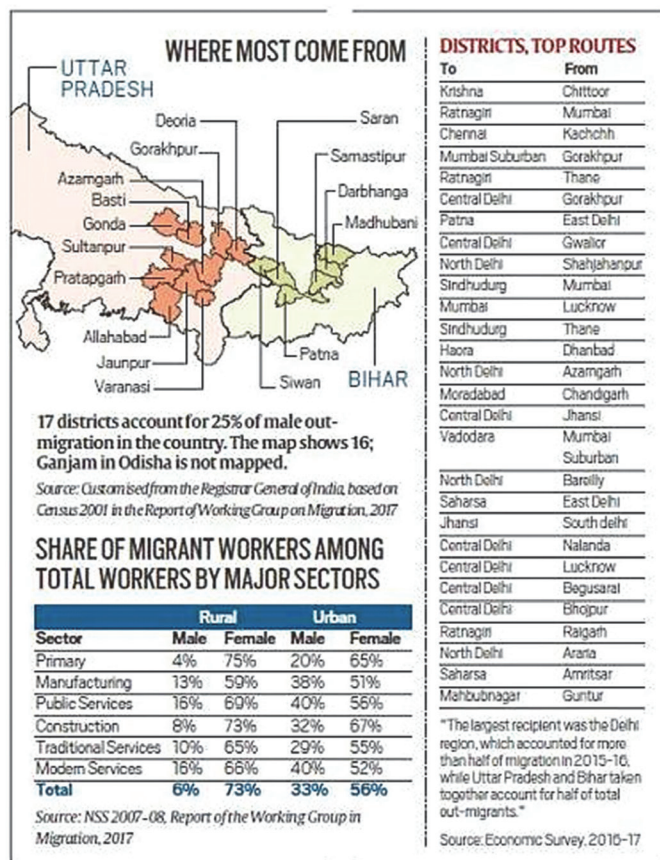


Figure 1: Source of the migrating workforce

The Vulnerability of Guest Workers in the Construction Industry

The biggest source of vulnerability for the guest workforce is the absence of proper data on this workforce and the absence of an appropriate state-organised system of realistic statistics on the number and the nature of movement. Short-term and seasonal migratory movements which are a significant component, are mostly unaccounted for. The two state conducted mechanisms for data collection – Census and National Sample Survey (NSS) use different criteria for the definition of migration. While Census records change in address between two counts that are taken at an interval of 10 years, NSSO defines migration as a change in address over past six months. Incomplete data and non-uniform sampling techniques make it challenging to plan and devise policies for the benefit of this community.

Guest workers face numerous forms of exploitation at their workplace including irregular or non-payment of wages, physical abuse, lack of housing of minimum standard, lack of basic amenities like water and sanitation, inadequate or absence of health facilities, entitlement to social protection and food under National Food Security Act 2013 through the Public Distribution System (PDS), voting rights, caste certificates or access to government schemes like National Rural Health Mission. Though the workforce is engaged in construction works, they are entirely neglected in the planning process of the projects. Even the Smart City programs have left out a significant part of the poor and marginalised population. They are ironically considered a problem case for the very development that they are essential for creating and maintaining.

Many of these guest workers start as unskilled workforce at a very early age and stagnate in this poorly paid, hazardous, low skill work in a work-life span shortened by poor nutrition, health hazards, high physical demands and hazardous environment and the work per se. Their children then fall into the same cycle, and the vulnerability is transferred down through generations as can be seen from the graphic on the lifestyle of guest workers from southern Rajasthan (Figure 2).

Early Entry Age of 14 to 20 years	Peak Work Life 21 to 27/30 years	Beginning of Exit 27/30 to 35/40 years	Return 35/40 years onwards
- Youth enter labour markets as manual labour - Secondary wage earners	- Hard manual labour for 12-14 hours - Become primary wage earners - Get married and start family	- Manual labour takes toll - Frequent return to village with chronic illnesses	- Take up local labour opportunities, Commuters - Lower earning capacity - Children start migrating

Figure 2: Lifecycle map of a typical guest worker

This workforce is exposed to the health risks that include occupational health hazards like malnutrition, lung diseases, respiratory problems, allergies, kidney and bladder infections, back problems and other infectious diseases. Often this group is stigmatised as carriers of diseases. The children of the families of this workforce who usually travel to the workplace with their parents have little or no opportunity for schooling, education or child care or health facilities.

Finally, ill-founded restrictions on domicile status deny the right to this population for enrolling in skill-building and enhancing opportunities. There is little awareness of the facilities available, absence of career counselling, and inflexible rules of education qualification and preset timing for skill acquisition leave limited opportunities for them.

Current International Practices, Specification and Policies

Provisions for living facilities for construction workers

at project sites as specified by international bodies like International Labour Organization (ILO), and financing agencies like The World Bank (WB), European Bank for Reconstruction and Development (EBRD), International Finance Corporation (IFC), and Asian Development Bank (ADB) are briefly given below.

IFC/ EBRD/ WB Guidelines on Workers' Accommodation

The documents of the international bodies provide guidelines on the principles and standards applicable for construction of workers' accommodation, including provision for construction workers. The provisions cover transport systems, general living facilities, rooms/dormitories, sanitary facilities, canteen and cooking facilities, food safety, medical facilities and leisure/social facilities. The baseline standards to be adopted for the facilities are determined by local building rules & regulations and good building practices.



Examples	Common Characteristics	Sectors Covered	Key Issues
Workers camp	Temporary	Extractives	Enforcement of standards and monitoring difficulties
Worker village	Migrant workers	Utilities	Relations with the communities
Mobile worker camp	Gender Separation	Infrastructure	Living Standards
		Manufacturing	Cost

Table 1: Requirements for Workers' Accommodation at the Construction Camp

International Labour Organization (ILO)

ILO's document "*Migrant Work & Employment in the Construction Sector*" makes a holistic review of the impact of internationally migrating workforce in the construction industry. It also deals with the various risks faced by the migrant workforce in various countries including recruitment anomalies, precarious legal status, immigration risks, local law compliances, job volatility, layers of sub-contracting to get employment, wage theft, poor workplace health and safety conditions, trafficking, forced labour, policing, and absence of settlement support services in host place. ILO Helpdesk document No. 6 provides details for the guiding principles, siting and construction of workers' accommodation and the sanitation, health and safety facilities that should be made available.

ILO Construction OS&H Guidelines⁷ specify the welfare guidelines for setting up a construction site. The instructions are related to accommodation, facilities of water for drinking and washing, sanitary facilities, restrooms at the worksite, transport to and from the workplace. These facility provisions are intended to improve worker health and reduce fatigue. The facilities can be provided individually by separate contractors or by one contractor for all workers.

Asian Development Bank (ADB)

ADB along with ILO has produced a document "*Core Labour Standard*" (CLS)/ International Labour Standard (ILS) which is implemented in projects funded by ADB as a commitment to "Social Protection Strategy".

Eliminating forced labour, child labour, discrimination of employment opportunities and benefits are the

underlying principles of CLS. Other standards develop these basic CLS principles and address issues of migrant workers also. CLS stresses on equal treatment in terms of providing social benefits to local and migrant workers.

Inspection by law enforcement agencies in various countries is another tool deployed to minimise exploitation of workers enhancing social security of workers at project sites.

To ensure compliance to ILS/ CLS in ADB funded projects, the bidding documents incorporate 22 labour related clauses covering areas of the CLS in the General Conditions of Contract (GCC). With respect to temporary workers, it explicitly ensures that there is no discrimination with permanent workers in terms of CLS, health and safety provisions, and accident insurance. The ADB monitoring process tracks the implementation of these guidelines on records throughout the project execution phase for compliance with CLS and is subsequently documented in Project Completion Report (PCR) and Project Performance Evaluation Report (PPER).

Occupation Health and Safety Administration (OSHA), US Department of Labour

OSHA standard 1910.142 provides details for the construction of temporary labour camps, specifying the type of construction, sleeping facilities, kitchen and cooking facilities, water supply requirements, toilet and sanitary requirements, drainage and sewerage system requirements, laundry, washing and bathing facilities, lighting, waste disposal, first aid, medical facilities and reporting of infectious diseases.

Best Practice guidelines for Labour Camp Accommodation Welfare UAE

This document provides guidelines for compulsory accommodation for construction workers for establishments with less than 50 workers with wage less than AED 2000 per month. It provides guidelines for housing facility, good living conditions, sanitation and public health facilities and rest houses at the workplace. The contractor is required to comply with this standard to guarantee health and safety of the workers⁸.

Guidelines from New Zealand Labour Department

Guidelines for the provision of facilities and general safety in the construction industry from New Zealand Labour Department⁹ provides general guidance on health and safety of construction workers including washing facilities, toilets, public and general safety.

Various other reputed international construction agencies and developers (AES Gener Una Empresa, Lusail Real Estate Development Company, have detailed standards and guidelines for setting up, operating and closure of labour camps^{10, 11}, sewerage system requirements, laundry, washing and bathing facilities, lighting, waste disposal, first aid, medical facilities and reporting of infectious diseases.

Current Government/ Private Sector Specifications for Labour Camps

Government Sector Projects

Government funded projects spell out provisions for the construction of labour camps with guidelines for room sizes, ventilation requirements, cooking facilities, type of construction, area and internal lighting, water supply, plumbing and sanitary requirements, temporary latrines, and sewerage facilities, mother and child welfare and day creche facilities. All comply with local Public Works and Health authority guidelines, Factory Rules of the State and approval of the Resident Engineer.

They also provide for inspection of the facilities by authorised Inspectors from the Labour Commissioner's

Office. An Environmental and Social Impact Assessment Report for a Project spells out the requirement of numbers of local and guest workers and allotment of government land for labour camp along with detail specification for setting up of labour camp and its inspection in line with IFC and EBRD guidelines¹².

Private Sector Projects

Review of project specifications and the General Conditions of Contract for various projects shows disparity amongst the provisions for facilities to be provided for construction labour at project sites. Most of them have provisions regarding wages, PF, accident insurance, ESI facilities, dealing with infectious diseases, occupational health and safety including the use of safety equipment and training for the execution of work but standards for accommodation and other living facility requirements including water supply and sanitation are generally not spelt out directly. However, compliance with local regulations, Factory Rules are required, and the cost and responsibility are that of the contractor.

Some contracts have more detailed provisions that deal with workers living place requirements, medical and sanitary facilities and social benefits to be provided at site to the workers. The room sizes, ceiling height, ventilation requirements and sanitary facilities are also spelt out with the proviso that the material are fire-resistant, non-hazardous with nominal resistance to a natural disaster. Insulation properties are to ensure prevention of extreme temperature conditions in rooms both for high summer and low winter temperatures. Contracts also cover the quantity and quality of water supply, toilet facilities (separately for male and female), lighting provisions with circuits having tripping device and breakers¹³.

In a project under Ministry of Micro, Small and Medium Enterprises (MSME), the contract specifically required that the contractor only hires workers registered under BOCW (Buildings and Other Construction Workers) Act. It also required compliance with the provisions of the Act concerning welfare facilities for the construction workers.

Current Policy & Regulations Regarding Guest Workforce in India

Labour appears under the concurrent list in the Constitution of India, and a number of laws have been enacted by the Central and State Governments. The various facets covered include occupational health, safety, employment, training of apprentices, fixation of minimum wages and its payment, compensation for injuries at workplace, bonded Labour, contract Labour, women and child labour, industrial dispute resolution, social security provision like PF, EI, and bonus. The broad classifications of these laws¹⁴ relate to:

1. Industrial Relations
2. Wages
3. Working Hours, Conditions of Service and Employment
4. Equality and Empowerment of Women
5. Deprived and Disadvantaged Sections of the Society
6. Social Security

There are two principal legislations dealing with building and other construction workers:

1. The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996, and
2. The Building and Other Construction Workers Welfare Cess Act, 1996.

The former provides the framework for the “*Draft Model Welfare Scheme for Building and Other Construction Workers*”. Section 60 of the Act details out the provisions about facilities like transit accommodation, hostel, labour shed, night shelter, mobile toilets, mobile creches and advises the States to take steps for implementing the provisions.

As per the Cess Act, the funds generated through the Cess collection should be made available primarily for providing social security to the guest workers with the balance for creating additional benefits under Section 22(h) of the Act.

The provisions for creating transit accommodation, mobile toilet, a mobile creche for construction site workers are to meet the requirements as specified.

According to the above laws, the building and other construction workers, including brick-kiln workers,

should be registered with State-level Construction Workers Welfare Boards. The rules also lay down minimum safety standards and employment conditions. The law mandates a Cess at 1% of the construction cost to be used to create a fund for providing social security and related facilities for construction workers; the state-level Construction Workers Welfare Board manages the fund. They also mandate the social security benefits to be covered¹⁵ and stipulate that the Administrative spending is to be restricted to 5% of the fund value.

Even though the Central Government passed the CWWB Act in 1998, the implementation of the Act by States has been slow with rules framed only by 2011. Construction workers need to be registered with CWWB to claim benefits under this act. Data on registered workers in Figure 3 show that the States have been able to register only about half the workforce in this sector in the two decades after its enactment.

Some of the states with substantial guest worker contribution have a poor record of registration.

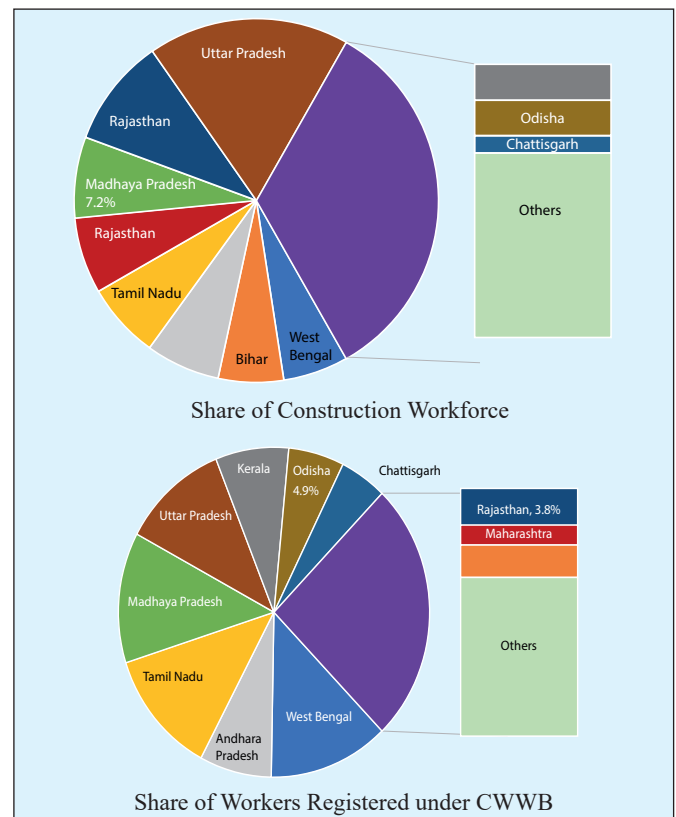


Figure 3: Share of the workforce in Construction and Registered with CWWB

A survey in 2013 of actual data from States shows poor utilisation of the fund. Kerala utilizes the maximum - way more than other states. Some improvement had been noted in 2015 with some zero-spending States initiating the fund usage to bolster the percentage utilisation from 15% to 21%. However, the overall use still stayed at a low level. There is also concern over the outreach of these programs and the level of awareness among the target beneficiaries. The 38th Report of the Standing Committee on Labour shows that out of INR 3,868.523 billion collected as Construction Workers Welfare Cess since 1996, only INR 996.761 billion has been utilised (25.8%). The national average of Cess distributed to workers through all the schemes under this Act worked out to INR 499/ worker-year¹⁶.

The current estimates of the unused fund collected from Construction Workers Welfare Cess are about Rs. 20,000 crores⁴.

To improve the awareness level, the actions that have been suggested are⁴:

1. Registration of workers by the States (spot registration camps)
2. Campaigns through TV, radio, social media and mobile phones
3. Training to workers with training materials by public and private agencies or like CPWD, State PWDs, UNESCO, et al. regarding awareness of social benefits.
4. Awareness-raising drive through social organisations.

The low level of awareness and information percolation amongst the workers has resulted in the continuance of poor working and living conditions.

Table 2 shows the usage data of the CWWB Cess fund across various States. Barring a few states, the utilisation

Dismal but slowly improving Use of the CWWB Cess							
Name of the states/UTs	Regd. Workers	Amount of cess collected (Cr.)		Amount spent (Cr.)		Spending as share of collection (%)	
	2015	2013	2015	2013	2015	2013	2015
Kerala	7%	808.8	1234.0	728.8	1152.4	90%	93%
Chhattisgarh	4%	222.2	539.3	125.4	345.5	56%	64%
Tamil Nadu	11%	604.3	1290.9	278.0	511.9	46%	40%
Madhya Pradesh	12%	903.7	1575.6	312.8	552.0	35%	35%
Puducherry	0.2%	20.7	71.7	4.6	31.2	22%	44%
Arunachal Pradesh	0.04%	23.0	--	4.6	--	20%	--
Sikkim	0.1%	18.6	54.7	2.4	10.8	13%	20%
Twenty other states/UTs	59%	8927.7	19660.5	279.5	2517.4	3%	13%
Eight other states/UTs	6%	70.4	1027.9	0.0	245.8	0%	24%
Total (cr.)	2.24	11599.3	25454.5	1736.2	5367.0	15%	21%
Source: submissions by Ministry of Labour and Employment to the working Group See text para 41, for characteristics of the twenty state and eight state groups							

Table 2: Data on usage of fund from the Construction Cess

is poor, but there is an improving pattern that can be noticed.

Another area of great concern is the low skill level of workers, especially in the construction sector. The National Policy for Skill Development and Entrepreneurship 2015 aims to accelerate the skilling effort to required standards in a sustainable manner. The magnitude of the problem can be understood from the following workforce data

1. 12.8 million Indians enter the labour market for the first time each year
2. 72.88 million are employed in the organised sector
3. 387.34 million are working in the unorganised sector

The Policy identifies the framework of institutes that help impart the training and links skill development to improved employability and productivity of workers.

A review of the international standards, the international funding agencies and Indian Government funded projects shows that the requirements for facilities for the workforce at construction sites are specified in the tender documents for adoption by contractors during the execution of the project. The rules and regulations framed by the governments at Centre and State levels in India include provisions for registration of such workers, social benefits, and acceptable living standards for the workforce at construction sites. Enforcement of these standards as statutory/ regulatory requirements for construction sites, especially for privately-funded industrial and infrastructure projects is an area which needs more attention through the involvement of regulatory bodies, engineering and industry associations, and non-governmental organisations.

Reality Check of the Condition of Workers at Site and Labour Camps in India

Construction projects are for a specific duration only after which the site activity winds down. Thus, the engagement of construction workers at a location is temporary, hence most project specifications require the contractor to meet the regulatory requirements of minimum wages, PF

and ESI contribution, and workplace safety and health requirements. The welfare of the workforce specifically spelt out in terms of minimum living conditions – accommodation, sanitary facilities, children schooling are seldom provided.

Developers need to be sensitive towards creating permanent/ semi-permanent facilities for the living arrangement of workers. The social welfare commitments as per the labour laws must be fulfilled.

There is difference in the living facility availed of by local and long-term contract workers and short-term migrating workers. The former class opt for off-site rental accommodation, often sharing with other workers for a better economy of spend, and because they mostly migrate alone without family and hence can avail sharing accommodation. The latter class are primarily found in vulnerable off-site settlements of slums and illegal road/ rail side settlements. The vulnerability of the latter group is more pronounced since, in most cases, they migrate with their family – spouse and children. Most of these people work in the unorganised sector. Hence, the problem is more magnified due to lack of concern and commitment towards social benefits for this group affecting both security and wellbeing of the family members on this migrant worker group.

Another difference arises due to the nature of the construction project itself. On real estate or industry infrastructure development projects, the construction workforce is contracted out, and the contractor usually makes some arrangement for these workers close to the site for better utilisation of their time. However, in public utility projects like roads, bridges, cross country pipelines, transmission lines and other infrastructure projects, such housing facility is usually problematic. The workforce occupies government lands through an agreement with local authorities.

A common problem in formalising facility provision for the construction workforce is proof of residence at the place of work. Since the nature of residence of this workforce is temporary, there is a tendency to retain the proof of identity and residence of their place of origin

through documents like Ration Card, Voters ID, Property Tax receipts, Utility Bill receipts and not update them with each change of location in few years. However, this lack of temporary local residence documents is the cause of the vulnerable position the guest workers face in the new locale. There is need for rethinking on the residency proof documents either by making documents like Ration Card, Voters ID valid across the country (and already linked to Aadhaar card, PAN card) or accepting other documents like registration with Building and Other Construction Workers' Welfare Board. Both these changes would require policy interventions for the design and implementation of a new system, which would make the process simple and streamlined and fully digital¹⁷. Any person in the country should be able to avail of all benefits in any part of the country where the person's residence is going to be of more than a certain minimum period of say a week or two weeks.

Suggestions for Safe Work Environment for Guest Workers

Suggestions for improving the status of the living facilities and social benefits to the construction workforce will require awareness, understanding and implementation of the requirements of the regulations provided in the various acts and adopting the international practices concerning their living standards.

A Central Registry, Aadhar, Insurance, Health, Payments and Tracking of Labour

The issue of registration of construction and building workers, the process and documentation associated with them can be made entirely on the digital platform and linked to other documents like Aadhaar, Ration Cards, PF Account, ESI Registration, etc. That would enable tracking the worker location, the status of employment, health status and other information across the country till the registration is valid. The registration can be linked to the "Jan-Dhan" accounts to facilitate wage payments by any employer at any geographic location of the worker in the country.

The successful implementation of the provisions of the BOCW Act would go a long way in alleviating the

condition of guest workers. The State Governments are empowered vide Section 60 of the Act to implement the provisions with the help of Advisory Committees.

The Act is applicable for all construction projects except for individual houses costing less than INR 1 million. It covers any person engaged in building or construction work and ancillary industries like a brick kiln, sand mining and stone cutting. However, it still excludes factory and mine workers and persons in managerial or administrative roles.

The Act also provides for constituting enforcement machinery using teams of Inspectors appointed by the Government. The Inspectors have the power to enter, inspect, and seize activities at construction sites non-conforming with the provisions of the Act. However, the meagre penalty limit of up to six months imprisonment and a fine of Rs 2,000 is not much of a deterrent. Data on such penalty imposition and its effectiveness in ensuring compliance to the Act is also not available¹⁸.

Provision for Living facilities

Construction projects being of a finite duration cannot afford to provide for formal living facilities for the temporary workforce at the site. Solutions for proper accommodation arrangements for the guest workers should address the two streams of long-term and short-term migrating workforce separately.

Living facilities for the workers can either be done by integrating these facilities in the overall real estate development plan or by the developer facilitating low-cost rental housing in the nearby areas. The available government funding could be used to create low-cost housing for construction workers during the project execution phase. It could then be sold out to the socially and economically weaker sections of the society through a transparent allotment process. This would require substantial effort at government policymaking and implementation levels. Alternatively, dismantlable or portable housing units could be provided.

Under the BOCW Act, some State Governments have extended financial assistance to construction workers for

building their house on own land, for example, the UP State Government provides Rs 45,000 to such workers against proof of domicile certificate and land ownership records¹⁹. However, as can be easily understood, such provisions would not apply to guest workers who would not be able to produce such documents.

According to news reports²⁰, the Maharashtra Labour Department plans to construct 1 lakh houses for construction workers as part of the Pradhan Mantri Awas Yojana (PMAY) at the cost of INR 500 crore. Only registered workers would be eligible to avail of the facility. The NSSO data shows that out of 27.53 lakh construction workers in the State of Maharashtra, only 6.88 lakhs are registered with the Labour Department, and out of these, only 3.45 lakhs registrations were active. The Government of Maharashtra has also announced schemes for providing nutritious meals to construction workers for Rs. 5 (“Atal Ahar Yojana”), pension to workers above the age of 60 years (“Shramev Jayate Yojana”), and medical facilities up to INR 1.5 lakh per worker (“Jan Aarogya Yojana”).

Planning of Worker Accommodation at Greenfield Sites

Some industrial and infrastructure projects identify land area demarcated for the establishment of construction workers camp. In Government-funded projects, land for establishing worker camps are arranged on Government-owned properties when available nearby. In real estate development projects, mostly financed by private developers, facilities for accommodation of guest construction workers are not usually planned by most. There is no data available on the number of construction workers engaged at project sites versus real estate and other infrastructure sectors.

To assess the number of construction workers that would be required at a site, productivity assessment is needed to be carried out at the planning stage of the project. Central Public Works Department (CPWD and BIS IS 7272 provide standard work units per person for various categories of construction activities. Using that data, a Project Planner can estimate the workforce requirement

in different phases commensurate with construction work volume to determine the need for living facilities required in various stages of the construction work at the site.

Figure 4 shows typical temporary housing types that can be used for construction labour accommodation. The temporary housing facilities which are of modular design, can be easily assembled and dismantled. These can be reused at the end of construction work by transporting to another worksite.



Figure 4: Temporary prefabricated units for construction worker accommodation

A suggested basic framework of facilities, using the guidelines, are given below to be provided at new construction sites.

Sites with a small workforce of less than 50 persons and project duration not exceeding one year, a separate labour camp may not be planned. The construction workforce could be provided with accommodation in a camp and where possible within the first phase living facilities of the main project.

Most residential projects have provision for a common club/ community centre in the development plan; commercial building projects usually incorporate a parking facility or an annexe building for services; industrial projects include office/ command centre buildings. Well planned living facilities would be ideal. Alternatively, the utility/ office buildings could be developed first at the site along with other construction enabling facilities using the minimum number of construction workforce who could be provided temporary accommodation in mobile housing units. After the building is constructed and partly functional, it could serve as accommodation for the larger batch of construction workers for the significant phase of the construction.

For sites with large workforce requirements for longer

durations, separate construction worker accommodation needs to be planned either on-site or off-site. While for Government-funded projects, the contracts call for minimum requirements for workforce accommodation on Government-owned lands, in contrast, such conditions are not always spelt out in private developer-funded projects. For these large value projects provision of living and health facilities for the workers must be made compulsory through Government regulations and be a part of the project cost. The minimum standards to be adopted for such facilities should conform to the guidelines of ILO/ UNDP/ OSHA/ WB/ ADB/ EBRD or similar agencies. Figure 5 shows a typical layout of construction camp called for in a Government contract and Figure 6 shows arrangement for worker accommodation at a project site managed by Tata Consulting Engineers (TCE).

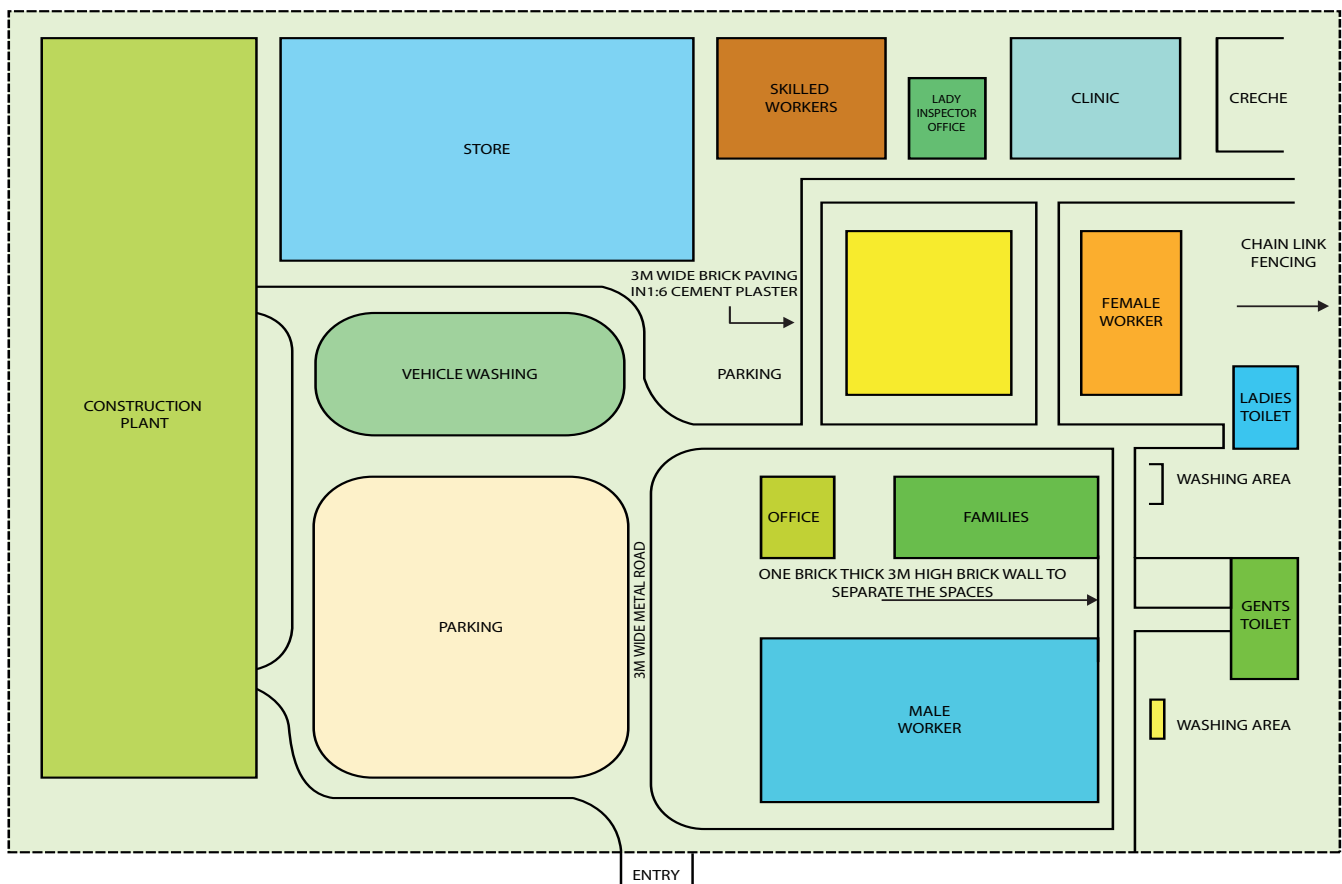


Figure 5: Typical layout of Construction Camp for a Government-funded project



Figure 6: Google Map image of a project site showing Labour Camp and Training Centre.

Labour camp in Figure 6 is for an occupancy of 616 persons with ten toilets, ten bathrooms, two drinking water facilities, seven kitchens. All rooms have tube lights, ceiling and pedestal fans. Separate washing area for clothes and utensils.

In the case of Smart City projects, LIG housing development should be included as part of the area-based development (ABD) in the first phase of project development. The units could be constructed with mechanised construction techniques of prefabricated/pre-cast construction to reduce dependence on manual workers and subsequently they could be used as housing for construction workers during the significant part of the overall city development program. That would alleviate the problems of standard accommodation and facilities for the guest workforce and incorporate the principle of inclusive development of weaker sections of the society and go a long way in the elimination of the urban slums.

Prefabricated housing solutions are available (e.g., Tata Steel's "Nest-in – Habinest") that offer light gauge steel construction for Mass Housing²¹. Such solutions can



Figure 7: Worker accommodation and facilities at the project site managed by TCE

be used to create temporary housing for guest workers at construction sites. The structures being of steel construction are robust, durable and reusable from one project site to another and offer a sustainable solution for construction worker housing.

Regulatory Approvals for Projects Linked to Labour Camps

Government of India has under the Ministry of Labour and Employment enacted laws dealing with Building and Construction Workers, which are to be implemented through the office of the Chief Labour Commissioner (CLC). The Act requires the formation of an Advisory Committee at both the Central and State levels along with Expert Committees. The Government can appoint Registering Officers for implementation of the provisions of the Act by power conferred on the Officer by the Act, which includes power for registration of establishments through an application process, revocation of registration and disabling non-registered establishments from engaging construction workers.

The Act also provides for registration of the construction workers as beneficiaries for receiving benefits under the provision of the fund set up through the collection of Construction Cess. A Registered Worker is to be provided with a photo identity card that also details of the building construction work carried out by the worker, and the card must be produced for Inspection when required. The Government should also lay down rules for work hours, rest day in a week, determination of fitness for work, minimum wages and overtime work payments for construction workers.

Employer establishments having more than five hundred construction workers are required to constitute a Safety Committee and appoint a Safety Officer. In view of the number of accidents occurring during construction it would be advisable to appoint a Safety Officer for 100 or more workers at a site. Safety Rules of the Government are applicable to construction sites.

The Act also requires the formation of a Welfare Board at the State level for providing welfare benefits and measures. The Board is required to maintain accounts of

the fund subject to audit by the Comptroller and Auditor General (CAG) of India.

Contractors are required to maintain a register and records of the workers employed, work performed, numbers of hours of work in a typical day, rest day, wage payment and receipts. Penalty provision are incorporated for violation of rules.

The Director General of Inspection appointed by the Central Government lays down the standards for inspection applicable pan-India. The State Governments are to appoint a Chief Inspector of Building and Construction to ensure compliance to provisions of the Act in the State. At both Central and State levels, the required number of Officers are also appointed as Inspectors.

Industry 4.0 Applications at Sites & Labour Camps

Digitalisation has made a number of tasks easier and enabled them to be tracked in real time. The movement of construction labour and review of the work performed, and progress can be made using remote monitoring systems. Their safety and health can also be easily tracked.

Labour movement at the site can be tracked by using RFID tags that can trace the position of the worker at the site during the working hour. Use of CCTV camera at worksites can follow the movement and work performance of the construction workforce. It also aids in improving the safety and health condition of workers without the physical presence of a Safety Officer at the site. It would help take urgent action in case of accidents or other health incidents.

Use of tracking and monitoring systems through IoT applications have opened new digitally enabled ways of tracking and monitoring the workers and activities at the site. In this section, some of these applications and their uses are discussed.

RFID and BIM-Enabled Solution

A paper published in the Journal of Information

Technology in Construction discusses the integration of RFID and BIM using RFID tags, readers, fixed turn-style readers, mobile hand-held devices and cloud server for tracking persons in real-time to control safety, security and workforce onboarding protocols²².

GAROFID

The RFID based system tracks workers, contractors and visitors at construction sites for enhancement of safety and productivity.

It can track and locate workers in zones of 20 to 120 m (65~400 feet) radius, monitor movement of workers and analyse the data to target areas of better work management, streamlining of attendance system and provide a real-time view of the construction site in various zones²³.

Construction Labour Tracking System

Another application case is the CLTS for measuring Labour Productivity. This technique uses two-way communication among workers, supervisors and site engineers along with tracking through Geographic Information System (GIS) to collect and measure performance. It can be used to monitor Labour in the work area and to identify crowded zones at the project site²⁴.

SAP

This tool helps track time spent by Labour and work performed at the site, record compliance to regulatory requirements, improve workplace efficiency, and manage pay rates for piece work.

Tracked information can be viewed through customised reports, obtain supervisor approval for time entry and process payroll and billing systems. The features of the tool include check-in time stamp, time spent at the worksite in a designated area and outside, manage labour charge codes, check out time stamp, summarise labour tracking data, edit and approve time records, and view labour tracking reports. Though it is used primarily for shop floor monitoring in production facilities, it can be customised for use in building construction sites²⁵.

B2W Track

B2W is a web and mobile-based software used for recording, communicating and analysing work progress. It helps managers and supervisors keep better track of construction work through data acquisition on-field momentum (productivity, labour attendance, material and equipment), make better decisions using accurate and current data and implement cost control measures²⁶.

Trimble LEM (Labour Equipment Materials)

It is used to increase the precision and volume of field productivity. It provides facilities for collection of real-time data, report generation, onboarding of workforce, time and attendance management and intruder detection. Different modules are available for concrete structures, steel structures, MEP services, architectural and general work solutions to perform functions of design, construction and operation of the facilities. Remote Construction Site Monitoring (RCSM) tool provides a real-time view of construction progress²⁷. It can be used to monitor workforce presence at the site, automate compliance, security, health and safety checks, enable remote communication with site teams, monitor site security, contactless site entry and wellbeing checks.

Litum Real-Time Location System (RLTS)

IoT construction network using RFID tags and stationary receivers can help track movement of assets and workforce and provide bird's eye view of the overall workflow. Litum uses ultra-wideband frequencies in 6 GHz range for communication.

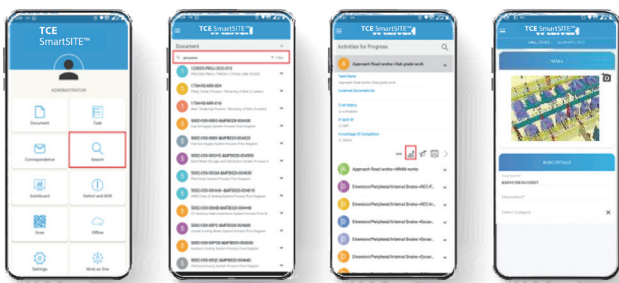
It collects data continuously from RFID tags and readers on workers, equipment used, vehicle movement, working hours, and maintenance records. It helps optimise and improve resource management, monitor and log actual labour hours.

Facilities are available to track safety records like entry to the unauthorised area, detect falls and trips, motion sensors to detect worker not having moved for a long time, and SOS button is used for sending emergency alerts. Additional equipment sensors are also available

to track potential hazards of an impending collision, geofencing sensitive areas, enforcing skill level certification for a specific task, monitoring temperature and detection of hazardous gases, prevent equipment loss and theft²⁸.

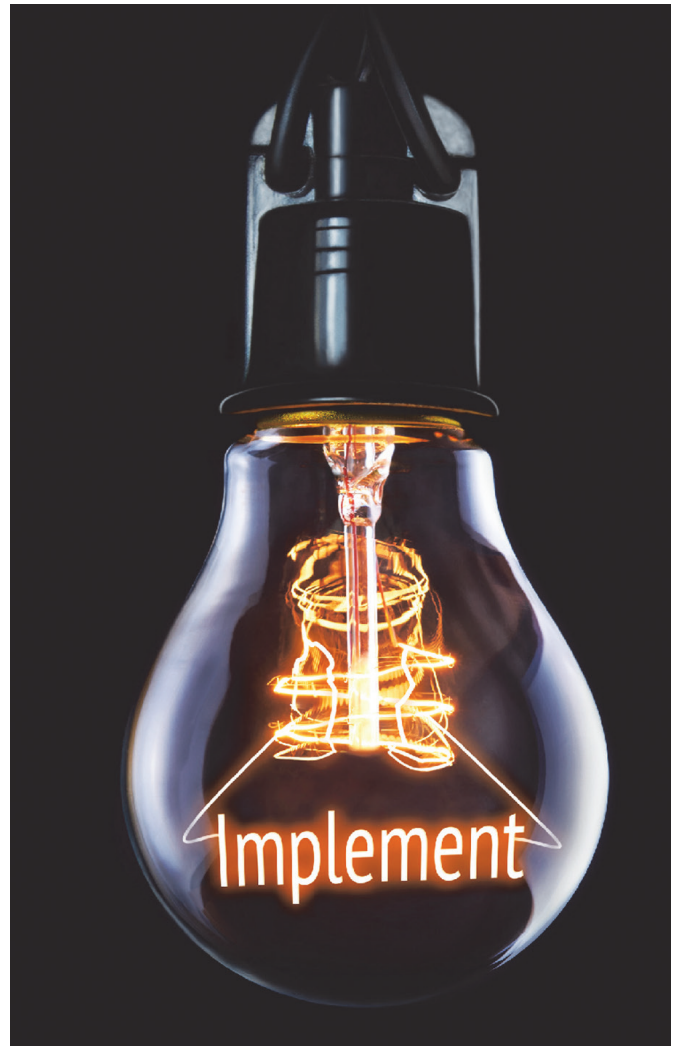
TCE Smart Site solutions

Tata Consulting Engineers (TCE) has developed a desktop and mobile-based application called SmartSite™ that can bring all stakeholders at a construction site on a single platform. The application supports Digital Collaboration and Mobility, the key trends to help construction players in their Digital Transformation. The app is an amalgamation of 60 years' experience of TCE and agility brought by the real-time information sharing. It enables tracking and managing all engineering documentation for the project, collaborate digitally through electronic review and correspondences and ensures better visibility of project status through real-time dashboard and reports. There is also an application "Suraksha" to track site safety indicators. The app is also used for capturing the daily data of all the people available on the construction site. This data helps in segregating the workforce according to the skill category viz. skilled, unskilled or according to their trade. In future with the use of RFID/NFC ID cards, once a worker punches in attendance, the data can be captured and analysed. The registry data, health records, location of residence, work assigned, and area of work can be analysed for insights to ensure their wellbeing.



Role of Engineering, Industry Associations and Government in Ensuring Implementation

Engineering associations such as IEI, CEAI, ECI, CIDC, BAI, et al. and Industry associations such as CII, FICCI, ASSOCHAM, et al. act as an intermediary between



the Government and the work & industry sector. The associations represent the collective voice of the various sectors for discussions on policies and regulations formed by the Government. The discussions aim to boost the business and contribute to the economic growth of the nation. The association advise the Government for developing business regulations and practices towards sustainable operations. The Government also consults this body of experts before formulating standards, policies and schemes. In this role, the associations can help the Government develop policies for ensuring social benefits to the construction workers. The associations and their members can arrange workshops and awareness sessions for disseminating the knowledge of the benefits to the workers through dialogues. They can also engage with the government officers as part of the Inspection

teams to ensure compliance with the rules and regulation at construction sites.

Another extremely important area where the associations can contribute immensely is in skill development and enhancement program for workers. The percentage of low skilled workers is very high compared to skilled and highly skilled workers.

With the construction industry moving towards more mechanised construction, reskilling, new skill development and expertise in operating construction machinery are becoming increasingly important. The associations and their member organisations can carry out skill development programs either as part of the Corporate Social Responsibility (CSR) activities or in partnership with NGOs.

Suggestions

The article has highlighted the importance of the construction industry to the Indian economy, the role of the 'guest workers' in the construction industry right across the country, the severe conditions under which the workforce performs, the regulatory provisions under various Acts, international and national practices for the provision of decent living conditions and social benefits to the workforce. Against that backdrop, the opportunities for improvement of the situation have also been highlighted in respective sections. The following suggestions are presented for implementation for complete regulation of this unorganised workforce sector and improving the living conditions at construction project sites.

1. Make registration of all construction workers compulsory under the BOCW Act. The registration should be linked to Aadhaar and Jan-Dhan account of the workers. The registration should be with the State Welfare Boards, but the documents should be valid pan India.
2. The social security/benefit provisions provided in the welfare measures stated in the Act such as PF, Ration Cards, ESI registration should also be mandatory and linked to the registration. All information should be stored on digital platforms, and simple smartphone-based application tools should be available for accessing and using the data.
3. Strengthen the institutional arrangement at government level (mainly by State governments) for improving the collection of the Construction Cess and utilisation of the Welfare Fund created out of the Cess collected for providing pan-country social security benefits to the registered workers.
4. Improve awareness among the workers on the benefits of enrolling through the State Welfare Boards through campaigns by the State government, Civil society organisations, Engineering and Industry associations using public communication, social and digital media.
5. Develop and deploy continuous skill development program to elevate the skill level of the workers so that they can engage in jobs requiring higher skills for better remuneration, ultimately improving quality of work and their productivity plus their means of livelihood.
6. Project specifications should especially provide for proper living and health facilities for construction workers at site as minimum requirements. The living facilities at worksites should be as per the requirements of BOCW Act and international guidelines by ILO, OSHA, IFC, WB, ADB and other reputed institutions.
7. Living facilities for construction workers can be either temporary or portable or use portions of the permanent construction of the project in a planned manner.





8. Control and regulatory measures should be put in place that relates the project approval/ sanction to the minimum level of acceptable living standards, and health and social benefits of the construction workers. Government bodies, along with the engineering and industry associations, can be authorised to review the provisions made for the construction worker in the Detailed Project Report/ Project Execution Plan documents for Financial Approval of a Project.
9. During project execution, mandatory check and inspection of the worker registration and employment process deployed by the contractor and the implementation of the provisions of social security benefits should be carried out by Government Officials/ Authorised Agencies appointed for the purpose with assistance from the Engineering and Industry associations.
10. At the construction site, use of digital platforms to be encouraged for checking and monitoring the regulatory compliances of the guest workers vis-à-vis the living facilities provided through CCTV, tracking health condition of the workers through mobile-based applications, monitoring their movement at the site through GIS/ RFID based monitoring systems, work safety requirements, etc. would lead to better productivity and engagement of the workforce.

Conclusions

The plight under which the 'guest workforce' in the construction industry was working was brought to light during the lockdown imposed to contain the COVID19 pandemic. Their miserable condition was reflected in the

mass exodus of the workforce from the construction sites or the urban areas where they worked on daily wages. A survey conducted by Gleeds India Insights shows about 50% to 80% of workers had left the work sites. In India, a significant part of the construction industry is dependent on manual labour, both skilled and unskilled and the absence of the guest workforce lowers productivity and causes delay in projects underway.

Though some activities of construction can be mechanised and prefabricated construction adopted with the infusion of new technologies, the imperative would be on getting the workforce back at the site which the surveys show may happen around last quarter of 2020 or first quarter of 2021. Without the workers, the construction industry is finding it very difficult to restart operations on the pre-pandemic scale.

While reopening construction sites and before deployment of the workforce it would be advisable to include compulsory worker registration, provide proper living conditions, and social benefits including compulsory PF, ESI registration, and health and safety requirements to maintain hygiene standards and social distancing norms.

The social distancing norms may affect productivity requiring additional workforce. To make the construction activities at site cope with the "new normal" way of working, new construction technologies like BIM, Reality Capture, 3D Printing, prefabrication and pre-casting, use of IoT based sensors and monitors for remote monitoring of workforce and site activities will gain prominence. Mechanised construction using more equipment and heavy piece handling machinery through product-based design approach, prefabricated and modular construction with standard designs, improved contract clauses for workers, and revised site execution procedures would see an increase in these applications.

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The Government has also realised the need for ensuring better work and living conditions for guest workforce in the construction industry. As this study shows, there are regulatory provisions for governing the requirements and benefits to construction workers. However, the level of implementation of these Acts in projects has not been at the desired levels. There are reports in public news media about Government planning to rethink on the definition of the 'guest workers' and the introduction of new/ additional legislation for enhancing social security is being planned by the Labour Ministry. The law would provide for workers to enjoy the benefits across the country and would also include unorganised sector workers by recognising this sector through Unorganised Worker Identification Number (U-WIN). This registration is proposed to be linked to the Aadhaar database and accessible to the Centre and the States. While the process of framing and enacting new laws to benefit the guest workforce in the construction industry would be welcome, ensuring better implementation of the available legislation through available means and using digital tools for creating, managing and utilising the data would go a long way to ensure the due respect to our Nation Builders.

Disclaimer

This article is based on research and analysis of material available in the public domain and hence the correctness of the contents is subject to their being correctly reported therein.

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Maintenance of Hydraulic Structures - Some Case Studies



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1. Introduction

After independence, India has grown its infrastructures all over the country e.g. roads, railways, metros, tunnels, bridges, buildings, dams, barrages, canals, heavy industries, ports, airports etc. through successive Five Year Plans. All these infrastructures, built at enormous costs, need annual/ periodic maintenance in order that they perform as planned with a view to extend their life for providing proper service to the Nation. Residual life and performance of all infrastructures depend not only on proper planning, design, quality of construction and construction materials, but also on proper maintenance so that they continue to serve the purpose for which they are built. There are several instances where it is noticed that a large amount of public money is invested in creation of infrastructures but they are not used efficiently and are not properly maintained, thereby drastically reducing their life as well as return commensurate with the investment. Thus, the question that arises is - Should the country build infrastructures which cannot be maintained? In this paper, some of these issues are discussed with reference to a few hydraulic structures like dams, weirs and barrages, canals and structures, roads and cross-drainage structures like bridges and culverts and flood embankments.

2. Performance and Maintenance of Hydraulic Structures

Unlike buildings where there are a lot of private

investments, most of the hydraulic structures are constructed, operated and maintained by the government-both Central and the States. People in general don't take interest in these properties since they consider the public properties as not belonging to them and there is hardly any public participation in the operation and maintenance of these structures often resulting in their poor performance. Some of these issues are discussed sections 2.1 to 2.6 in the paper.

2.1 Dams

More than 6000 dams (GOI, 2019) – high, medium and small -have been constructed all over the country. Dams which are classified as rigid masonry dams may be of gravity type, arch type or buttress type. Flexible dams are built with earth and rocks. Rubber dams (inflatable ones) can be built for heading up of water during lean flow period and removed during flood season. The main purpose of dams is to store water during monsoon for the purpose of water supply during lean season and drought period. Dams are also used for flood control and hydro-power generation. Rigid concrete or masonry dams need less maintenance compared to flexible ones. However, water seeping through innumerable joints and inspection galleries pose a lot of problems unless inspected, repaired and maintained properly. Besides loss of water, seeping water may cause structural problems which requires constant vigil and regular corrective measures.

Rigid dams, if overtopped due to inadequate spillway capacity, may not fail. These are designed as earthquake resistant structures. Flexible dams, on the other hand, would fail due to overtopping. Failure may take place also due to uncontrolled seepage resulting in piping and sand boiling, undue and differential settlement, cracks, flood erosion, slope failure, burrowing of animals, etc. They need constant attention and maintenance. There are several instances of wash out of flexible dams causing flood damages downstream.

One of the major concerns in all dams is silting of reservoir and loss of live storage capacity (Deepa, 2015; Mazumder, 2016; CBIP, 1980,) associated with loss of water supply initially promised. Flushing of sediments may restore some capacity and dredging to remove sediments is highly costly.

2.2 Weirs and Barrages

These are low height obstructions usually provided for flow diversion. Innumerable weirs and barrages have been built all over the country for irrigation,

drinking water, navigation, hydro-power, etc. Barrages are invariably provided with gates for heading up of water level in all run-off the river schemes for hydropower generation. A Typical barrage section is shown in Figure-1 illustrating different components e.g. spillways, gates, piers etc. for diversion of flow to head and tail race canals/ tunnels, desilting units, power house, etc. All these components need regular maintenance for efficient operation and for increasing life span. Spillways, energy dissipaters, tunnel linings, turbines, gates, piers, etc. are often damaged due to rolling sands, stones, debris, etc. carried by the flowing water. In case of Kosi and Farakka barrages there is severe problem of bank erosion and threat of flow avulsion. Huge amount of money has to be spent for river training in both Kosi and Farakka barrages (Mazumder, 2004; Chitale, 2009; CBIP, 1992) for their safety.

2.3 Canals and Canal Structures

After partition of India, most of the canals built in pre-independence years went to Pakistan, except the Ganga Canal and few others. Government of India built numerous multi-purpose projects with canal networks -mains, branches, distributaries, water courses, field channels, escapes, drainage channels, etc. A large numbers of canal structures e.g. aqueducts, siphons, regulators, drops, flow meters, silt ejectors, escapes etc. were to be built for conveying, operating and distributing irrigation water to the agricultural farms and disposal of excess water. Some of the canals are lined, however, a majority of them especially the mains and the

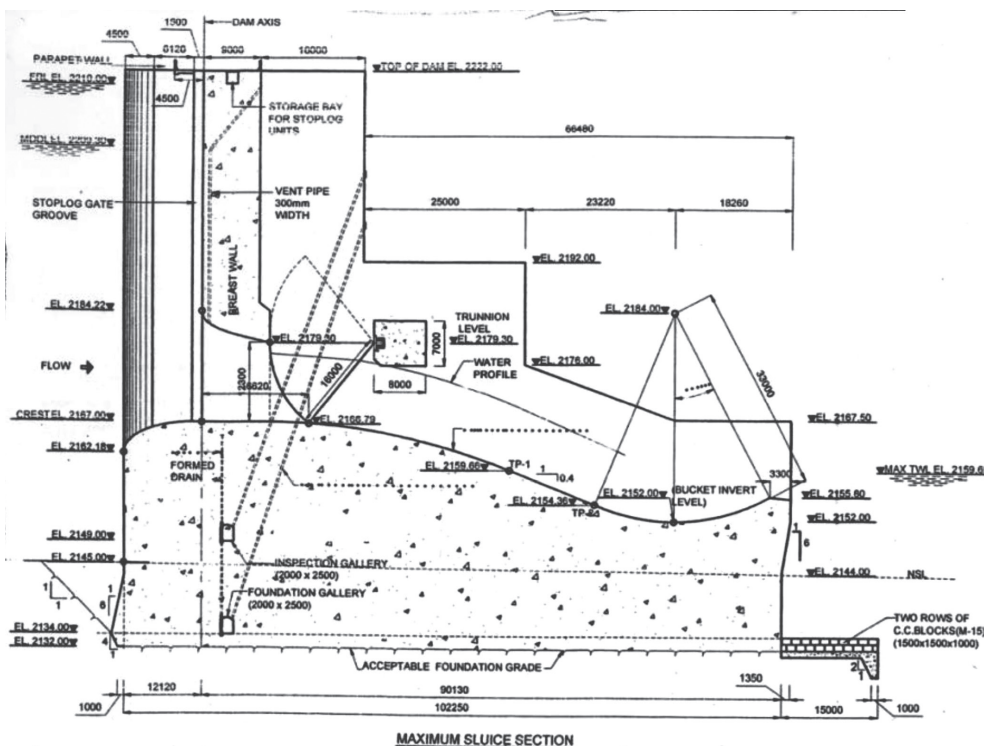


Figure-1: Showing a Low Head Barrage with Piers, Gates, Galleries and Spillway

branches are unlined because of their large size. There is thus huge loss of water (Bharat Singh,1991; CWC,2010, Mazumder,2016) in conveyance due to poor maintenance of the canals.

During the British period, 85% of the annual maintenance cost of canals used to be realised from irrigation revenues. Today, the revenue earned is so poor (due to the Government policy of free water and electricity supply) that hardly 15% of maintenance cost can be met from revenue earned (Mohile,1994), leave apart the cost of operation, administration and interest payable to borrowers. It is estimated that 20 to 30% of irrigation water is lost (Mazumder,1986; Mazumder and Kumar,2015) in conveyance and about 10% in evaporation from open canals. The other mode of water transport through closed underground pipe systems to minimise the water loss is a costly proposition. One of the fundamental reasons for the current state of affair is lack of participation and involvement of farmers who think that the canals are Government properties and the owner is responsible for their maintenance. This has resulted in poor performance, loss in carrying capacity due to silting and scouring, weed growth, etc. in the canals. Timely supply of canal water, in required quantities, equitably distributed amongst farmers needs a lot of co-ordination and public participation.

2.4 Roads

Design life of a road is drastically reduced due to lack of proper maintenance. Cracks, pot holes and other distresses are often observed in road pavements resulting in poor riding quality, hydroplaning, slow speed, traffic congestion, etc. Erosion of shoulder is often found due to improper camber and not being paving the shoulder, as shown in Photograph-1. Photograph -2 shows cracks in a rigid concrete pavement.

One of the common problems often experienced in both urban and rural roads is inadequate drainage of surface water during rainy season due to accumulation of debris and silts in kerb inlets



Photograph-1: Damage to Road Shoulders



Photograph-2: Showing Crack in a rigid concrete pavement

because of their improper location, spacing and size. Photpgraph-3 illustrates a hilly road in Mizoram where all the pavement materials was washed out and the base material was exposed due to inadequate drainage system and growth of weeds on shoulder obstructing free movement of surface run-off from the pavement as well as inadequate drains and size of drains to intercept the run-off from the uphill region. Most of the foot hill drains were blocked by debris and stones eroded from the adjoining hill reducing the conveying capacity of the drains.



Photograph-3: Washing out of Pavement in a Hilly Road in Mizoram due to Improper Drainage

Another important reason of road subsidence and cracks on road surface is inadequacy of sub-surface drainage of water seeping from cracks, joints, pot holes, shoulders, etc. from top surface of the road. Capillary rise of ground water, unless intercepted by properly designed drainage layer, is responsible for loss of strength of the sub-grade. A layer of GSB must be placed below the drainage layer in order to arrest movement of fines from sub-grade to drainage layer thereby reducing its permeability and draining capacity.

2.5 Cross-Drainage Structures

Innumerable cross-drainage structures are to be built in both canals and roads for free movement of water without undue afflux and other associated problems. Inadequate cross drainage without proper planning and design often result in severe problems often resulting in their poor performance and reduction in the life of the canals and the roads.

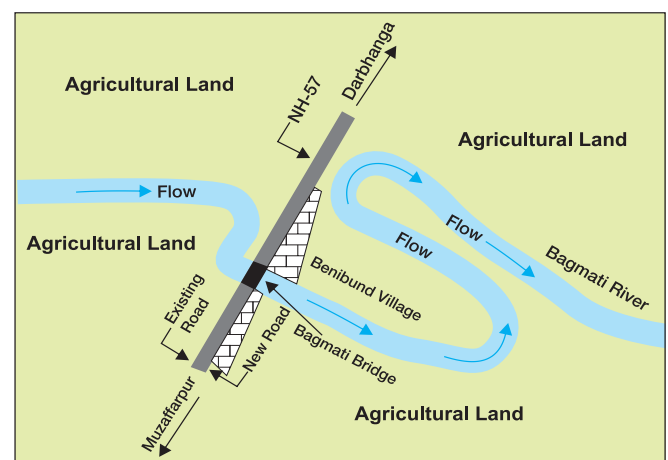
Culverts are an integral part of roads. Unless properly planned, located, designed and maintained, their conveying capacity is drastically reduced. Photograph-4 illustrates the inlet condition of a typical culvert in a road in Mizoram. The inlet is blocked due to growth of weeds, grass, etc. and stones deposited near inlet. Most of the pipe culverts in a hilly road are pushed from a deep pit at the entrance. Unless the stones, silts and debris deposited



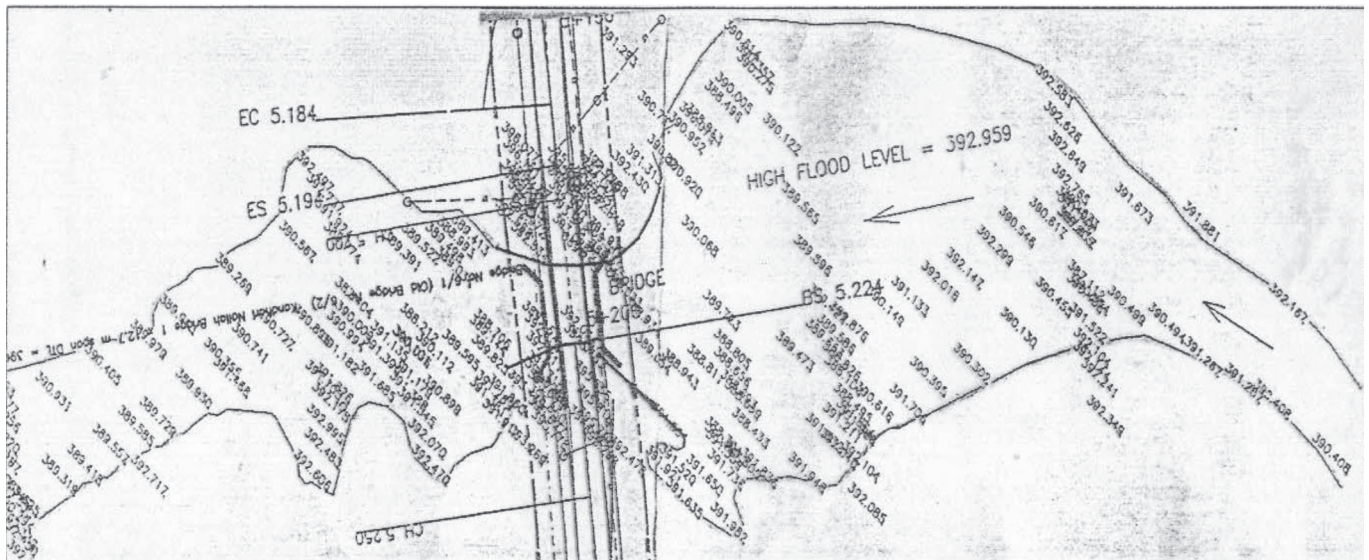
Photograph-4: Weed Growth near Culvert Inlet in a road in Mizoram

in these pits and within the culverts are cleaned, their conveying capacity is reduced resulting in high afflux and submergence of approach road adjoining the culverts.

Bridges are to be provided over all stream crossings in roads, railways, canals, drains, etc. Any negligence in their structural design would cause incipient failure of the bridge when it is opened to traffic. Inadequacy in hydraulic and hydrologic design (Mazumder,2017) may not cause immediate failure but it would cause perennial problem of maintenance. Figures-2 and 3 illustrate a few typical cases of distresses observed by the author while



Photograph-5: Plan view of Bagmati River Showing Sharp Bends U/s and D/s of Bagmati Bridge on NH-31 in Bihar



Photograph-6: Formation of Bowls U/s and D/s of a Bridge on NH-57 in MP likely to be Outflanked due to Excessive Restriction of Waterway

working on projects. The approach roads were damaged. The problems arose due to inadequacy of waterway under the bridges constructed in wide flood plains. The cost of river training and maintenance may sometime exceed the cost of a bridge. Annual maintenance of the superstructure and foundation of a bridge is a must for safety and for extending the life of bridges.

2.6 Flood Embankments/ Levees

As per the “Rastriya Barh Ayog” report (1980), India built 5,300 km of flood embankments/ levees all over the country before 1954. After the extra-ordinary 1954 flood, 16,000 km of levees were added by 1980. By the end of the XIIth Five Year Plan, the total length of levees built all over the country, was 37,062 km. These embankments/ levees protect both agricultural land and rural and urban properties. Flood protection measures consist of building dams, flow diversion, shifting of houses to a higher elevation, etc. (Mazumder et al,2018). However, the most effective measure for flood control to prevent damages is to construct flood embankments in areas susceptible to flood damage due to overtopping of river banks. They are also constructed upstream and downstream of barrages in the plains to contain afflux upstream

and for the safety of the barrages e.g. Kosi barrage (Sanyal,1980), Farakka Barrage (Mazumder,2015), Gandak barrage, etc. The Brahmaputra River and its tributaries flowing through Assam, and the Ganga River and its branches flowing through UP, Bihar and West Bengal cause flood havoc almost every year due to the large volume of water flowing from their respective catchments. In all these states, flood embankments exist along river banks to protect areas affected by floods.

Levees are usually not built to the same stringent specifications like earthen dams which are built across the rivers. Hence, constant vigil and maintenance are needed to avoid failure of the embankments due to multiple reasons e.g. overtopping, sliding, erosion, settlement and cracks, inadequate sluices, burrowing by animals, etc. Embankments breach also by direct attack of river due to meandering and many other problems related to river behaviour and morphological changes in the river within the embanked reach, etc. Breaches in Kosi flood embankments (Mazumder,2011; Chitale,2009; Sanyal,1980) and afflux embankments have caused devastating floods resulting in loss of life and properties, communication problem, and unimaginable human sufferings – especially for poor

people who live near river banks and flood plains (Photographs-5 and 6).



Photograph-5: Disastrous floods in Malda District in West Bengal due to breach in Marginal Flood Embankment U/S of Farakka Barrage in 1998



Photograph-6: Devastation brought about by flood of River Kosi due to change of its course after a breach in left Afflux Embankment in 2018

Flood embankments are owned and maintained mostly by Government and there is hardly any people participation in their maintenance. This is one of the major reasons of failure of embankments leading to breaches and floods. The other reason is lack of appropriate knowledge of river behavior and morphology of the river (Garde,2006). Failures of

embankments are not properly investigated in India since the interest is generally more in construction rather than in maintenance. River training measures adopted are found to be not only highly costly but ineffective too due to inadequate investigations. Since most of the flood control measures are undertaken in a haste under emergent condition and a lot of money is involved in flood relief - the quantum of money actually used for the purpose is questionable.

3. Operation and Maintenance of Hydraulic Structures

Operation and Maintenance of hydraulic structures require knowledgeable, experienced and trained personnel, regular inspection, repairs and upkeep (Sheng-Hong Chen). Inspection implies the observation of the state of the structure, repair and restoration of the structure to its original state. Two main classes of maintenance are discerned: Corrective and Preventive Maintenance. When a Corrective Maintenance strategy is applied, the structure would be repaired after failure. In a Preventive Maintenance scheme, the structure would be repaired at specified intervals defined in time or operational hours before failure occurs. In a more refined strategy, the state of the structure is inspected at such intervals. On the basis of the inspection result, the decision to repair is taken.

Persons responsible for Operation and Maintenance of hydraulic structures must be conversant with the following:

- Standing Operating Procedure (SOP) and Operation Schedules,
- Maintenance and Vigilance procedure for the structure,
- Maintenance and Operation schedule for all control equipment,
- Identification of signs of deficient behaviour,
- Reporting procedures of Emergency Situations and Emergency Repairs,
- Training, updating and knowledge of personnel concerned
- Regular updating of relevant codes by BIS, IRC, etc.

Periodical Inspection of hydraulic structures is necessary specially before and after monsoon season to ascertain/ examine their condition and functioning. The main purposes of carrying out Periodic Inspection are:

- a. to ensure adequacy of the structures to serve the purpose for which they were designed,
- b. to verify the conditions of the structures and monitor their behavior,
- c. to investigate conditions that might cause distress to the structures, and
- d. to study the extent of deterioration based on which maintenance and repairs are to be done.

4. Agencies/ Stake Holders Involved in Operation and Maintenance

Usually, the owner of infrastructures is responsible for Operation and Maintenance. In most of the hydraulic structures discussed under section 2 above, the Government-both at the State and Central levels- are the owners and the responsibility of Operation and Maintenance lie with them. The Central Water Commission (CWC) under the Ministry of Jalshakti, Government of India has the responsibility of Operation and Maintenance of big dams (like Bhakra dam, Tehri dam, etc.) and big barrages (like Kosi barrage, Farakka barrage, etc.). Responsibility of Operation and Maintenance of the numerous medium and small dams and barrages owned by the State Governments lie with the respective States. Flood Embankments, except a few owned earlier by local Zamindars, are maintained by the States to which they belong to. The same is the case with canals and canal structures unless owned by private bodies like Jain Irrigation System, etc. In the road sector too, maintenance of National Highways and Expressways are carried out by NHAI, CPWD under the Ministry of Roads Transport and Highways, Government of India. However, majority of the State roads, District roads, Village roads, etc. lying within the jurisdiction of the States are maintained by the State Public Works Departments and other local bodies of the respective States. Canals and canal structures are usually operated and maintained by the Water Resources/ Irrigation Departments of the respective States except for centrally

sponsored Government projects like Rajasthan canal, Bhakra Nangal canal, Hirakud canals, DVC canals, etc. owned by the Center. Cross-drainage structures like bridges and culverts are to be maintained by the authorities owning the roads. River training, however, is extremely costly and needs deep knowledge of river morphology. Depending on the river size and flow, the training works may be executed by either the State or the Central Government body like CWC.

5. Some Concluding Remarks

After Independence, India has invested a huge amount of public money in building numerous infrastructures for the prosperity and progress of the country. Initially, there were a lot of problems due to paucity of data, lack of proper planning, deficiency in design and construction, etc. Now the country possesses the knowledge and expertise in building almost all infrastructures needed for growth and development of the country. It is, however, extremely important that the infrastructures created must be protected, operated and maintained properly to get the returns, improve their performance and increase their life span as envisaged. Proper planning, design and construction are intimately related to recurring maintenance cost. In the domain of hydraulic structures discussed in this paper, there is an urgent need to further improve upon by updating knowledge and experience in order to achieve higher efficiency and better performance. The Operation and Maintenance manuals wherever developed, need to be implemented more effectively.

With the current technology available all structures can be remotely monitored 24x7 and their behaviour tracked and observed. Sensors can be programmed to raise alarms in case the behaviour crosses a threshold limit. Aerial monitoring can also be done and that would save a lot of time. Use of IoT must be enhanced to monitor, repair and maintain all the assets built for the development of the nation.

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Development, Growth, Safety, Health, Sustainability, et al are the terms often heard now a days since they are synonymous with progress and providing a better quality of life for the people. Let's look at who all are involved in making theses a reality and also ensure that they continue to function and perform as intended. The person who comes up with the idea or dreams of one, is ofcourse the first one the initiator. That person could be from any strata of the society, any sphere of activity and any profession; need not even be educated as per current curriculum. All that is required is the ability to think systematically and rationally after the *eureka* moment. To turn that idea in to reality would thereafter need others to be brought in, first to develop that concept further, next to study its feasibility and if viable to take it forward. Depending on the sector that the idea pertains to, specialists from that sector would be required. However, **to make the idea fructify, Engineers are a MUST.**

The **pandemic has amply demonstrated the power of technology** and how that has been able to keep the wheels of all sectors moving inspite of lockdowns.

The Indian Institute of Technology Bombay, which also happens to be my *Alma Mater*, held its Convocation on 23rd August 2020. It was a Virtual Convocation and held deploying 'digital avatars' of the Chief Guest, Guest of Honour, Director, Students, et al. **Would that have been possible without the Technologists?** The Technologists - the Scientists and Engineers are groomed within the hallowed portals of such institutes. It is they who enable

such transformations and progressive deployments from what they learn.

All the infrastructure development that the nation needs – the houses for the millions, the water and sewer systems, the roads, the highways, the railways and metros, the airports, the ports & harbours, the dams and canals, the power plants and transmission lines, oil & gas plants, chemical and industrial plants, nuclear, space and the list goes on. They all need qualified, experienced Engineers with demonstrated capabilities to conceptualise, plan, design, construct/ execute, operate and maintain them. Even for agriculture to yield better harvests, Agricultural Engineers need to be in the forefront. **Without Engineers those ideas would remain a dream.**

Take the case of a building, a project that everyone is aware of. To start with the land needs to be surveyed, the boundaries determined and demarcated, the contour map prepared; next the geotechnical investigations to determine the soil/ rock characteristics and the bearing capacity together with other soil parameters determined; the preliminary layout plans which would have started after the survey work, get finalized. The layout plans would need to be prepared with the requisite inputs from the engineers of other disciplines – structural engineer for the structure of the building to cater to the loads/ forces that it would be subjected to; plumbing engineer for the water supply, waste water and stormwater systems, fire engineer for the fire systems, electrical engineer for all the electrical systems, communication engineer

for the telephone, IT, Building Management and allied systems i/c IoT, HVAC engineer, safety engineer, security engineer, accessibility engineer, people movers/ transportation specialists, etc. **Holistic and integrated planning and execution are a MUST together with a futuristic vision for atleast 30 years.**

The space and the routing of all the services/ utilities are decided by the concerned engineers and provided in the plans. This is a very important phase of a project since the accessibility for all persons must be provided for including that for maintenance (routine or special) during the operating life of the building. Experience has shown that Service/ Utility floors, shafts and ducts are invariably cramped since they are considered as a non-revenue area; they are squeeze fitted. That's the notion amongst Owners, Developers, et al that needs to be changed. If accessibility is difficult, maintenance of services/ utilities cannot be done properly and hence safety and hygiene are sacrificed. Owners, Developers, Buyers, Authorities and all those concerned need to understand this and not wait for a pandemic like situation to start thinking about it. Just like cramped spaces cramp a person's style, so do cramped service and utility areas hinder proper maintenance and consequently the safety and hygiene of the built environment. The floors, shafts and ducts for services/ utilities must provide unhindered, unfettered, unencumbered access to each and every plant, equipment, pipes, cables, ducts, etc. so that apart from providing access for maintenance, routes ingress and egress are also available in times of emergency.

Safety is often taken for granted until a problem occurs and then the inquisition begins. However, if the safety aspects and requirements are addressed and provided for right from the beginning, then the chances of a major problem occurring are slim. Same applies to security matters. With increase in size and the complexity of projects the requirements of each discipline need to be adequately and properly provided for. Engineering should be done only by qualified, experienced and capable engineers and not others.

Engineers have been demanding legislation for the Profession of Engineers for decades. However, for reasons unknown many other professions have been made legally recognized professions but that of Engineers is still not done.

Engineers are by far the largest number of professionals but as yet there is no single authority to register and regulate the profession of Engineering. On the other hand, Doctors, Chartered Accountants, Company Secretaries, Cost & Works Accountants, Advocates and Architects are much much smaller in number but all are covered by legislations. **THEN WHY NOT THE LARGEST NUMBER OF PROFESSIONALS IN THE COUNTRY?**

Legislation for the profession of Engineering is inter alia essential: to Regulate the profession of Engineering, bring in Accountability and Responsibility, ensure Safety of the built environment, ensure a Healthy built environment, and ensure a Livable habitat.

CEAI NEWS

CEAI Diamond Jubilee Celebrations

CEAI is celebrating 60 years of Service to Consulting Engineers and in keeping with the Aims & Objectives to improve the level of engineering in India and also of Indian Engineers at large CEAI is organizing a series of Webinar as their Diamond Jubilee Celebrations. The webinars planned so far are given below. Others that are organised will be intimated on the CEAI website and also via other media avenues.

Sl. No	Topic	Day, Date	Start Time
1	Safety in Engineering	Tuesday, 29-09-2020	10:30 am
2	Emerging Technologies in Infrastructure Sector	Friday, 16-10-2020	3:30 pm
3	Dam Safety and Instrumentation	Friday, 06-11-2020	3:00 pm
4	Operation & Maintenance of Assets	Thursday, 19-11-2020	3:30 pm
5	Digitization in Engineering	Friday, 18-12-2020	3:30 pm

Webinar on Safety in Engineering

The webinar on ***“Safety In Engineering”*** on 29th September 2020 was the spring board for the Diamond Jubilee Celebrations of CEAI.

CEAI's Western Region Centre (CEAI-WRC) therefore organised the webinar with the support from Centre for Workplace Safety and Health, Mysuru, Larsen & Toubro, IIT Madras, Bureau of Indian Standards, NICMAR, Pune and Delhi Metro Rail Corporation Ltd. The event was meticulously planned and executed by Mr. A P Mull, Past President CEAI, Dr. Harshavardhan Subbarao, Chairman CEAI-WRC and Mr. Jeffrey Nambiar, Hon. Secretary and Treasurer, CEAI-WRC.

The thought for the topic was generated on account of the numerous cases reported in the media of accidents and failures at construction sites, chemical and industrial plants, roads, railways, metro lines, etc. Added to those are the natural disasters. How many are truly natural is a moot point, since natural calamities are often the result of human interventions in nature. The regime thrust upon by the pandemic was an added imperative.

Safety is involved in all walks of life however, for the webinar it was limited to Safety in Engineering, a factor that must be considered for all aspects and in all stages of the lifecycle of all built or manufactured assets. Hence, the webinar introduced the overall concept of Safety considering the intricacies involved right from the lowest rung Worker to the Chief Executive and the Board. It encompassed the current status and raised cautions for the future. It clarified as to how digitalization can be adopted for improving safety at the workplace.

Dr. Harshavardhan Subbarao, Moderator of the event, welcomed everyone and informed them of how the programme would be run. He informed as to why the subject was selected, then introduced Mr. Amitabha Ghoshal, President CEAI and requested him to give his opening remarks.

Mr. Amitabha Ghoshal, President CEAI greeted everyone and then drew attention to the fact that nowadays everyone is concerned about their safety which in this year of a pandemic has taken a new meaning. He explained that it is not only the physical safety that one really has to worry about but safety from unseen undetected viruses that have attacked the entire civilization. He added that CEAI as the representative body of the Consulting Engineers and also a Member Association of FIDIC in India took upon itself to bring about an awareness campaign and to have a more elaborate discussions on the subject. **He further added that CEAI not only represents the consultants but the entire engineering industry since consultants not only**

take the engineering fraternity forward but also look after their interest. The consulting engineers would in turn benefit if the entire engineering industry moves forward. CEAI's main aim is to bring recognition to the engineering industry which has not received its due place in society.

Thereafter Dr. Harshavardhan Subbarao took over to conduct the webinar. He invited the speakers and introduced them before they made their presentation.

Dr. Nikhil Bugalia, Visiting Professor, Building Technology and Construction Management Group, Department of Civil Engineering, Indian Institute of Technology Madras spoke on **“Complexity, Safety & Leadership”** since they form the core factors. He gave a Systems approach to Safety and laid the base by explaining the difference between Safety for a Process and Safety against Occupational health and injuries. With the world getting more complex, the key messages for the consulting engineers of India and the way forward according to him are:

- “Safety” is of paramount importance for modern-day engineering systems, and it makes a strong business case
 - ✓ “Nudge” your clients
- “Safety” has moved beyond the realm of technology alone, a socio-technical perspective is necessary
 - ✓ Equip yourselves with the right tools
- “Safety” cannot be imported
 - ✓ Work with your organizations to “research” the factors “local” to the system.

Dr. Bugalia stressed that automation is not a panacea for all issues. Talking of Safety, making business sense, he gave the example of Boeing's losses (after the disastrous crashes of Boeing 737MAX aircraft) and how the safety requirements were also changing the Indian car industry since customers desired safer cars. He explained the two types of accidents – by component failure and that of interaction between the components. He then dealt on the non-technological factors affecting Safety where the staff, management, company, regulators, associations and government all affecting Safety - therefore implying that modern systems are not only technical but are socio-

technical. System-wide risk assessment encompassing component and system design evaluation has to be extended to all life-stages of the system. The former has a more significant impact on-Safety since people in operations have limited options to manoeuvre later on. It was, therefore, necessary for the system to continuously evolve based on the experiences in each of the life-stages and SOP information exchanges must take place. The benefits and costs should be proportionately distributed. He went on to explain that Occupational Health and Process Safety are fundamentally different although, a socio-technical and hierarchical approach was needed for both, fundamentally different types of controls are necessary to manage Safety of the two types. He also explained that depending upon the kind of system, the information and decision communication system would need to be tweaked. He gave an example from the Japanese Railway to explain that – the components had not failed, but the accident occurred due to standard operating instructions. He then moved on to explaining the Mapping process, interactions, and variability which are done using System-Theoretic Accident Model and Processes (STAMP) and Functional Resonance Analysis Method (FRAM). He urged the safety practitioners in India to familiarize themselves with these tools and to lead the risk-assessment efforts in their organizations, considering a socio-technical perspective.

Dr. Bugalia touched on the vital aspect to be kept in mind while importing systems and equipment into India with reference to their Safety aspects. He emphasized that the technologies and their operating processes are always reflective of the business needs, organizational structure, industry structure, and standards etc. local to the original system. Hence, while the technical components may still perform the same way they perform in their original systems, all other components such as human, organizational and regulatory performance could vary significantly for the recipient country, which could lead to safety issues.

Dr. Bugalia then stressed on the Business Case aspect of Safety for promoting in-house R&D, analysing the things systematically and pre-processing the information. He summed up with stressing on the

necessity of Understanding of Factors Local to the System.

Mr. M. Nachiappan, DGM (EHS), Building & Factories IC, L&T Construction dealt with ***“Digitalisation in Safety”*** in the light of L&T’s experience in adopting them. He traced the development across time from mechanization to IoT i.e. Industry 1.0 to Industry 4.0 and explained the Safety Pyramid - how 3,00,000 Unsafe Conditions & Acts (Hazards) result in 1 Fatality. He moved on to give an Overview of technologies used for Safety in Engineering: BIM for simulation to facilitate safety integration in Design Stage, Planning & Scheduling; enable Simulated Training and also enable Inspection & Control Planning. He then described how different equipment & gadgets assist at a construction site – Drones for Surveying, Inspection of structures and Quality & Safety Inspections; Laser Scanning for Blind Spots of Heavy Construction Equipment and to take accurate measurements of work area before starting the work to ensure there is enough space; QR Codes to enable accessing safety information of equipment, provide necessary information for a particular task and attendance for training; RFIDs attached to PPE to provide real time locations and also attached to safety devices to support and check onsite compliance; Wearable Sensing Devices for biometric screening with respect to physical characteristics of workers in real time to supervisors vis-à-vis their temperature, heart rate, repetitive motion, etc.; IoT for sensors to facilitate intelligent monitoring: warning signals in case of emergency, intrusion alert e.g. sensors, warning systems, etc. He explained that Artificial Intelligence, Natural Language Processing and Machine Learning were being used for Analytics and explained its pyramid from a simple level to a complex level of data analytics and how it could help in predictive analysis and Injury Prevention.

Mr. Nachiappan then dealt with the global trends in safety and digitalisation. Mobile Apps were adopted the most, followed by Real Time GPS Tracking, Vehicle Data Tracking, Wearable Devices, Smart Sensors, VR and Drones in that order. The data from these were classified and analysed as being Descriptive, Predictive or Prescriptive. He elaborated on the drivers

for adopting emerging technologies – Risk Reduction, Safety Improvement, Regulations/ Compliance, Cost Savings, Driving Productivity, Advance Sustainability, Improve Transparency, Driving Innovation and C-Suite Priority. Their impact would accordingly be felt on Decision Making, Process Improvement, Compliance Improvement, External and Internal Reporting.

In the last part Mr. Nachiappan covered where digitalisation has reached in the Indian Construction Industry. The Focus areas were Engineering & Design, Geo Spatial, CRM, Employee Engagement, Plant & Machinery, Safety & Workmen, Materials and Project Progress. **He showed a video clip and informed that the use of Virtual Reality (VR) for Training in Safety was very effective since the person felt that he/she was involved.**

The App developed for connecting to workmen named as WISA (Workforce Induction & Skills Application) was excellent. It acts as a Platform & Marketplace for Workmen Uberization; Profiling for Unique Identification using Aadhaar, Build Skills and Experience database and Manage Skill Upgradation; Safety for Awareness & Compliance, Reactive & Proactive Tracking; and Productivity for Biometric attendance, Record time spent, Measure productivity and Benchmarking. He gave examples of application of QR and Bar Codes in construction projects.

He further explained how various EHS related apps were conceptualized to address each of the element of the OHSMS framework as per ISO 45001 - Occupational Health and Safety Management Systems including leadership & commitment and PDCA cycle (Plan, Do, Check & Act). The various Apps in use at L&T, B&F IC were explained including their significant functionalities and how they act as tools to make safety implementation more pervasive and effective.

The Apps addressed the areas of ‘Conforming Risk Control before Starting the Work’; Leadership Participation in Safety Management; EHS Inspection; Asset Inspections; Auditing, Compliance tracking and most important an App which measures the personal contribution of all employee for safety improvement

objectively & quantifies a monthly score. The benefits of the Apps are seen in Time Savings, Effective, Tracking, Easy for Measuring & Tracking Personal Efforts, Instant MIS reports, Transparency and Auto Escalation based on Risk Level. Like Dr. Bugalia he also showed that getting correct and timely data provided better business insights. A number of EHS Dashboards which he showed, provided glimpses of the analytics and also gave an insight into how the output of analytics can be presented to leadership in a simple and yet effective way for decision making.

Mr. Nachiappan very lucidly explained how the whole sequence starting from VR Training and moving on to Mobile Safety Apps, Inspection, Audit and Compliance Verification, Measuring Safety Efforts of individuals, Analytics Dashboard which have been done till date. He also shared future plans in the areas of Predictive Analysis, Dynamic Risk Assessments, Image and Video Analytics which would lead to a Futuristic Construction environment. He showed how the Apps and remote monitoring were helping Safety Engineers in their day to day work at site.

Mr. Nachiappan in a nut shell showed why getting Safety Data is important and how it can be used to reduce the incidences of violation of Safety. He also very clearly explained that real time tracking, alerting and reporting make a big difference and that training using VR is extremely effective. He cited that the shift to digitalization in L&T has enabled better business insights.

Dr. N. Krishnamurthy, Founding Director, Centre for Workplace Safety and Health, Mysuru; Safety Consultant and Trainer, Singapore based on his long and extensive experience expounded on the ***“Status and Future of Workplace Safety in India”***. Safety behaviour is ingrained in one’s psyche and hence requires a lot of efforts to change. Good education would go a long way in tiding over the safety issues and for that education must be multi-disciplinary and also include cognitive and behavioural skills. He also suggested that new areas such as Workplace Safety, Risk Management, BIM and VR, Maintenance etc. be also taught. At present the Central Labour Institute at Mumbai and five Regional

Labour Institutes give advice & training on safety; the National Safety Council offers training courses, and does audits and consultancy; the Department of Industrial Engineering and Management at IIT- Kharagpur deals with Safety and IGNOU has Industrial, Fire and Safety Engineering. However, courses on Workplace and Occupational Safety are rarely seen. He therefore recommended that Occupational Safety and training be made mandatory by the government.

Dr. Krishnamurthy raised the question as to where do engineers fail the profession and society? He suggested that it was by ignoring safety, that engineers failed their customers or clients and society the most, when the mistakes cost many people their life or limb, and/or damage property, or badly pollute the environment. He went on to say that Safety should be the bedrock for ALL branches of engineering, because engineers provided the facilities, products and services for all other professionals to carry out their duties and for society itself to function. He however added that it was Civil Engineering that needed safety most, because it: Involved many trades; faced many hazards; used different, large crews; struggled in the open; had to get everything right the first time; and affected everybody. The concept of safety is practiced only by a very few top companies. With just about 10% of the total workforce organized and high rate of unemployment, the workforce becomes susceptible to exploitation. Although legislations exist on occupational health & safety, they are not disseminated or widely adopted. Plus, there is lack of data on occupational safety and health even in most global or regional lists. Hence the Consequences: Accidents – Injuries – Deaths – Property loss – Environmental damage – Social and moral degradation. He cited many building failures, mechanical and chemical lapses, fires, etc.

He explained ‘Normalisation of Deviance’ which implies that most people are so used to the dark side and the low side of professional life, that they cannot even imagine how the bright side and the high side would look, any more. The Consequences of that are accidents, injuries and deaths; heavy cost, inefficiency, bad workmanship, delay, damage, wastage, continuance of illegal and unethical practices, loss of business, and loss of prestige in the world. He exhorted that Engineers

decide that enough is enough and therefore they must share knowledge regarding safety and make everyone aware of the dangers of not heeding safety requirements. They must do a Risk Assessment, since with that prediction and control accidents can be safely managed.

He emphasised the responsibilities of Engineers – ‘Duty of Care’ to society, in all works. Leading Engineers are aware of the problems as was brought out by the Channel News Asia of Singapore which did an investigative reporting of the Indian Construction Industry in May 2019, and interviewed many industry leaders seeking opinions.

He stated that Engineers owe it to society, not only to provide solutions to civic and technical problems, but to ensure they continue to work as intended throughout their expected life. Education and training must emphasise and train for maintenance over the entire life cycle of the product or facility, because it is necessary to realise that they are more important than planning, design, and fabrication and erection of a product or facility. For, while the construction of a building may take two years, people would be living or working in it for fifty years or more. Engineers need to emulate – not imitate or depend fully on others; they must develop their own indigenous answers using low to high-tech solutions.

He made a pointed remark that India is missing in many of the ILO and WHO statistics for lack of reported data and barely makes it on the global map. However, he hoped that things would change for the better. He went on to say that while there was a detailed annual report on Accidental Deaths and Suicides in India produced by the National Crime Records Bureau – that was Reported Crime Data only. There is no data on occupational deaths and workplace accidents, which are of primary concern to engineering and other industries, without which, engineers cannot know what, where and how big the safety problems are, and therefore cannot prevent, or mitigate them. Absence of data implied that there was no way to know where one stood and what to do to correct the situation.

Getting back to workplace safety he said that only a handful of companies adopted and followed safe practices. There he added that “about 48,000 workers

die in India due to workplace accidents, of which 38 fatal accidents take place every day in the Construction sector.” (Source: Indian Express, Mumbai November 21, 2017)

He advocated that Engineers should demand a voice in promoting, implementing and enforcing not only workplace safety and health, but, to the extent that engineers have the shared responsibility, they also engage with public and social safety and health.

Dr. Krishnamurthy said that although there were a number of Acts, Codes and Standards relating to Safety, they were costly and not affordable by SMEs and hence the message did not go down to where it would be most effective. The deterrents are also not effective. There is need for greater publicity and to educate the public and keep politics and syndicate interests out of engineering. He advocated that:

- Engineers must unite in the resolve to keep public welfare and workplace safety as their primary (only) goal, without interference from non-technical vested groups.
- Gradually educate and guide civic bodies in appropriate technology for the good of the people, beyond company interests, proactively, instead of reacting to accidents.

Dr. Krishnamurthy suggested a Blueprint for Safety Improvement, as below:

What Government, academia and industry should do in the long term	• Expand, implement and enforce legislation • Provide safety education • Promote renewable energy sources and use
What engineering organisations should do in the medium term	• Spread information • Reward safety practices • Develop pride and commitment • Inspire youth in safety
What engineers and administrators can and should do in the short term	• Spread awareness • Get and share data • Do Risk Assessment and become proactive • Be Safety role models

To provide a wider spectrum of expertise, three Panellists had been requested to join and share their knowledge and experience.

Mr. Sanjay Pant, Head Civil Engineering, Bureau of Indian Standards, who is always very supportive of sharing knowledge, had agreed to join but was not able to do so at the last moment and hence had requested his colleague Mr. Abhishek Pal, Scientist 'C', Civil Engineering, BIS to be on the panel. Mr. Pal explained regarding the number of BIS codes and standards on safety. *Mr. Pant had also wanted to personally request Engineers to contribute constructively and effectively in the revision of the IS codes and standards and also help in evolving new ones.*

Mr. Abhishek Pal informed that Safety being a very important aspect, there were a number of Codes and Standards that have been issued by the Bureau of Indian Standards for Safety in Civil Engineering. He drew attention to the fact that good construction management was essential for ensuring Safety and explained the different Parts of IS:15883 (Parts 1 - 12) "Construction Project Management- Guidelines". Talking of IS:16416 "Guidelines for Construction Project Formulation and Appraisal", he stressed that Safety starts at the project formulation stage itself. The IS: 16601 "Guidelines for Habitat and Welfare Requirements for Construction Workers" was in line with the 'Building and Other Construction Workers Act'. He informed that the codes related to all kind of construction activities classified under New Construction, Addition/Alteration and Demolition. Safety inter alia helps to improve productivity morality and loyalty of the labour. He moved on to the various Safety Guidelines and Codes under different construction operations. He presented the list of codes available for different phases and categories – Excavation, Substructure, Superstructure, Addition/ Alteration or Demolition of Buildings, Enabling Works, and a number of other ones. Then there were codes on Safety in Equipment/ Signs, Selection, Maintenance and Care of Safety Equipment and Occupational Health & Safety.

Summing up Mr. Pal reiterated that Safety provisions have to be done in a systematic manner

at the planning stage and many codes regarding Safety in Construction were in place and others were under preparation. There was also a 'Handbook on Construction Safety Practices'. Apart from these the design aspects were covered in various other codes. He informed that the codes are available for free download on the BIS website www.bis.gov.in and comments can also be sent as per the standard format given by BIS.

Prof. Abhijeet Sangapurkar from NICMAR (National Institute of Construction Management and Research) explained regarding the synergy between theory and practice for safety in construction – assurance and control. He added that there is no dearth of codes and laws but how and to what extent they are being implemented is the question. *How to bridge the gap?* Safety is like a binary function – either its implemented or not implemented, there are no half measures. He explained that from an engineering perspective Safety Management should be an analytic function, which means it should be continuously present and differentiable, all the time. It should be like a Dirac delta function where one needs to be above a critical point X_0 to establish oneself firmly in safety implementation practices as $\delta (X-X_0)$ exists only at X_0 and nowhere else. Only after this point it goes from Zero to One. With myriad regulations and codes available he gave the example of a sick person for whom paracetamol was akin to codes and the antibiotics to putting in place safety measures which is a function of one's perception and bent of mind for having a safe working condition. **He appealed to the participants and advocated that one can and one should implement safety in engineering. One should really Walk the Talk.**

Mr. Devendra Gill, General Manager and Head-Safety of Delhi Metro Rail Corporation Ltd. stated that now every city in India is looking to provide a Metro network/ link, but they are inherently very challenging projects especially since they are in urban areas. The sheer number of workers who are deployed is very large, their skill set is also a challenge for all the executing engineers and agencies but what is more challenging vis-à-vis other construction projects is the public interface. Metro works involve heavy lifting

operations and deep underground construction works in the heart of a very busy city, on very busy public roads. The project completion timeline is very tight since traffic is blocked and there is no luxury of getting time extensions. For Metro works it is well known that Safety means Productivity, completing Projects in time and achieving a good Quality of work. Rework is something every Engineer abhors. Before these pandemic times, many International experts and visitors from the world over have visited DMRC worksites and there have been learnings and exchange of ideas with them. The BIS standards and other statutes and contract conditions are world class but what is lacking are implementation strategies and commitments.

He explained that the first big factor for the success that Delhi Metro and other Metros have been able to achieve is their commitment towards implementation of the regulations. The second factor is the adoption of new technology that earlier speakers have talked about, is the need of the hour. DMRC have already started digitalisation and soon many Metros would adopt the same strategy which would bring in a lot of welcome changes in the performance of the Metro works. There are a lot of technological introductions – the kind of lifting machines, cranes and other devices; a lot of improvement that has come about – the concept of building safe infrastructure through safe resources is the trend now. Hence, new machines and technologies are now coming to the Indian construction sector. It is known that most of the construction machinery that are deployed in India are the ones that have outlived their lives in advanced countries and then after working in Middle East for many years, they are brought to India. Now welcome changes are happening and there is hope of bringing in a lot of newer technology and machines to India. The third element is Skilling the people who form the majority of the workforce. The initiative by the Government – the Skill India Mission, for the Construction sector has been a long awaited step, however, a lot still has to be achieved and hence efforts are required because of the multiple stakeholders viz. Client, Contractors, Sub-contractors and the last stakeholder which is the Worker. Due to their lack of awareness and interest in skill enhancement, it is a very big challenge which

all must collectively address. Many of the Clients and construction agencies like Public Works Department, Defence etc. stipulate in their contract conditions that some percentage of the workforce should be trained and skill certified but it has been very difficult to get such people. Now changes have come – the Government commitment to schemes like Recognition of Prior Learning (RPL) would make the life of personnel in the Safety profession easier. Hence, there is hope that the future scenario would see reduction in accidents.

According to Mr. Gill there are 4 areas which need to be attended to – Commitment of the Management, Commitment towards implementation of Standards, which are already world class, the Regulations have no problems, the Skill Set after the advent of technology, and the introduction of newer machines in the construction sector.

Dr. Harshavardhan Subbarao was the effective link between each speaker and panellist, their talk and suggestions and made his contributory and explanatory notes for the benefit of the participants. The Q&A session was very lively; it clarified and amplified the messages of the speakers. **The messages were very clear that Safety in Engineering must be taught in engineering colleges and institutions, workers must be trained in their trade, informed of what they need to do and why, VR training is very effective and must be adopted, digitalisation provides immense benefits, Engineers must be allowed to make engineering decisions and not be subject to economic or financial considerations, Safety makes a lot of Business sense.**

Mr. Amitabha Ghoshal thanked all the speakers and panellists for their informative and though provoking inputs which have helped to focus on a very important aspect of engineering. He also thanked all the attendees for their patient hearing and their interaction through the Q&A and Chat boxes. He informed of the positive responses that CEAI has received from the Government relating to issues faced by the Consulting Engineers. He asked the Engineers to become members of CEAI to strengthen and support it in its endeavour to strengthen the cause of Engineers and make sure that they get their due recognition in society.

He implored that safety, integrity and quality - all are intertwined and Engineers must have their emphasis on them so that the country prospers by more effective participation by ethical engineers. He reiterated that Engineers must be recognized in the society much more than they are today and towards this he requested all to join CEAI to make India a country which rises in its quotient of Safety and Integrity, the goal of CEAI, and make it a country in which Ethical practice is more important than Regulatory practice.

The webinar received excellent response, over 800 had registered and over 400 attended apart from those on Youtube. The feedback has been extremely good and encouraging.

CEAI is thankful to the supporters - Centre for Workplace Safety and Health, Mysuru; Building & Factories IC, L&T Construction; and IIT Madras for the excellent speakers who shared their knowledge and experience and to the Bureau of Indian Standards; Delhi Metro Rail Corporation Limited; and National Institute of Construction Management and Research for the hands-on panellists.

CEAI is also thankful to Platinum Sponsors – Gawar Construction Limited and Welspun Enterprises Limited; the Gold Sponsors – Shiv Build India Pvt. Ltd., Himalayan Infracon Pvt. Ltd., and Diamond Construction Company for contributing their mite; the Media Partners: CE&CR, Management & Communication Group, and Constrofacilitator for carrying the webinar and to FIDIC for their support.

There were requests for more details on the subject and practice of Safety, starting with identifying Risks and taking off from there to provide a safe environment to the extent that incidences can be foreseen and mitigated. CEAI will plan that in the next few months.

ADB Training Programme for Officials of North East States

Topic: DPR Preparation And Project Readiness

ADB appointed CEAI to conduct a training program on how to prepare DPR and Financial Evaluation of Road and Highway Projects for personnel of North East States. Initially this programme was to be conducted as a physical event in Kolkata but due to pandemic the training was conducted online on 7th and 8th September 2020.

The faculty from Kolkata was coordinated by Mr. Amitabha Ghoshal, President CEAI and comprised:

- Mr. Samiran Sen - Consultant
- Mr. Kalyan Ghosh - Consultant
- Mr. Sudip Dutta – PwC
- Mr. Samiran Sen acted as the Coordinator.

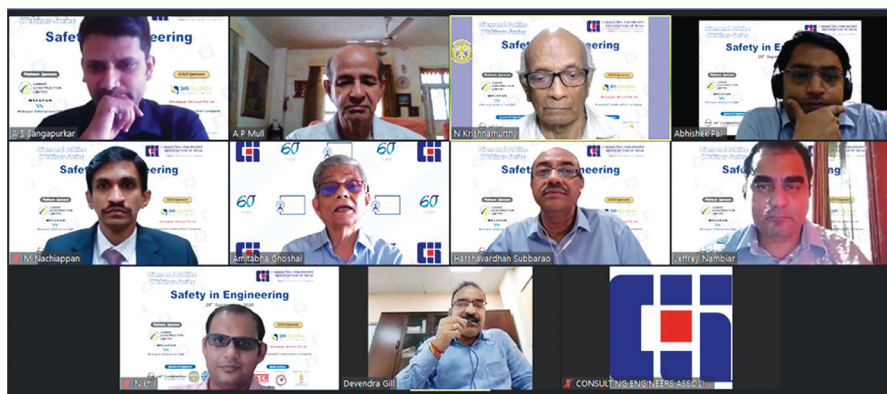
Mr. Sen conducted 2 sessions – first on Preparation of Feasibility Report and second on Procurement.

Mr. Ghosh covered preparation of Detailed Project Report including Surveys and Investigations, Land Acquisition, Designs and Cost Estimation.

Mr. Sudip Dutta explained regarding Financing of Projects and Financial Evaluation.

The presentations were followed by quiz of 5 questions

Between 50-60 persons from NE States participated. CEAI will endeavour to organise more programmes for ADB.



Interactive Workshop ‘Solutions for Remote Working by small Companies’

CEAI organised an online Interactive Workshop on “Solutions for Remote Working by Small Companies” on 18th July 2020 which focused on the immediate requirements for small consulting companies to modernise their digital infrastructure, upgrade their hardware and software so as to be better prepared for seamlessly conducting their businesses during future such eventualities, and at the same time optimise productivity.



Mr. Amitabha Ghoshal, President CEAI welcomed the participants and stressed that the webinar had been specially designed for the consultants who have small or medium size offices. He briefed about

the difficulties being faced by the consultants and the solutions available from working from home during the pandemic.

Ms. Sayona Philip, immediate Past President of CEAI, was the Moderator for the webinar.



Mr. Pravinchandra Shahu, Business Head – Digital and Advance Technology IT & ADC, Tata Consulting Engineers Ltd. explained how small and medium sized firms could enable remote working and let their employees

work from home or any other location away from the office so long as internet connectivity was available. He clarified how Cloud based Solutions could be deployed, the hardware and software required, the modalities involved for shifting from office mode to remote mode working, the security features to be built and the budgets for the change. He also presented a Typical Case Study.

Report on Webinar on “Integrity & Trust in the Consulting and Engineering Industry”

A webinar on “Integrity & Trust in the Consulting and Engineering Industry”, was organised on 16th July 2020 by Power Engineering & Consulting JS Company (PECC3), Vietnam with support from FIDIC Integrity Management Committee and FIDIC Future Leaders Committee. All the speakers stressed on the importance of Integrity in the business of the Consulting and the Engineering Industry.



Mr. Jitendra Kumar Singh as the Vice Chair of FIDIC-ASPAC Future Leaders Committee was the speaker from India and CEAI. He made an excellent presentation and also substantially and meaningfully contributed to the discussions.

Mr. Thai Tuan Tai, President PECC3 welcomed the speakers and the participants. He outlined PECC3's path for Integrity Management. He linked Humility to Integrity and went on to outline the 2020 GOAL: Building a culture that is Trustworthy within Individual, Groups, Divisions and the whole Company.

Mr. John Ritchie, Member of FIDIC Integrity Management Committee dwelt on the aspect of a consultant being a “The Trusted Advisor” and that the aim of a Consultant should be to develop that relationship. He explained as to what The Trusted Advisor should do to achieve that status. He showed the linkage between the “trusted advisor” and Integrity Management.

Mr. Richard Stump, Member of FIDIC Integrity Management Committee explained about the FIDIC Integrity Management System (FIMS), the Guideline documents that FIDIC developed on the Policies and Principals of FIMS and how they can help Consultants

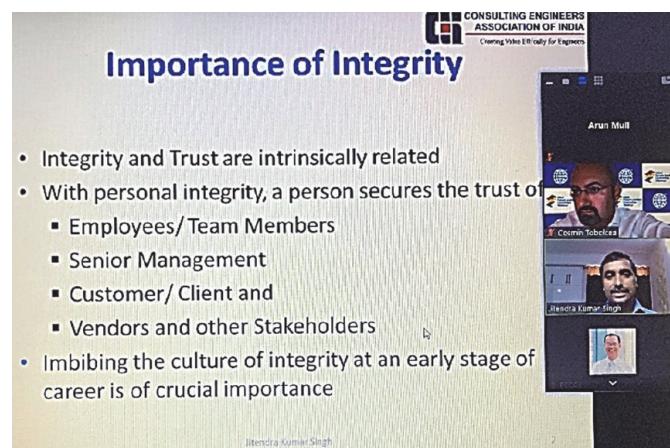
go up the chain of Integrity. He also explained as to how FIMS could be adopted to ISO 37001 which is an Anti-Bribery Standard.

Mr. Jorge Diaz Padilla, Chair of FIDIC Integrity Management Committee spoke of the status of Integrity the World over. He said that as per Transparency International which has been listing companies on ethical business practices for the past 50 years it is an uphill task. There has been no progress because the 3 aspects— Supply Side – Demand Side – Condoning Side have not been tackled yet. It's when these are curbed that the practices would change and business Integrity would get a boost. He reiterated that Quality, Integrity and Sustainability are the three pillars of a project.

Mr. Jitendra Singh stressed on the Importance of Integrity and explained the common dilemmas faced by Future Leaders. He then discussed as to why unethical practices continue and gave examples of the various situations referred to. He concluded with as what the system structure ought to be to nurture a culture of Integrity.

Mr. Cosmin Tobolcea, Chair of FIDIC Future Leader Committee talked on the Vision of Future Leaders and their Purpose, the objectives of FIDIC and that Integrity is an important aspect. He also explained the activities of the Future Leaders Committee.

Mr. A P Mull, GC Member and Chairman, CEAI Publication Committee participated and also interacted during the Q&A session.



Online Training on “Software Solutions for Water Environment and Transportation Infrastructure”

CEAI successfully organized its first Online Training, on the topic “*Software Solutions for Water Environment and Transportation Infrastructure*” on 20th August 2020.

President CEAI, welcomed the speakers and participants to the online training program.

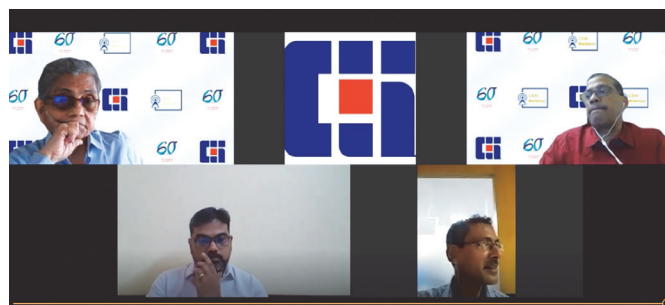
The training was conducted in two sessions. The First Session was on “*Water, Wastewater and Stormwater software solution for Project Lifecycle*”, the speakers for which were:

- Dr Ajay Pradhan, Cetus Consulting Solution Services
- Mr Suneet Manjavkar, Bentley
- Mr Sanjay L Lalan, Tata Consulting Engineers Ltd

The Second Session was on “*Transportation lifecycle Software solution with BIM & Digital Twin*” and was conducted by:

- Mr Aseem Prabhakar, ICT Pvt. Ltd.
- Mr Kasturi Srinivas, Bentley
- Mr Roshan Bucha, Bentley

The sessions were very lively and left the participants desiring more of such training webinars.



Report on Webinar on “Water Hammer”

CEAI Pune City Chapter organised a Webinar on “*Water Hammer*” jointly with the Indian Water Works Association (IWWA), Pune; supported by Tata Consulting Engineers Limited, on 12th September

2020. More than 300 persons registered for the event and on the given day over 70 recorded their attendance online. IWWA Pune had also provided the event link to Facebook (<https://www.facebook.com/124554765812783/live/>)

Dr. Parag Sadgir, IWWA and Professor College of Engineering Pune (COEP) was the Moderator and introduced Mr. S B Bhujbal, Chairman IWWA Pune. Mr. Bhujbal spoke of the activities of IWWA Pune and then requested Mr. Vijay Nadkar, In-Charge CEAI Pune City Chapter to introduce Mr. Amitabha Ghoshal, President CEAI. Mr. Amitabha Ghosal explained the role of CEAI. He added that IWWA, CEAI and other likeminded institutions should bring the engineering fraternity together to Engineer's establish place in the society and also voice their views. He conveyed the commitment of CEAI and its relentless endeavour towards the same. He thanked the organisers of the event.

Engineers from Tata Consulting Engineers Limited, made excellent presentations to explain the Water Hammer phenomena in different pipeline systems.

Mr. P L N Rao, Group Sector Head Hydro Power, gave an overview -regarding water hammer: ***“General Appraisal in Water Supply, Thermal & Hydro Power Projects”***. He emphasised the importance of the Water Hammer phenomena in Water Conductor Systems and informed about project worldwide which were severely impacted due to the detrimental effects of the phenomena. He also compared the current design approach which plans/ intends to let water hammer occur as against to yesteryear's design approach of preventing it. He briefly explained the key aspects to be focussed while carrying out Hydraulic Transient modelling. He presented the major causes of water hammer and the protection measures that have been successfully adopted depending upon the type of water conductor system, suitability, reliability, cost and construction feasibility.

Mr. C. Suresh Ram, Senior Manager presented some insights on ***“Water Hammer in Condenser Cooling Water Systems of Thermal & Nuclear Power Plants”***. He explained the importance of Condenser Cooling Water Systems (CCW) in Thermal/ Nuclear power plants and how water hammer can affect these systems and in turn the Plant's power generation efficiency. He presented the critical operating conditions which causes water hammer in CCW systems and simple, cost effective protection measures. He also presented development of numerical modelling of a CCW system, its validation and prediction of results.

Mr. Arnab Kr. Mondal, Assistant General Manager explained ***“Water Hammer in Water Supply Projects”***. He explained the causes of Water Hammer phenomena in Water Supply projects and gave a few insights on column separation/ cavitation. He explained the various types of surge protection measures adopted to protect the long pipelines from water hammer. He also presented a few case studies explaining the type of surge protection measures suggested based on analysis/ guidelines and their effective functioning in protecting the system.

Mr. Pate, Honorary Secretary, IWWA Pune gave the Vote of Thanks and Dr. Sadgir, Co-ordinator then announced the conclusion of the event.

Screen shots of the Webinar on Water Hammer, 12th September 2020 are given below.



TATA CONSULTING ENGINEERS LIMITED
ENGINEERING A BETTER TOMORROW
OVER FIVE DECADES

IWWA & CEAI Webinar Series-3
Waterhammer-
General appraisal in Water Supply, Thermal & Hydro Power Projects

P. L. N. Rao, Group Sector Head / Hydro Power

zoom

Introduction to Water hammer

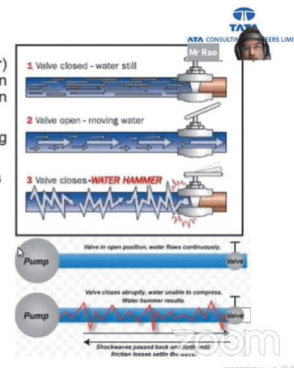
• **Water hammer** (or, more generally, **fluid hammer**) is a **pressure** surge or wave resulting when a **fluid** in motion is forced to stop or change direction suddenly.

• It is an unsteady flow phenomenon – resulting changes in terms of velocity or pressure

• Synonyms – Hydraulic Transients, Pressure Surges

Causes:

- Valve closure or opening
- Starting / Stopping of Pumps
- Power failure
- Load reduction / Load rejection
- Load acceptance
- Malfunction of valves / operational errors



TATA CONSULTING ENGINEERS LIMITED
ENGINEERING A BETTER TOMORROW
OVER FIVE DECADES

IWWA & CEAI Webinar Series-3
Water Hammer in
Condenser Cooling Water Systems of Thermal and Nuclear Power plants

C. SURESH RAO, Senior Manager (Civil)

zoom

SURGE PROTECTION MEASURES



TATA CONSULTING ENGINEERS LIMITED
ENGINEERING A BETTER TOMORROW
OVER FIVE DECADES

IWWA & CEAI Webinar Series-3
Water Hammer in Water Supply Projects

ARNAB KR MONDAL, Asst. General Manager

zoom

Water Hammer effect in Pipeline

Water hammer in the pipeline is generally caused by three factors:

- i) sudden change in flow
- ii) valve closures and
- iii) pipe failure

The starting surges will not exceed the pump head (or cut off head) and the pipe is designed to take such surges.

Surges due to water hammer can be minimized by controlled valve closure.

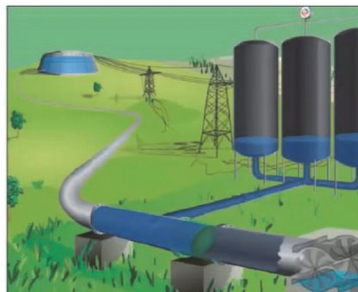
Pipe Collapse
The third factor, pipe failure and consequent sudden rapid transient pressure fluctuations can result in vibrations or resonance that can cause even flanged pipes and fittings like bend and elbows to dislocate, resulting in a leak or rupture.

Massive Leakage
It creates sounds like someone pounding on the pipe with a hammer, creating high shock pressures.

Function of Air Chamber or Air Vessel



Surge vessel under operation of the pump



Surge vessel after a pump failure; the water equalises the vacuum

Animation of Air Vessel

TATA CONSULTING ENGINEERS LIMITED

CONFIDENTIAL 17

CEAI INTERVESTIONS

Media Report of Press Release Issued by Morth through Press Information Bureau

NHAI Accepts Suggestions from Industry Body CEAI to Improve Ease of Doing Business in National Highways sector

Posted On: 29 SEP 2020 6:35PM by PIB Delhi

In order to further improve the ease of doing business, NHAI has agreed to most of the suggestions made by industry body, the Consulting Engineers Association of India (CEAI).

NHAI reports that CEAI had submitted suggestions pertaining to areas that include Omnibus Bank Guarantee, Performance Parameters of Consultants, Approval of DPR, Value Engineering, Technical Capacity Provisions, Evaluation of Bids etc. After having detailed deliberation with the industry body, NHAI agreed with most of the suggestions made by them. Suggestions which were outside the purview of NHAI have been sent to the related authorities for consideration. Further, NHAI assured the body that all good suggestions facilitating smooth working with the Consultants shall be positively considered in the future as well.

Some of the key suggestions accepted by NHAI are highlighted as below:

- a. Suggestions regarding Omnibus Bank Guarantee system has been accepted by NHAI and guidelines have been issued on the matter.
- b. Suggestions regarding use of innovative technology / material has been accepted. NHAI has asked the Consultants to propose new technologies while preparing DPRs and wasteful expenditure items should be avoided. NHAI also assured that the approval process of various stages of DPR shall be expedited.
- c. NHAI has reiterated its commitment to ensure timely payments to the Consultants.

- d. Under Technical Capacity Provisions, cap on the number of projects awarded to a Consultant will be linked to the Consultant's performance and its rating on the Vendor Performance Evaluation System.

NHAI has further reported that it is committed to improve ease of doing business and facilitate better working relationship with all its stakeholders.

Reports are also available in the following links

<https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1660092>

<https://www.outlookindia.com/newscroll/nhai-agrees-with-industry-suggestions-to-improve-national-highways/1945398>

<https://in.news.yahoo.com/nhai-agrees-industry-suggestions-improve-144256029.html>

<http://www.babushahi.com/full-news.php?id=108977&headline=NHAI-accepts-suggestions-from-CEAI-to-improve-national-highways>

<https://www.mangaloremirror.com/nhai-accepts-suggestions-from-industry-body-ceai-to-improve-ease-of-doing-business-in-national-highways-sector/>

<https://orissadiary.com/nhai-accepts-suggestions-from-industry-body-ceai-to-improve-ease-of-doing-business-in-national-highways-sector/>

<https://www.devdiscourse.com/article/business/1232155-nhai-agrees-with-industry-suggestions-to-improve-national-highways>

<https://www.connexionblog.com/2020/09/29/nhai-accepts-suggestions-of-industry-body-ceai-to-facilitate-trade-in-national-highway-region-taja-khabar/>

<https://sae.news/2020/09/29/nhai-accepts-suggestions-from-industry-body-ceai-to-improve-ease-of-doing-business-in-national-highways-sector/>

<http://www.uniindia.com/tags/nhai-agrees-to-most-of-suggestions-made-by-ceai>

CEAI urges govt to revisit L1 tendering system

STATESMAN NEWS SERVICE
KOLKATA, 15 JULY

The Consulting Engineers Association of India (CEAI), the apex body of consulting engineers in the country, has urged the government to revisit and say goodbye to the age-old conventional L1 tendering and procurement system in the country.

The least cost selection method or L1, which is the award of work to the lowest financial offer, has been a prevalent procurement strategy for procurement of works by contractors, consultants and purchase of goods for a long time in the country. This has often resulted in poor quality of works and goods, CEAI said.

This necessitates an urgent need to change the selection mechanism and move

The award of work to the lowest financial offer... has often resulted in poor quality of works and goods

towards the concept of "workable rates" procurement mechanism, it added.

K K Kapila, chairman, infrastructure committee of CEAI and mentor of this movement, said: "The changed procurement system which offers various alternatives to derive workable rates in a transparent manner, will give opportunities to competent firms to plan a project or a bid on workable rates, thereby facilitating better management and execution which will reflect on quality and timelines." The L1 system, which is plagued

with delays of time and cost overruns, will ultimately lead to time consuming arbitrations and higher costs, he said.

Amitabha Ghoshal, president, CEAI, said that the heart of this change lies in creating awareness in the minds of the general public that the focus on "least cost factor" has resulted in compromises in achieving world-class infrastructure or purchase of quality goods as well as services.

The country needs a public procurement mechanism which focuses on quality and cost in all activities in public domain, Mr Ghoshal said.

"It is time to say goodbye to this age-old system and wake up to the dire necessity of change which is inescapably required for moving towards Atma Nirbhar Bharat," said Mr Kapila.

The Statesman
PEOPLE'S PARLIAMENT, ALWAYS IN SESSION

Thu, 16 July 2020

<https://epaper.thestatesman.com/c/53540706>



CEAI'S Support Towards Solving Water Logging Problem in Delhi

Shri K K Kapila and Dr. Ajay Pradhan, along with a colleague, called on the Water Minister Shri Satyendra Jain at Delhi State Secretariat on 19th August 2020. The meeting was attended by the Minister Mr Ankit Srivastava, Technical Advisor, and the Secretary of the Department.

The CEAI team made a small presentation on the overall drainage and storm water management system of Delhi and recommended initiation of preparation of a new Drainage Master Plan, as the last one was almost four decades old. The City has grown exponentially in the intervening period. Since the preparation and implementation of a Master Plan of a mega city like Delhi would take considerable time, short term measures

to mitigate the bottlenecks of critical waterlogged areas in capital city of Delhi could be considered.

CEAI's team made a presentation on the need for Rain Water Harvesting Structure in the proximity of waterlogged areas, by identifying suitable sites, to utilise storm water for ground water recharging. The solution would give an opportunity for Delhi, to use the

rain water, for replenishing the depleting ground water table.

The meeting ended by agreeing on the next step, that would be to coordinate with the Technical Advisor, for planning, designing and implementation strategy, in few pilot areas.

CEAI offers help to Delhi govt in bid to solve city's waterlogging problem

STATESMAN NEWS SERVICE
NEW DELHI, 28 AUGUST

Expressing concern over waterlogging problems in the national capital, the Consulting Engineers Association of India (CEAI) has written to Delhi's urban development minister Satyendra Jain, urging him to identify five worst-affected waterlogging spots during rains so that the association could help in addressing them by providing their expertise.

This communication was followed by a meeting between the CEAI delegation — led by K K Kapila, chairman, CEAI Infrastructure Committee, and Ajay Pradhan, CEAI vice president — and minister Satyendra Jain, according to a statement issued by the CEAI.

The delegation of the CEAI, an apex body of consulting engineers in the country, at the meeting also presented their brief assessment about ways and means

to tackle this annual flooding of Delhi during monsoon, till a master plan of drainage systems takes a concrete shape, the statement said.

The CEAI delegation has also offered to provide interim solutions pending the development of the detailed master plan for Delhi, it stated, adding that the drainage master plan was prepared four decades ago.

While the new master plan is important, it might take

some years to get it prepared and implemented on ground, it said.

"We suggested short-term measures at the meeting that will avoid waterlogging in near future and instead conserve excess water towards a sustainable development solution for Delhi," said Kapila.

"In this meeting, we had presented a simple arrangement to tap the logged rain water, pass it through a screening process and take it to water harvesting pits so

that, on the one hand the instances of waterlogging gets reduced and on the other, the water table of the groundwater rises," said Kapila, according to the statement.

"The work at five identified locations should start so that the impact can be seen during the winter rains. Once the effectiveness is proven for everyone to see, it will be worthwhile to handle other waterlogged areas in the city," he added.

The Statesman

Sat, 29 August 2020

<https://epaper.thestatesman.com/c/54566073>

Meeting with Chairman, NHAI

After consistent follow up, the first meeting with Chairman, NHAI, was set up for discussing the various problems faced by the Consultants, for a long time. From CEAI, the meeting was attended by the President, Members of the Infrastructure Committee and a few other Members. Longstanding problems like, ways for improvement of quality of DPRs, QCBS mode for selection of Consultants and improvement in speed of release of payments to Consultants were discussed,

in a congenial atmosphere, in the presence of senior members of NHAI administration. Enthused by the proactive nature of discussions held, the Chairman, NHAI, proposed that, such dialogue should be held at regular intervals, to improve the quality of planning, design work and implementation of Highway sector projects. Mr K K Kapila, Chairman, Infrastructure Committee, who led the discussions on behalf of Consultants, readily agreed.



भारतीय राष्ट्रीय राजमार्ग प्राधिकरण
(सड़क परिवहन और राजमार्ग मंत्रालय)
National Highways Authority of India
(Ministry of Road Transport and Highways)
जी-5 एवं 6, सेक्टर-10, द्वारका, नई दिल्ली-110075
G-5 & 6, Sector-10, Dwarka, New Delhi-110075

दूरभाष / Phone : 91-11-25074100/25074200
फैक्स / Fax : 91-11-25093507 / 25093514

Ref.: NHAI/11018/01/2008/PQ/296
(Comp. no. 27742)

Date: 01.09.2020

OFFICE MEMORANDUM

Sub.: Pending payment of consulting firms - Reg.

During the meeting held by Chairman on 28.08.2020, the representatives from the Consulting Engineers Association of India (CEAI) expressed concerns on following payment related issues:

- (i) Delay in payment to the consultants.
- (ii) Non-payment of GST amount along with the monthly invoices.
- (iii) Withholding of payments pending grant of EoT to the consultancy contracts.

2. This has been viewed seriously. In this regard, it may be noted that;

- (i) Vide policy circular no. 9.2.31/2019 dated 20.12.2019 (*copy enclosed*), instructions were issued for clearing the pending undisputed payments within maximum 5 working days. In case of any hurdle in payment of bill, the heads of offices shall bring the same to the notice of Member concerned immediately.
- (ii) Further, vide policy circular no. 3.3.18/2017 dated 17.11.2017 (*copy enclosed*), it was clarified that the applicable GST amount, in terms of contractual provisions, may be paid along with the invoices subject to proof of deposition within 15 days of filing the returns or along with next invoice, whichever is earlier.
- (iii) Vide policy circular no. 151/2014 dated 04.02.2014 (*copy enclosed*), it was decided that pending grant of EOT to the Consultancy Contracts, the amount due for overstay on the project and which are billed as per actual may be paid without linking the same with EOT approvals.

3. In view of above, the abovementioned instructions are hereby reiterated for immediate compliance from all concerned.

4. This issues with the approval of Competent Authority.


(Ajay Kumar Sabharwal)
GM (T/SRD&Q)

Encls.: As above

To,
All NHAI (through web admin)



CEAI Centre, OCF Plot No.2, Pocket 9
Sector B, Vasant Kunj, New Delhi 110070
Tel 91-11-26134644 / 26139658
Email ceai.ceai@gmail.com
Website www.ceai.org.in

**President
CEAI**

*CEAI/159/2020
6th September 2020*

Dear Fellow Member

CEAI GC, has taken upon itself, the task of improving the working conditions of the Consulting Engineers and, ultimately, to help improve their Balance Sheet, in these difficult days.

You are aware that, we have been pursuing this objective relentlessly, by taking up issues with the various authorities.

We had reported to you last week, of our holding a purposeful meeting with Dr. S S Sandhu, the Chairman of NHAI, one of the important client organizations for Consultants.

We are very happy to report back to you that, the number of vexing problems, the Consultants were facing, have been addressed by NHAI, on an immediate basis, by issuing a Circular that comes in effect on immediate basis. A copy of the circular is attached for your kind perusal.

We are grateful to Chairman NHAI, for addressing some of our concerns by issuing this circular. This makes our resolve, to pursue the issues of concern to our fraternity, even stronger.

We seek your continued support to help us achieve our goal faster and effectively. One of the ways each of you can definitely help us is to welcome at least one more new member to our Association.

Together, we shall succeed!

Warm Regards

Amitabha Ghoshal



भारतीय राष्ट्रीय राजमार्ग प्राधिकरण

(सड़क परिवहन और राजमार्ग मंत्रालय)

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NHAI/Policy Guidelines/Engagement of Technical Consultants /2020

No.10.1.23/2020 dated 4th September, 2020

[Decision Taken on File No. NHAI/11013/AE&IE/RFP Doc./2017-Part(2) E-file No. 13491]

Sub.: Addendum to standard RFP document for engagement of technical consultants - reg.

Vide policy guideline no. 10.1.22 dated 10.08.2020, directions have been issued to include technical capacity provisions in RFP / Bidding of future consultancy assignments for maximum number of assignments/ works with any consultancy firm.

2. In this connection, it has been decided that the cap on number of projects will be linked with the Vendor Performance Evaluation System (VPES) Rating after the VPES Rating system is adopted full-fledged in NHAI. The suitable instructions will be issued subsequently.

3. It has been also decided to restore Omnibus Bank Guarantee provisions in the RFP documents for engaging technical consultants.

4. In view of above, the following addendums shall, henceforth, be incorporated by the Technical Divisions and the ROs/ PDs in the RFP/ bids for engaging technical consultants.

(i) RFP for DPR Consultant:

Sr. No.	Details of Addendum	Addl. Clause No.	Section
1	Technical Capacity Provisions (As per Annex-A)	3.1.3	Letter of Invitation
2	The bidding firm/ JV satisfies the technical capacity provisions as stipulated under clause 3.1.3.	5.1 (viii)	Letter of Invitation
3	Determination of Technical Capacity (As per Annex-B)	Form- T11	Appendix-III Formats for Technical Proposals
4	Omnibus Bank Guarantee Provisions (As per Annex-C)	2 nd para under Cl. 6.1	Letter of Invitation

(ii) RFP for Authority Engineer:

Sr. No.	Details of Addendum	Addl. Clause No.	Section
1	Technical Capacity Provisions (As per Annex-A)	15 C	Section-1 Information to Consultants
2	Determination of Technical Capacity (As per Annex-B)	Appendix B-11	Section-4 Format for Submission of Technical Proposal
3	Omnibus Bank Guarantee Provisions (As per Annex-C)	2 nd para under Cl. 7.1	Section-2 Letter of Invitation to Consultants

(iii) RFP for Independent Engineer (HAM/ BOT Projects for Construction Stage):

Sr. No.	Details of Addendum	Addl. Clause No.	Section
1	Technical Capacity Provisions (As per Annex-A)	15 C	Section-1 Information Consultants to
2	Determination of Technical Capacity (As per Annex-B)	Appendix B-11	Section-4 Format for Submission of Technical Proposal
3	Omnibus Bank Guarantee Provisions (As per Annex-C)	2 nd para under Cl. 7.1	Section-2 Letter of Invitation to Consultants

(iv) RFP for Independent Engineer (O&M stage of BOT Projects):

Sr. No.	Details of Addendum	Addl. Clause No.	Section
1	Technical Capacity Provisions (As per Annex-A)	12 C	Section-1 Information Consultants to
2	Determination of Technical Capacity (As per Annex-B)	Appendix B-11	Section-4 Format for Submission of Technical Proposal
3	Omnibus Bank Guarantee Provisions (As per Annex-C)	2 nd para under Cl. 10.1	Section-2 Letter of Invitation to Consultants

(v) RFP for Independent Engineer (OMT Projects):

Sr. No.	Details of Addendum	Addl. Clause No.	Section
1	Technical Capacity Provisions (As per Annex-A)	12 C	Section-1 Information Consultants to
2	Determination of Technical Capacity (As per Annex-B)	Appendix B-11	Section-4 Format for Submission of Technical Proposal
3	Omnibus Bank Guarantee Provisions (As per Annex-C)	2 nd para under Cl. 10.1	Section-2 Letter of Invitation to Consultants

(vi) RFP for Supervision Consultant (O&M of Public Funded Projects):

Sr. No.	Details of Addendum	Addl. Clause No.	Section
1	Technical Capacity Provisions (As per Annex-A)	12 C	Section-1 Information Consultants to
2	Determination of Technical Capacity (As per Annex-B)	Appendix B-11	Section-4 Format for Submission of Technical Proposal
3	Omnibus Bank Guarantee Provisions (As per Annex-C)	2 nd para under Cl. 10.1	Section-2 Letter of Invitation to Consultants

5. The addendums/ amendments issued earlier from time to time shall also be incorporated accordingly.

6. This issues with the approval of Competent Authority.



(Amarendra Kumar)
CGM (Coord.)

Encls.: Annex-A, B & C

To,
All NHAI

Copy to:

*DG (RD) & SS, MoRTH for Information
PS to Chairman
PPS/PS All Member/CVO
Hindi Division for Translation*

MEMBER NEWS

Dr. Ajay Pradhan, Vice President CEAI invited to join as a Member in the Government Task Force and Industry body on Water



Dr. Ajay Pradhan, Vice President, CEAI; President & CEO, Cetus Consulting Solution Services Pvt. Ltd. has been invited to join as a Member of two National Committees.

- Ministry of Jal Shakti, Government of India – Task Force on Surface Water
- CII National Committee on Water 2020-2021

Ministry of Jal Shakti, Government of India:

Member of the Task Force – Preparation of Comprehensive Road Map on Water Management in India. As a member of the Task Force, responsible to the Sub-Committee on Surface Water - River Rejuvenation, Flood Control and Dam Safety. The Committee will address the current water crises in India, chalk out a road map for fair, judicious and equitable use of water in India and recommend scientifically considered suggestions that the Government of India can consider for implementation.

Confederation of Indian Industry (CII):

Member of the National Committee on Water (2020-2021). As a member of the National Committee, to provide support and input of the industry views towards finalisation of Water Policy. Helping government towards preparation of national guidelines for ground water extraction and management for industry, policy issues on reuse of water, zero liquid discharge, etc. CII Water Institute acts as a think tank towards knowledge dissemination including best practises.

Dr. Ajay Pradhan, has worked on water issues of the country and brings with him excellent knowledge and experience.

Presentation by Dr Harshavardhan Subbarao



Dr. Harshavardhan Subbarao, GC Member and Past Vice-President CEAI., and CMD of Construma Consultancy, gave a presentation on **“Recent Advances in Repair and Rehabilitation of Bridges”** at a webinar organised by Kerala Highway Research Institute KHRI in association with IIT Madras on 22nd August 2020. The topics covered included:

1. The one of its kind suite of 10 documents on the European Standard for assessment and repair of concrete structures, *EN1504: Products and systems for the protection and repair of concrete structures - Definitions, requirements, quality control and evaluation of conformity*, provides an integrated framework for the entire concrete repair industry and all stakeholders of a given repair project. Although it is principally a product standard, it also aims to assist specifiers, clients and contractors. The Standard addresses all stages of the repair process, from initial awareness that a problem exists, to the handover of a structure to a satisfied client where the repairs have been properly designed and executed;
2. Ultra High Performance Fibre Reinforced Concrete, UHPFRC - a wonder material for concrete repair with case studies on increasing strength, stiffness, ductility and durability of bridges.
3. Use of externally applied Advanced Fibre Composites – CFRP laminates and fabric wraps, for bridge strengthening and seismic retrofitting with a case study on Cheru Bridge in Pagwara.
4. A novel external prestressing system using special compact prestressed anchorages and a unique curved mono-strand jack.

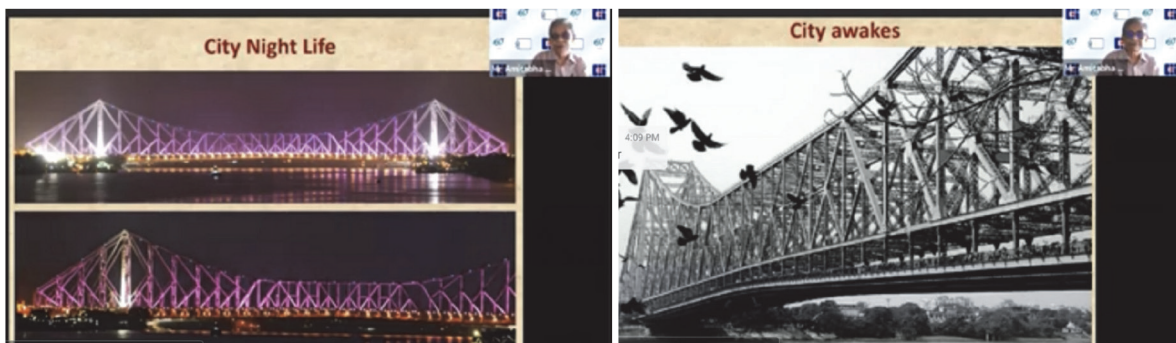
The talk was very well received with a lively Q&A session, and Dr. Harsha has promised to the presentation again for the benefit of a wider audience including CEAI Members, fellow professionals, academicians, students, members of the bridge community and repair industry.

Webinar by Mr. Amitabha Ghoshal on Howrah Bridge



The Indian Association of Structural Engineers (IAStructE) organised a webinar on the “**Brief Historical Review of Howrah Bridge – The first Long Span Bridge in India**” in which CEAI President Mr Amitabha Ghoshal was the speaker.

The session was chaired by Mr. Alok Bhowmick, GC Member of CEAI and President IAStructE and moderated by Dr. Harshavardhan Subbarao. The presentation on the bridge, completed 77 years ago, very vividly covered the history, planning and execution of the great bridge, lauded the world over as a technological marvel. Mr. Ghoshal had laboured hard to collect all the old drawings and records from the musty record rooms of Braithwaite Burn & Jessop’s to put together the presentation and also use the material for a book that he writing on the Howrah Bridge. In this talk he dealt on the intimate relation of the bridge with the population – permanent and transient, and also the then social context, when India was in turmoil on account of the struggle for independence from foreign rule. His exposition held the over 1500 audience spell bound – there was a very wide participation with more than 400 attending the event and more than 1100 hits on the live YouTube presentation. On account of the very wide and involved participation there were a large number of Chats and Q & A during the session, which be patiently responded to.



Views of the Howrah Bridge at night and at dawn

Achievements by Tata Consulting Engineers Ltd.



TCE PARTNERING WORLD ENERGY MISSION International Thermonuclear Experimental Reactor (ITER)

ITER (International Thermonuclear Experimental Reactor) is an international fusion reactor being constructed under the collaborative efforts of seven participating countries including India. This experimental and collaborative research aims to create sustainable energy for the world by harnessing nuclear fusion to solve the world's energy requirements. ITER nuclear fusion research and engineering megaproject is the world's largest magnetic confinement plasma physics experiment, and *TCE has been involved in the projects since inception.*

TCE provided the detailed engineering of the Cooling Water System for the project. TCE was also a part of the conceptual design phase and preliminary design phase which formed the foundation for their final design.

Currently, 50+ TCE engineers from different specialisation are working at the site to help ITER deliver the Engineering Work Packages to the Construction Team for Erection. TCE is also supporting ITER through offshore projects being executed by the delivery teams in India



ENGINEERING NEW INDIA Engineering Consultants for NPCIL's First Indigenous 2x700 MWe PHWR at Kakrapar, Gujarat

The Kakrapar Atomic Power Plant located at Kakrapar, near Surat in is the first indigenously designed and built Pressurised Heavy Water Reactor (PHWR) unit of 700MWe capacity. Tata Consulting Engineers (TCE) worked very closely with NPCIL on the project and provided consulting engineering services for:

1. Detailed engineering including preparation of P&ID's, Specifications, Datasheets, Piping layouts, HVAC layouts, Earthing and Lighting Diagrams, Tray Layouts, Elementary and Wiring Diagrams and Instrument Specification Sheets
2. Development of an integrated 3D model for the Nuclear Island which included entire reactor system along with safety systems, utilities and secondary cycle.
3. Complete engineering and 3D modelling of BoTIP (Balance of Turbine Island Package) for this Nuclear reactor.
4. Development of first Mobile Fuel Transfer Machine for 700 MWe PHWR.

This was the first time such an integrated 3D engineering was performed for an indigenous Nuclear Power Plant. TCE is proud to be associated with the Design Engineering of the unit.

FIDIC NEWS

Mr Sudhir Dhawan is President Elect of FIDIC ASPAC /Asia Pacific



At the General Assembly Meeting of FIDIC Asia Pacific held on 29th September 2020, Mr Sudhir Dhawan, Past President CEAI, has been chosen as President Elect of FIDIC ASPAC/Asia Pacific. He will take over as President in the next GAM . FIDIC ASPAC

is a regional group of 23 member associations of FIDIC comprising countries of Asia and Pacific region . CEAI successfully organized FIDIC ASPAC conference for the 1st time in New Delhi in 2019.

FIDIC hosts first-ever online International Infrastructure Conference

Day One - 11 Sep 2020

The first-ever online FIDIC International Infrastructure Conference kicked off on 11-09-2020 with panellists and delegates taking part in the ***“Engineering a post-Covid Future – the challenges for global infrastructure”*** event from all over the world - *FIDIC communications advisor Andy Walker*.

Over the two-day event, the conference, sponsored by Aon and Bentley Systems, addressed many of the issues currently occupying the global infrastructure sector as it grapples with the challenges of a post-Covid future. Day one of the online conference looked at infrastructure

after Covid and what that will look like, shining a light on global infrastructure perspectives and the likely developments as the world emerges from the pandemic.

Introducing the first conference session, Greg Clark, Global Head of Future Cities and New Industries at HSBC, said that Covid-19 would have a profound effect on cities and how people live in them. Pointing out that the world is now living in “a century of the city”, Clarke also reminded delegates that the globe was also grappling with the consequences of climate change which was presenting infrastructure with an additional challenge. The Covid crisis had also seen the acceleration of business model changes as firms grapple with the new digital realities, he said.

“The science about the virus is still uncertain and a vaccine is still far off and there is unlikely to be a ‘silver bullet’ to see it off,” said Clarke. He also said that there would be fiscal stresses as governments tried to come to terms with financial challenges and the approach would be different across nations. The transport sector would face particular challenges, Clarke said, and there would also be a big agenda around the accessibility of infrastructure, including digital and health facilities. “Tele-medicine will increase in the future as a result of the pandemic,” he said.

“If I were part of the global infrastructure sector, I would be watching very carefully how governments and societies respond to this crisis and consider carefully the effects on business models and how the sector will have to operate in the future,” Clarke said.

This point was amplified in the panel discussion. Solomon Quaynor, Vice President, Private Sector, Infrastructure and Industrialisation at the African Development Bank Group, said that people are likely to want to live differently in future and therefore infrastructures will need to be much more flexible in order to be used for different things. This “hybridity” is likely to be a key trend going forward and would give rise to new financial models in how infrastructure is funded.

Nicole Geoghegan, General Counsel at (HS2) Ltd said that they were looking at how they can partner with the private sector in order to shape the infrastructure they were building, especially in the area of digital connectivity. Tracey Ryan, Managing Director of



Aurecon New Zealand, (pictured above) said that the industry could definitely do more and take a wider view of what was possible and what was needed in a post-Covid landscape.

“We are going into a period of extreme innovation and experimentation,” said Greg Clarke and a period where there will not be a single or clear answer to the challenges that will be presented as a result of Covid. Clarke said that it was very likely that the commercial sector would be called on more to finance infrastructure in new and different ways as governments would have to make do with less fiscal room for manoeuvre. This was “the time of the engineer” said Solomon Quaynor and there were big opportunities for the sector in raising its profile and making a real difference.

Concluding the introductory session of the conference, Greg Clarke said that there was a common interest in the finance sector and the engineering and construction sector understanding how infrastructure is financed and, flowing from that, how risk is managed. “This is a shared agenda for years to come and the whole industry needs to work together to build a more collaborative approach to find solutions,” said Clarke.

FIDIC is grateful to Gold Sponsor Aon and Silver Sponsor Bentley Systems for their support of this event.

Day two 14/9/2020

Day two of FIDIC’s first ever online international infrastructure conference started on 14-09-2020 with panellists and delegates taking part in a session entitled **“Navigating change and delivering infrastructure in the new normal”** - FIDIC communications advisor Andy Walker.

Kicking off the session, international judge and arbitrator Sir Vivian Ramsey said that a key change to the normal has been a move to a new uncertainty that people are having to live with. This uncertainty, he said, has affected mental as well as physical health. Economically, we have seen the collapse of the international airline industry and also the hospitality sector. Infrastructure has been less affected but has still faced big challenges, said Sir Vivian. “We have also seen the acceleration of the change from fixed to flexible offices and companies are now considering what they might need going forward,” he said.

Sir Vivian asked whether much of infrastructure’s design could be carried out remotely. While this would increase, he believed that face-to-face contact was important for creativity, training and building experience and he hoped that would not disappear. Of course, construction needs to take place onsite and that would continue with appropriate safety measures in place, he said. “We are likely to see more off site prefabrication in the future as this can be done more safely,” Sir Vivian said.

The wider impact of the crisis he said would be that industry players would look at risk differently in the future, with issues like ‘force majeure’ increasing in importance, he said. Sir Vivian also thought that there would be a move towards more smart contracts. “We should also expect more design changes as the world comes to terms with new safety regulations and guidelines – this will affect shopping, transport, IT and we will also see an increased need to ‘green’ the future to ensure we have a carbon footprint that is more acceptable to society,” he said.

Richard Robinson, Atkins Chief executive for UK and Europe, said it would be an open question as to when people would get back completely to office work in the future, given people’s fears about travel and safety. Digital would increase in importance and the industry would need to grapple with how it implements new technologies when historically that was an area that construction had been poor at in the past.

Responding to the creation of a new normal affecting the infrastructure sector, Dr Gernot Strube, senior partner at McKinsey, said: “We will see a profound effect on everything in the industry,” and the entire sector would need to innovate quickly to keep up. He thought that supply chains would face particular challenges that would have a lasting effect on the industry. Fenwick Elliott partner Nicholas Gould said that there were no easy answers to challenges that had affected all industry sectors across the world.

“Coronavirus social distancing rules mean that we have a reduced capacity in our offices, around 35%, and we are gently encouraging staff as the country recovers from Covid,” said Richard Robinson. “People can work very efficiently outside the office and are doing so,” said Nicholas Gould, who thought that we would see the wholesale decentralisation of cities across the world.

Most of the speakers thought that the move towards home and remote working was here to stay, but there was a hope that industry does not lose permanently that face-to-face interaction that people value in a workplace scenario.

So, does the industry just need to accept that everything has changed and that we all need to work in a different way and not hope against hope that we will return to 'normal'? "Don't worry about going back to normal because that is not going to happen - we need to be optimistic and look forward not back," said Nicholas Gould. Although Sir Vivian Ramsey thought that the industry needed face-to-face contact to function effectively, he strongly believed that the new normal presented an opportunity for change. "There is a wish to get back to the previous normal, but we should grasp the opportunity now to make changes especially in the area of smart data," Sir Vivian said.

"There is a real appetite for change in the industry and we need to embrace it," said Sir Vivian. "This is an opportunity that must not be missed," he said.

FIDIC is grateful to [Gold Sponsor Aon](#) and [Silver Sponsor Bentley Systems](#) for their support of this event.

OTHER NEWS, VIEWS & NOTES

VIEW POINT

The themes for the next issue of Viewpoint would be "Digital Engineering" (December 2020)

Considering the experience of CEAI members and various stakeholders in the subjects, CEAI would be happy to receive articles on the above themes.

Authors could share their knowledge and experience by providing case studies of the works executed or in execution, first-hand accounts of the challenges faced, practical issues experienced and the solutions to those, etc. Photographs, charts, diagrams, drawings, etc. would benefit our readers for better appreciation of the issues encountered and addressed.

The articles for an issue need to reach CEAI at least 6 weeks prior to the end of the month of the View Point issue.

Articles need to be in Times New Roman 12 with single line spacing with before and after 6 pt and normal margin on A4 size. A recent clear and bright passport size photograph of the author is to be sent along with the article.

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VIEW POINT is circulated to all CEAI Members, FIDIC, Ministries of the Government of India, Public and Private Sector Undertakings, Construction Firms, Contractors, Consultants, Foreign Missions and Funding Institutions in India and other organisations related to or dealing with the engineering profession.

Advertising in the VIEW POINT gives the advertiser wide exposure and visibility.

Support from CEAI members and stakeholders are sought in increasing the number of advertisements, such that View Point gain in its stature as an unique Technical Publication.

The rates for advertisements in VIEWPOINT are given below. This is excluding GST @ 5% or as prescribed, which will be extra:

Item	Rate Per issue* (Rs)	Discounted rate at 20% for 4 consecutive issues* (Rs)
Back Cover	25,000/-	80,000/-
Inside Front Cover **	15,000/-	48,000/-
Inside Back Cover	15,000/-	48,000/-
Full Page	10,000/-	32,000/-
**GST @ 5% or as prescribed will be added to the above rates.		
**Inside Front Cover booked till June 2021		

Tech Quiz

1. **A stakeholder is....**
 - a) Anyone who is involved in the project
 - b) Anyone positively or negatively impacted by the project
 - c) Anyone who can influence the direction of the project
 - d) Anyone who can impact/ be impacted positively or negatively by the project
2. **The ability of stakeholders to influence the project is typically highest at the stage.**
 - a) Planning
 - b) Initial
 - c) Executing
 - d) Design
3. **Most projects will have a _____ number of stakeholders.**
 - a) Resistant
 - b) Supportive
 - c) Diverse
 - d) Unknown
4. **In India, the responsibility of providing water supply to citizens, lies with**
 - a. Urban Local Body (ULB)
 - b. The State Government
 - c. The Central government
 - d. None of the above
5. **Which of the following is not included in the Stakeholder Management Plan?**
 - a. Project lifecycle
 - b. Communications requirements
 - c. Impact of scope changes to stakeholders
 - d. Stakeholder management strategy
6. **The activity of gathering information from stakeholders regarding whose interests should be taken into account throughout the project, is called:**
 - a. Identify stakeholders
 - b. Stakeholder analysis
 - c. Expert judgment
 - d. Plan stakeholder management
7. **The implementation of which of the following processes decreases the risk of project failure?**
 - a. Control stakeholder engagement
 - b. Plan stakeholder management
 - c. Manage stakeholder engagement
 - d. Develop stakeholder engagement
8. **The five levels of stakeholder engagement are...**
 - a. Oblivious, opposed, neutral, proactive, driving
 - b. Unaware, opposed, neutral, supportive, driving
 - c. Oblivious, resistant, neutral, supportive, leading
 - d. Unaware, resistant, neutral, supportive, leading
9. **Under AMRUT funding of projects, Service Level Improvement Plans (SLIPs) and Detailed Project Reports (DPRs) for water supply, sewerage and urban transport projects are prepared by...**
 - a. Apex Committee (AC) at national level
 - b. State level High Powered Steering Committee (SHPSC)
 - c. State Level Technical Committee (SLTC)
 - d. Urban Local Body (ULB)
10. **Which of the following statements is false vis-à-vis stakeholders?**
 - a. Stakeholders may have a positive or negative interest in the success of the project
 - b. All stakeholders should be identified before the project execution begins
 - c. Stakeholders may not be affected by the outcome but may perceive that they could be affected by the outcome
 - d. Stakeholders may be people, or organizations

The first person who mails the correct answers to CEAI info@ceai.org.in will get a congratulatory mail and will be acknowledged by publishing the persons photograph in the next issue.

Contributed by Jitendra Kumar Singh

Answers to Tech Quiz June 2020 issue

1(d), 2(c), 3(a), 4(e), 5(a), 6(b), 7(c), 8(d), 9(e), 10(c)

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