Engineering Council of India

9th National Conference

Challenges of the 12th Five Year Plan - Role of Engineers and Technologists

November 28, 2011

Proceedings

Principal Sponsor

ओएनजीसी
ONGC

Oil and Natural Gas Corporation Limited

Venue :
Auditorium
Scope Convention Centre, Core-8, Scope Complex
7, Institutional Area, Lodhi Road, New Delhi

Supported by :
Member Associations of the
Engineering Council of India

Opening Session in progress

Dr. T.C.A. Anant delivering Theme Address

Dr. Pronab Sen delivering Inaugural Address

Technical Session - I in progress

Technical Session - II in progress

Panel Session in progress

Views of the audience

Engineering Council of India

9th National Conference

Challenges of the 12th Five Year Plan - Role of Engineers and Technologists

November 28, 2011

The Auditorium, Scope Convention Centre,
Core-8, Scope Complex, 7, Lodhi Road, New Delhi

Proceedings

Engineering Council of India
3rd floor, Jawahar Dhatu Bhawan, 39, Tuglakabad Institutional Area
M.B. Road, New Delhi - 110062
Phone : 011-65640356, 29963281, 29963282, Fax : 011-29963283
Email : eci@ecindia.org, ecindia@vsnl.net
Website : www.ecindia.org

Compiled and Edited by :
P.N. Shali, Director, ECI

Contents

Programme

Time	Particulars	
0900 to 1000 Hrs	Registration	
1000 to 1100 Hrs	Opening Session	
	Welcome Address	Dr Uddesh Kohli, Chairman, Engineering Council of India, Chairman Emeritus, CIDC, Chairman, CIAC, Senior Adviser, UN Global Compact, Former CMD, Power Finance Corporation Ltd and Adviser, Planning Commission
	Theme Address	Dr. T.C.A. Anant, Secretary & CSO, Ministry of Statistics & Programme Implementation, Government of India
	Inaugural Address	Dr. Pronab Sen, Pr. Adviser (SP-Del. / Mah. Power & Energy with Coal & PC Division), Planning Commission, Government of India
	Vote of Thanks	Dr. P.R. Swarup, Director General, Construction Industry Development Council and Member, Board of Governors, Engineering Council of India
1100 to 1130 Hrs	Tea / Coffee	
1130 to 1300 Hrs	TECHNICAL SESSION-I	
	Theme	Strategy Challenges of the 12th Five-Year Plan-Role of Engineers & Technologists Physical Infrastructure, Industry and Environment
	Session Chairman	Shri Pankaj Jain, Additional Secretary, Ministry of Statistics and Programme Implementation, Government of India
	Session Co Chairman	Shri S.L. Swamy, Chairman, the Indian Institute of Civil Engineers
	Keynote Speakers	Shri Krishna Kumar Agrawal, Managing Director, M/s K.K. Agrawal & Associates Pvt. Ltd. Consulting Engineers, New Delhi An Ideal Model and Practical Approach to Holistic & Integrated Rural Development & Industrialization

		Shri S. Ratnavel, CEO, Seba Consultancy, Madurai and Member, Association of Consulting Civil Engineers (India) Re-Engineering Technology Delivering System in Construction Industry-A futuristic perspective
		Shri L. Pugazhenthy, Executive Director ILZDA, Past President ,The Indian Institute of Metals Strategy Challenge of Sustainable Development in the 12th Five-Year Plan and Beyond - Role of Engineers and Technologists
		Shri Y P Chawla, Vice President, Indian Institute of Plant Engineers. Strategy Challenge of Sustainable Development in the 12th Five-Year Plan and Beyond-Role of Engineers and Technologists

1300 to 1400 Hrs	Lunch

1400 to 1530 Hrs	TECHNICAL SESSION-II	
	Theme	Strategy Challenges of the 12th Five-Year Plan-Role of Engineers & Technologists Development of Agriculture, Social, Urban and Rural Infrastructure, Education
	Session Chairman	Shri K.K. Kapila, CMD, International Consultants and Technocrats Pvt. Ldt. and Past Chairman, Consulting Engineers Association of India
	Keynote Speakers	Dr. V.M. Mayande, Vice Chancellor, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishi Nagar, Akola - (MS), Maharashtra & President Designate, ISAE Sustained Growth of Agriculture in the 12th Five-Year Plan - Role of Agricultural Engineers
		Dr. Anil Wali, Managing Director, Foundation for Innovation and Technology Transfer, Indian Institute of Technology Delhi Innovation and Technology Transfer for Sustainable Industrial Growth in the 12th Five - Year Plan and Beyond -A Way Forward
		Shri B. I. Singhal, Director General, Institute of Urban Development New Delhi Accelerated Development of Urban Transport Infrastructure in the 12th Five-Year Plan- Role of Engineers & Technologists

		Shri R.P. Lahiri, Dr. Manoj Kulshreshtha and N. Venkateshwarlu, School of Engineering and Technology, Indira Gandhi National Open University, New Delhi The Role of Professional Ethics for Sustainable Development of Construction Projects
		Discussion
1530 to 1600 Hrs	Tea / Coffee	
1600 to 1700 Hrs	Concluding Session and Panel Discussion	
	Theme	Strategy Challenges of the 12th Five-Year Plan-Role of Engineers & Technologists Preparing Engineers for Meeting the Strategy Challenges - of the 12th Five-Year Plan
	Session Chairman	Prof S.S. Chakraborty, Chairman-cum-Managing Director, Consulting Engineering Services (I) P Ltd, New Delhi
	Session Co-Chairman	Shri J.S. Saluja, Managing Director, SCPL, New Delhi, National Vice Chairman, Indian Institution of Plant Engineers and the Member Board of Governors, ECI
	Keynote Speakers	Dr. G.S. Yadava, Council Member & Past Chairman, Delhi State Centre - IEI and Act'g Vice Chancellor, Lingaya's University, Faridabad
		Dr K. K. Khanna, Former Director & Board Member, Steel Authority of India Ltd (SAIL)
		Shri G.C. Tallur, B.E. F.I.E, Former Secretary, PWD Government of Karnataka, Bangalore
		Shri Radhey Shyam Goel, National Convener, Coordination Committee of National Level Water & Hydel National Level Professional Societies
		Dr. Nivedita, Member, Managing Committee, Indian Society for Technical Education, New Delhi

1 9th National Conference on Challenges of the 12th Five Year Plan - Role of Engineers and Technologists

Introduction

The core theme of the 12th Five-Year Plan, reportedly, is faster and more sustainable inclusive growth with likely investment of more than I trillion dollars (Rs. 45,00,000 Crore). Around twelve strategy challenges, which refer to some core areas that require new approaches to produce the desired results, have been identified by the Planning commission. These are: (1) enhancing the capacity for growth, (2) enhancing skills and faster generation of employment, (3) managing the environment, (4) decentralization, empowerment and information, (5) technology and innovation, (6) securing the energy future for India, (7) accelerated development of transport infrastructure, (8) rural transformation and sustained growth of agriculture, (9) managing urbanization, (10) improved access to quality education, (11) better preventive and curative health care, and (12) markets for efficiency and inclusion. It would be seen that engineers and technologists will have a major role to play in meeting these strategy challenges.

India needs to grow at 9-10% annually on a continuous basis at least for 15-20 years. This will need investment resources including public resources, its efficient allocation with emphasis on higher investment in infrastructure. Mere 8% growth, as of now, will not do. We know that economic growth realized so far has not generated enough employment. Many sectors of our economy have been facing workforce shortages, particularly of skilled technical workforce. We need multidisciplinary and multi skilled technical workforce, particularly diploma and degree engineers. We need more M.Tech engineers and PhDs. We need to improve our education and training systems; create efficient and accessible labour markets for all skill categories; and encourage the faster growth of small and micro enterprises.

We need to ensure that our future development has got to be sustainable. For this, inter alia, we need technological and organizational innovation. We need to encourage and incentivise innovation and its diffusion in academia and government as well as in enterprises of all sizes. Faster and more inclusive growth will need a rapid increase in energy consumption. We will have to meet this need equitably, affordably, and sustainably. Our transport infrastructure is inadequate which is the reason for our lower efficiency and productivity; higher transaction costs; and insufficient access to our large national market. We will have to create an efficient and widespread multi-modal transport network. We need to develop an efficient and sustainable rural infrastructure. Hitherto lower agricultural growth has perpetuated food and nutritional insecurities. Consequently, rural incomes have fallen resulting in more rural poverty. Our metros and cities are with inadequate social and physical infrastructure; and these metros and cities are also facing worsening pollution. We will have to make our cities more livable. Educational and training facilities have been increasing rapidly. However, access, affordability, and quality remain serious concerns. Employability is also an issue. Our health indicators have not improved as fast as other socio-economic indicators have. A

good healthcare is unavailable (rural and semi rural areas) or is unaffordable (largely). Engineers and technologists have a major role to play in tackling all these issues for inclusive growth.

The bottom line and very important at that is that we need to consider also a greater and more involved participation of engineers and technologists, apart from others, in the institutional decision-making process for realizing faster, inclusive and sustainable growth of our economy in the 12th Five-year Plan and beyond.

Objectives

The main objective of the 9th National Conference is to identify the role that engineers and technologist will have to play in tackling the above elaborated issues in the context of implementing the 12th Five-Year Plan, clearly define the role and action to be taken by the concerned agencies – the government, corporate sector, regulatory authorities, academic institutions, professional societies of engineers and others and bring up recommendations as objectively as possible.

2 Recommendations

1. Rationalization of 'Engineering Branches' should be done depending on the requirements of the Industry and the other sectors of the economy.
2. It should be made mandatory for the existing engineering institutions, not having quality infrastructure, quality faculty and quality laboratory facilities, that they should improve these facilities within a given time limit.
3. There should be break on setting up of new engineering colleges until their need is established.
4. After the demand for new engineering colleges is established, new integrated engineering colleges should be created with education and training facilities of world standards for engineer technicians, diploma engineers, graduate engineers and postgraduate engineers under one roof.
5. Industry should also be allowed to set up engineering colleges in the country.
6. As a matter of reform of engineering education, there should be a mandatory project-based industrial training during the course; and a mandatory paid internship of six-to-one year in an industrial unit after the course. Both these trainings should be assessed and it should also be made mandatory for the students to pass these trainings.
7. A standing industry-academia interactive mechanism should be established at the national level for making engineering education practical and for increasing engineering & technological innovations.
8. The shortage of skilled engineer technicians is a cause for concern. This issue needs to be addressed.
9. For this, the pattern of current education after 10th class can be converted into vocational course instead of covering the conventional syllabus during the 11th and 12th class. After this, a certificate on the vocational course pursued during the 11th and 12th class can be issued. With this certificate a student can get employment in an industrial unit.
10. Ethics should also be taught in all classes' right from the primary stage. It should be taught as a compulsory subject in higher education, particularly in higher technical education.
11. Finance as a subject should be included in engineering curricula.
12. The government should allow engineers & technologists to take decisions on matters on which they are only competent to take decisions.
13. A separate department should be created for urban transport both at the state and central levels for administering and for policy formulation regarding matters concerning the urban transport.
14. A dedicated agency should be set up at the central level to plan, implement, and operate the urban infrastructure and services.
15. Thorium - based nuclear power should be developed with the urgency that it demands.
16. Engineers should have a role in building up the future Plans of the country rather than looking for their role after the Plan is formulated.
17. A policy which encourages emergence of engineer administrators should be brought out by the government.
18. Engineering profession needs to be regulated by enacting Engineers Act and setting up of a statutory council of engineers as early as possible.

3 Executive Summary

Broadly, a consensus emerged from the conference that engineers and technologists would have to play an important role in meeting the "Challenges of the 12th Five Year Plan" in all the major sectors of our economy such as, the industry, infrastructure, energy security, in realizing the sustainable goals that have been set for the fast-growing Indian economy, particularly in developing new renewable resource - based technologies, in innovating technologies, in tapping the full potential of hydro power, developing viable and sustainable technology for using hydrogen as a source of energy, in harnessing thorium resources that India has for generating nuclear power, etc. The engineering education needs to be reformed for making it more practical which the industry needs today; and sustainable aspects need to be brought in the curricula of engineering education and training. Sustainable aspects should also be an important component of the basic and higher education. The society as a whole should be brought in the net of sustainable development philosophy.

Plans should be formulated keeping the specific geographical, social, cultural, political factors, etc., for every state. Every state plan should incorporate its own needs and requirements, whereas in reality, there is a common Plan for all states, which is not effective. There should be a mechanism to understand the actual requirements and then the Plans should be devised accordingly. The technology driven system (TDS) should be followed for avoiding time and cost overruns. For achieving the objectives of faster and inclusive growth of our country, the government policies, administrative set up and all related factors should also be based on specific requirements of the each state.

The core objective of 12th Five Year Plan is faster, more inclusive and sustainable growth. The word sustainable, for the first time, was used in the Fourth Five Year Plan of this country. We invented the word. Land acquisition is projected as the stumbling block in our efforts for growth and development. We are treating land as practically free. It is just there; whether we need it or not; it is to be acquired. Thus, we have a situation where major projects in India would acquire land 3-4 times the amount really needed for the projects on the plea to make a provision for expansion and growth of these projects over the next 20-30 years. What we are doing in effect, is for the next 20-30 years we would leave the land unutilized; and this we are doing in the land deficient country. We should think about it. If you treat land as virtually free, you make a plan for your business differently. On the other hand, if you properly price the land, the way you plan business is different. We should plan our investments taking land as just valuable and expensive commodity. So, properly priced land is more inclusive.

If you look at company to company data in corporate India, what you find is that labour turnover rate has increased from 6-8% to around 20% across industry. It means that the labour is moving from the company to company in search of higher wages. This also puts pressure on business strategy. We need to really think the way labour is included in our business plans.

Other major development is the faster growth of wages during the last 2 years than last 20 years. The kind of perception we had about India as the hugely labour surplus economy, where wages would not fluctuate very much, and there are too many unemployed people, that assumption is gone. Today we know that there are skills which are in very short supply and as a result bargaining

position of labour, particularly of certain segments of labour, have become higher than they ever were.

In order to meet our energy needs, our dependence on imported primary energy sources- coal, even natural gas- is going to continue. Over the foreseeable future, domestic production of coal would not grow more than 6-6.5% even if we get all the clearances and the private sector is also included in its production. Water would be the major problem in our industrialization. We have to think about it and devise a viable way of water sharing between agriculture, industry and housing.

The problem of our entrepreneurs is in developing and using factors of production optimally through the use of technology. This being so because the problems arising from factors of production cannot be solved without application of new technologies. Here lies the challenge for engineers, who must look out for new technologies.

The major challenge before the government is to develop a system of monitoring investment of public-private-partnership projects (PPP) which is consistent with the legal framework, and which allows us to rack whether we are able to deliver results in time along with the original expectations. We need to expand the scope of monitoring to PPP in more effective way. We need an advanced monitoring system for this.

We have not kept pace with the advancements of concepts of monitoring fully government financed and controlled programs. We need to develop data collection mechanism for the construction sector which is unique to this sector. We need an advanced monitoring system for this. We need to devise methods for effective monitoring and tracking of expenditure. The challenge before us is to improve the descriptive quality of data. Another challenge before us is developing an effective and efficient mechanism for evaluating the availability of jobs from both the organized and unorganized sectors.

The Construction Industry Development Council (CIDC) has been working in the area of collection of the construction cost Indices under the guidance and with the support of the Ministry of Statistics and Programme Implementation for the last few years. It is proposed to expand construction cost indices data further to cover all the major regions of the country. The major issue is how to meet the skills gap in the construction sector at least up to the extent of 60% of the planned requirements of the construction sector.

Our emphasis should be on continuous learning and professional advancement. This should be at par with international standards and requirements. The skill development is, therefore, an area of concern. It has been included as one of the important targets of the 12th Plan. The institutional mechanism for skill development is also being strengthened in the 12th Plan.

In our rural areas social and psychological conditions are different from the urban areas; even one square meal is also not available; and the general value system is worst in the rural areas than it is in our urban areas-because hunger makes humans animals. The following steps are suggested for improving the rural scenario: comfortable and affordable housing, clean habitation and environment, basic amenities like water, electricity, sewerage, drainage and public hygiene, vocational orientation in education, proper roads and communication network, organized and objective education along with adult education, basic health, maternity facilities and health extension infrastructure, systematic guidance on the use of advanced agricultural methods and technologies, increase employment opportunities through growth of industry, encourage underground water conservation and rain water harvesting, taking up apt community development programmes, taking up systematic programmes of forestation and creation of green cover, technology transfer in horticulture and floriculture, planning programmes and their implementation for improving water supply, and

extend loans and financial facilities for rural development, etc. Here lies the role for engineers & technologists for enabling taking up these steps for improving the rural scenario.

Use of materials and resources judiciously is very much necessary. More attention would have to be given to minimize wastage in everything that we may produce and consume like metals, plastic, paper, glass etc. These materials would have to be recycled. We should also use more alternative sources of energy like tidal, biogas, solar, etc. We need to educate people on these alternative sources of energy.

Agricultural engineering inputs during the 12th Five Year Plan would be highly critical and indispensable to avoid further decline in agriculture, for sustainable agricultural production and consumption, creating new agro - industry network and supporting the existing net works. We will have to strengthen infrastructure for agriculture engineering education.

The role of agricultural engineers is to support innovation in agriculture, design power and energy tools, land and water structures, bring in innovations in food process technology, support bio-sciences research, support agro-based industries, develop rural engineering, and provide support to government for formulating appropriate policies on agriculture. Agricultural engineers would have to devise practical and efficient ways of production, storing, processing and packaging of agricultural products, and develop systems which will solve problems. They will have to develop processes, machines, and skilled workforce for realizing self - sufficient rural economy. They will also have to develop appropriate strategies for (developing) our rural areas through harnessing agro-based resources inter alia for the industrialization of these, apart from taking measures for the protection environment. They will have to explore opportunities that are available for inducting technologies for pest control, hazardous waste management, and environmental protection.

Sustainable development and inclusive growth are the key issues of the XIIth Five Year Plan. Sustainable development refers to the environmental responsibility in general terminology. Usage of best technologies and best programmes that have been undertaken by the organizations are the examples of sustainable development

Innovation is the most vital aspect in today's world. An organization will survive only if it is in a position to bring in the market environment friendly products for meeting various needs of the society. The organizations will evolve with time and they should try to develop technologies which are sustainable otherwise business will not make any headway. Engineers & technologists should be innovative, creative; and they should develop new technologies which are sustainable. This is the challenge that they should meet.

The 12th Five Year Plan aims at reduction of energy consumption of urban transport sector and its inclusive and sustainable growth. Neglect of urban transport is not right think to do in view of the energy and environmental considerations. The quality of public transport would have to be improved; and with this improvement, people would be willing to utilize the public transport- which will be environmentally sustainable mod of transport. For this, inter alia, the city - wide integrated and multi - modal transport network would have to be developed. IT would have to be used for traffic management, automation, fare collection, etc. The ministry of urban development has instituted a comprehensive system for capacity building, knowledge and database management, and research and development. A dedicated agency should be set up at the central level to plan, implement, and operate the urban infrastructure and services. A separate department should be created for urban transport both at the state and central levels for administering and for policy formulation regarding matters concerning the urban transport.

A country which depends on the foreign suppliers for basic designs cannot be called emerging economic power. We are still dependent on foreign suppliers for the basic designs; while as we have developed our competence in detailed designs and in building new plants based on these detailed designs. Our dependence for the basic designs on foreign suppliers makes us 2nd class engineers. India's this dependence for the basic designs on foreign suppliers is not good; and if it has to emerge as economic super power it must remove this dependence. We must make all efforts to acquire skills in designing things. The engineering education should enable it. If we have to reform the engineering education for this, we must do it. It must be ensured that the emphasis is placed on in-house research and development and designing in future. What it demands it should be provided. Professional institutions have a major role to play in addressing this issue. In sum: India should be able to innovate and design, set up plants based on its own designs and produce goods of better quality and at cheaper prices.

Engineers should play a major role in exploration of new and alternate mineral resources; one of the main resources is coal; and locating new coal deposits should be the priority in our scheme of things. India has not been geologically mapped and explored fully yet. Our mining engineers should come out with new ideas for exploration of minerals in the country including for hydrocarbons.

For the existing institutions, not having quality infrastructure, quality faculty and quality laboratory facilities, it should be made mandatory that such institutions should improve these facilities within a set time limit. New institutions should be created with education and training facilities for engineer technicians, diploma engineers, graduate engineers and postgraduate engineers under one roof.

The challenge is to use green technology and develop products and processes which cater to the same. There are many dimensions in innovation. Engineers should be innovative, creative; and they should develop new technologies which are sustainable. This is the challenge that they should meet.

Industry academia consultative mechanism needs to be established at the national level. Academia has a vital role to play in mobilization of resources, and inclusion of various new techniques and other related aspects of management of our resources. We should include finance as a subject in engineering curricula. We should devise mechanisms to translate innovations into technologies. There is a good co-relation between the two. We should also learn from various examples where basic science from an academic environment has been transformed into phenomenal business venture. Research involved in innovations should also be sustainable on a long term basis. Organizations should also try to incorporate this into their research and development work as a part of their long term goal. Thus they will be contributing to the sustainability in great measure. We should go for high impact innovations which have global impact; and then only our engineers will be recognized worldwide for their competence, intelligence and talent.

There are 31 branches of engineering which stand identified by the AICTE for starting engineering courses. All these 31 branches are not required. Rationalization of branches should be done depending on the requirements of the Industry and the other sectors of the economy.

The engineering profession needs to be regulated as the other professions such as the medical, the legal, the charter accountancy, etc, are regulated in India. For this, the Engineers Act needs to be brought on our statute and statutory council of Engineers set up without further delay.

4 Opening Session

Welcome Address : Dr. Uddesh Kohli

Engineering Council of India was formed in the year 2002 by coming together of various associations and bodies of engineers and at present it has become a representative body of 30 member associations / societies; and it acts as one voice for improving the profession, its image and to get a proper legal recognition to the profession and to make engineers accountable to the society.

The approach paper of the 12th Five Year Plan, which is now in the formulation stage, has been recently discussed and approved by the National Development Council. We are very fortunate to have with us Dr Pronab Sen and Dr T C A Anant, both representing two important aspects of planning process. Dr Pronab Sen, on planning side - how to formulate plans, projects, etc, and Dr T C Anant on the implementation side - how do we ensure that planned projects are implemented well and on time.

It is unfortunate that still legally engineering is not recognized as a profession in India. For this, we have drafted an Engineer's Bill; and it was submitted to the Ministry of HRD. The Ministry circulated the Bill via a draft Cabinet Note to the concerned ministries and departments of the government of India for comments; and these comments were received, incorporated in the draft wherever it was considered necessary, and the Ministry again recalculated the draft to the these ministries and departments of the government of India. It is now ready to be submitted to the Cabinet for approval; after this is given, it will be moved to the Parliament for an enactment. Once it becomes an Act, we will have a regulatory body in position which will help in regulating the profession in the same manner as dentists, architects, doctors, chartered accountants, company secretaries, etc, are regulated.

Our emphasis should be on continuous learning and professional advancement. This should be at par with international standards and requirements. The skill development is, therefore, another area on which ECI is working. It is planning to evolve and adopt latest systems to improve the employability of engineers, as only 25% engineers who come out from our engineering institutions every year are found employable at present.

Theme Address : Dr. T.C.A. Anant

The Ministry of Statistics and Programme Implementation is playing the role of monitoring of government work by evaluating its major national programmes including sectors such as infrastructure and services. For doing this, the Ministry uses variety of devices for gathering data from the implementing agencies; based on this data, the reports are prepared and circulated; and these reports show how we are progressing in various areas. These reports are widely read.

The major challenge before the Ministry is to develop a system of monitoring investment of public-private-partnership projects (PPP) which is consistent with the legal framework, and which allows us to rack whether we are able to deliver results in time along with the original expectations. We need to expand the scope of monitoring to PPP in more effective way. We need an advanced monitoring system for this. We

Dr Uddesh Kohli is the Chairman, Engineering Council of India, Chairman Emeritus, CIDC, Chairman, CIAC, Senior Adviser, UN Global Compact, Former CMD, Power Finance Corporation Ltd and Adviser, Planning Commission

Dr. T. C. A. Anant is Secretary & CSO, Ministry of Statistics & Programme Implementation, Government of India

have not kept pace with the advancements of concepts of monitoring fully government financed and controlled programs. We need to devise methods for effective monitoring and tracking of expenditure.

The collection of statistics in our country is one of the largest and complex processes; and hence, supervision and coordination for collection of official statistics in India is a huge task. It is necessary to collaborate with engineers and other professionals to improve the quality of data. In order to evaluate the construction sector projects, the data is estimated from the derived indicators of production of steel, cement etc. We need to develop data collection mechanism for the construction sector which is unique to this sector. In fact, for estimation of services, we need to develop data collection mechanisms which are unique for each service. This is the biggest challenge before us. Once operationalised, it will provide full information; and we need help of all stakeholders in this task. I may inform that appropriate indicators have been worked out for transportation, railways, and civil aviation sectors.

Based on the available data, we are strengthening the database further of land, minerals, forests, water, etc. The challenge before us is to improve the descriptive quality of data. Another challenge before us is developing an effective and efficient mechanism for evaluating the availability of jobs both in the organized and unorganized sectors, as we know the organized sector jobs are major indicators of growth. We should have an efficient system to analyse and evaluate the transition process of the job ladder. We need to develop a mechanism to analyse the process of conversion from semi skilled to skilled labour. In order to develop a data base for our natural resources, we need to work with different departments of the central government, the state governments, and other concerned institutions.

Inaugural Address: Dr. Pronab Sen

The theme of the conference - Challenges of the 12th Five Year Plan- is well documented in the approach paper; and it is on the Planning Commission's website. What it really means is the way we think about our economy? The core objective of 12th Five Year Plan is faster, more inclusive and sustainable growth, which we need to deliberate on. Regarding faster growth, there is common perceptions that there should be more and more capital investment in the economy - i.e higher the investment rate results in faster economic growth. But it is not true. We have to reflect whether as a country is it desirable for us to continuously increase our investment rate to increase the rate of growth of GDP or is there a different way? This is the challenge of faster growth. More inclusive growth is the other important objective of the Plan. In the Eleventh Plan for the first time we talked about inclusive growth, though initially there was no clear articulation regarding the same, now we have a better understanding about the concept.

The notion of sustainability of development was an Indian creation; as a matter of fact, the word sustainable, for the first time, was used in the Fourth Five Year Plan of this country. We invented the word; and other countries like China is the classic example where all norms of sustainability have been violated in the quest for development and growth of that country. But India, as a responsible member of the world community, should not take such liberties with global environment.

The single biggest area of dismay and debate amongst the business community in India has been the issue of land acquisition. The community is projecting it as a big problem. Land acquisition is projected as the stumbling block in our efforts for growth and development. Is it

Dr. Pronab Sen is Pr. Adviser (SP-Del. / Mah. Power & Energy and Coal & PC Division), Planning Commission, Government of India

really the case? India, as a country, has a higher population density than any other country in the world. Despite this, we are treating land as practically free. It is just there, whether we need it or not, it is to be acquired. Thus, we have a situation where for major projects in India we would acquire land 3-4 times the amount really needed for the projects on the plea to make a provision for expansion and growth of these projects over the next 20-30 years. What we are doing in effect is that for the next 20-30 years we would leave the land unutilized; and this we are doing in the land deficient country. It is not peculiar to public sector; and private companies are also equally responsible. The reason why it is done is that the land provides a very good fall back asset. A lot of companies when they face financial problems, they rescue themselves by selling the surplus land. Think about the implications of land acquisitions on the business plans. When you plan, you think of primary factors of production land, labour capital, etc, if you treat land as virtually free, you make a plan for your business differently. On the other hand, if you properly price the land, the way you plan business is different. We should plan our investments taking land as just valuable and expensive commodity. So, properly priced land is more inclusive. The more conservative you are in the use of land, more sustainable is the growth of society. There is a caveat here between faster growth and more inclusive and sustainable growth.

Other major development is the faster growth of wages during the last 2 years than last 20 years. The kind of perception we had about India as the hugely labour surplus economy, where wages would not fluctuate very much, and there are too many unemployed people, that assumption is gone. Today we know that there are skills which are in very short supply and as a result bargaining position of labour, particularly of certain segments of labour, have become higher than they ever were. This does not required active and dynamic trading. If you look at company to company data in corporate India, what you find is that labour turnover rate has increased from 6-8% to around 20% across industry. It means that the labour is moving from the company to company in search of higher wages. This also puts pressure on business strategy. We need to really think of the way labour is included in our business plans.

It is a common perception that our energy problem is due to land acquisition for mining coal. If forest land is made available for coal mining, it will meet the requirement and solve the problem. It is not correct. In order to meet our energy needs, our dependence on imported primary energy sources- coal, even natural gas- is going to continue. Over the foreseeable future, domestic production of coal would not grow more than 6-6.5% even if we get all the clearances and the private sector is also included in its production. We need to think about the way we integrate the larger dependence on imported fuel supplies into overall energy scenario-thermal, hydro and renewable sources of energy.

After energy, it is water which is very important factor for the growth of the economy. Water would be the major problem in our industrialization. We have suppressed this problem at present. Instead of going for new water connection, people are digging bore-wells and sucking water from land. It is not a viable solution. We have to think about it and devise a viable way of water sharing between agriculture, industry and housing.

Over the next five years corporate India will have to reinvent itself the way it did in 1992 / 97, which resulted in the higher production. The land was used optimally; skilled labour, energy and water resources were utilized optimally. The problem

of entrepreneurs is in developing and using factors of production optimally also through the use of technology. This being so because the problems arising from factors of production cannot be solved without application of new technologies. Though there are technologies in the world, and these technologies are continuously being upgraded aboard. So, the key is the way we generate and use energy, water resources, land resources, skilled labour and what you have. Here lies the challenge for engineers, who must look out for new technologies available from the developed countries, invent new technologies for replacing the existing ones which are not efficient, and to make the existing technologies energy efficient. They must at the same time look within and find solutions to our problems. The problems and needs in our country are different and difficult, and they have to be dealt with accordingly.

Dr. P. R. Swarup

It is my privilege and honour to propose a vote of thanks. It is a privilege to listen to the two great professionals who are also good teachers. I am very happy to see many students and young engineers present in the conference. It is their time now; and ECI has ensured their participation. This is very important. Youth is India's future; and it is our job to sharpen their skills. These conferences are one of the important means of doing that. I may inform this august house that the Construction Industry Development Council (CIDC) has been working in the area of collection of the construction cost Indices under the guidance and with the support of the Ministry of Statistics and Programme Implementation for the last few years. The CIDC collects compiles and maintains data on training of construction workers, supervisors, etc, and this data is available in the form of electronic cards, and is also hosted on website of the CIDC. It is proposed to expand construction cost indices data further to cover all the major regions of the country. The major issue is how to meet the skills gap in the construction sector at least up the extent of 60% of the planned requirements of this sector. We are deficient not only in skilled workers but also managers. A simple and straightforward mechanism needs to be developed to convert people to act as engineers / managers. The training plays an important role in the development of physical infrastructure.

India has a largest youth population. Therefore, it has the demographic advantage over rest of the world. This demographic advantage can be harnessed. With this, we can fulfill the demand of the country for the existing and new skills; we can also meet the demand for engineering skills abroad. For providing the proper education and training, even institutions like IIT's should up grade the technology of delivery by using more simulations in their teaching. We should establish more skill development institutes in the country. We should also involve private sector in this. The programmes that these institutions should take up including by those that are in the private sector should be certified by qualified agencies. For the working engineers, modular courses can be taken for improving their skills and for learning new skills.

Dr. P.R. Swarup is Director General, Construction Industry Development Council and Member, Board of Governors, Engineering Council of India

5 Technical Session - I

Opening Remarks by the Session Chairman : Shri Pankaj Jain

India has been growing at around 8-9 percent per annum in the recent past. Fortunately, India did not face the same problem as the western economies have faced in the recent past. India was able to maintain its growth momentum despite these developments in the western economies. This shows that the fundamentals of our economy are robust. The Indian is emerging as a global economic power. There is a large scope for further development of India, particularly of rural India. This is where our actions should lie in the days to come. The economic development of rural India should match with that of the urban India, and then only India can be considered as the fully developed country. The 12th Five Year Plan is primarily aimed at that. Indian engineers and technologist have a major role to play in realizing this. India is a young country. India should take advantage of the demographic dividend that it has. There should be no delay in clearances of the development projects. We should ensure it. We need to work with a mission. We should be more innovative. We should develop technologies which suits us. These technologies should be taken form the labs to the land with speed that it demands. We can become economic super power only if we become a technology developing country in the world. Engineers and technologist have a major role to play in this. We should reform our engineering education system so that it produces engineers which our industry demands. We should also reform our diploma engineering education and that of the engineering technicians. We need to augment our training facilities. We can better do it with private participation. So we should involve private players also in the skill development programmes. The 12th Plan has recognized this as an important objective of the Plan.

Keynote Presentations : Shri K.K. Agarwal

Unless one belongs to rural areas, one does not understand the ground realities and the disparities which are so large. The information we get is only through newspapers regarding how the money under government schemes is utilized. You may recall the former Prime Minister Late Shri Rajiv Gandhi's statement that only 16% of the money / benefit reaches the actual beneficiary. The rest of it goes in the hands of rent seekers. This is the most unfortunate thing to happen in our country. The situation, however, has improved in some rural areas of UP, Bihar and Odisha and in some parts of southern India. The situation in other rural areas remains the same. Therefore, about 70% of the population remains in bad condition; and very strong measures are required to improve this situation.

Financial help is only a temporary solution; we should also encourage the rural people to develop themselves. The ground reality is that in our rural areas social and psychological conditions are different from the urban areas; even one square meal is also not available and the general value system is worst in the rural areas than it is in our urban areas- because hunger makes humans animals. An ideal model and practical approach to the holistic and integrated rural development and industrialization are, therefore, the following: no freebies to anyone except loan on returnable basis, no extra liability to the

Shri Pankaj Jain, Additional Secretary, Ministry of Statistics and Programme Implementation, Government of India

Shri Krishna Kumar Agrawal, Managing Director, M/s K. K. Agrawal & Associates Pvt. Ltd. - a consulting engineers firm, New Delhi.

government barring plan responsibility and regulatory mechanism, reversing population migration from rural to urban areas, providing affordable housing to rural population , devising a mechanism for empowerment, encourage the role and responsibility of society as the whole, positive and favourable rural employment for agricultural development and industrialization, and ensuring development in all tribal areas and difficult terrains like terrorist effected areas.

If at all these factors are implemented, this will help in exponential growth of GDP. The problems of poverty, no organized education system, and no healthcare, hardly any avenues of employment and organised industrialization and corruption will need to be addressed. The vital role will have to be played by not only engineer and managers, but also by economists, social workers and the society at large for addressing these problems. If we take care of all inclusive rural development, India will become the developed nation of the world by 2020.

The following steps are suggested for improving the rural scenario: comfortable and affordable housing, clean habitation and environment, basic amenities like water, electricity, sewerage, drainage and public hygiene, vocational orientation in education sector both in urban and rural areas, proper roads and communication network, organized and objective education along with adult education, basic health, maternity facilities and health extension infrastructure, systematic guidance on use of advanced agricultural methods and the technology should reach end-users, increase employment opportunities through growth of industry, encourage underground water conservation and rain water harvesting, taking up apt community development programmes, particularly in rural areas, taking up systematic programmes of forestation and creation of green cover, technology transfer in horticulture and floriculture, planning programmes and their implementation for improving water supply, and extend loans and financial facilities for rural development, for example, a programme can be developed with a seed capital of 100 crore for a period of 20 years on returnable basis for villages with 10000 population. All the above measures should be undertaken to fight poverty and stop mass scale migration of rural people to urban areas.

Role of engineers is very important; engineering managers have to do the detailed and extensive planning for every village, keeping in view the local law and order, etc. For development of rural India, schemes have to be self supporting. Engineers, urban planners, architects and engineering consultants have to play a vital role in realizing the dream of prosperity, growth and real development in the rural areas along with the urban areas.

Shri S. Ratnavel

The role construction is playing has both a direct and indirect impact on the economy. The construction forms an important part in the work of about twenty three ministries with its share ranges from 16- 34% percent. The overall average of construction component of investment is 47.48%; and overall contribution of civil engineering is 7.4% (2005-06) of estimated GDP. The State Governments and local bodies like public works departments, etc, spend the money on constructing roads, bridges, hospitals, etc; and quality of this construction is a matter of great concern. The technology driven system (TDS) should be followed for avoiding time and cost overruns.

In the name of investment, people spend one rupee and in the next year they spend one-and-half rupee in the name of maintenance. In order to avoid such misuse of public money, we should have a proper system of evaluation and

Shri S. Ratnavel is CEO, Seba Consultancy, Madurai and Member, Association of Consulting Civil Engineers (India)

monitoring to stop these acts of gross negligence and wastage. Proper planning, need-based and analysis of the benefits should be done. In the context of 12th Plan, rules and regulations should be based on the specific requirements of every state. India is a huge country with lot of diversity and varied factors affecting them should be taken into account. Plans should be formulated keeping the specific geographical, social, cultural, political factors, etc., for every state. Every state plan should incorporate its own needs and requirements, whereas in reality, there is a common plan for all states, which is not effective. There should be a mechanism to understand the actual requirements and then we should devise the plans accordingly.

The planned investment should be made according to the factors like soil conditions, construction technologies adopted, etc., to avoid wastage and use the resources to the optimum level. In the maintenance of heritage monuments, the best way could be to modify and maintain the existing structure so that it retains its heritage value. There is gross wastage and negligence in the use of construction materials. It is estimated that around 40% of the construction materials is wasted. Ours is a developing country and we should make all efforts to use resources prudently and leakage and wasted should be avoided at all costs. Proper construction systems should be developed. Though there are many rules and regulations on paper, none of them are implemented in reality. There should be a proper registration, regulation and monitoring of the materials being used. For achieving the objectives of faster and inclusive growth of our country, the government policies, administrative set up and all related factors should also be based on specific requirements of the each state.

Shri L. Pugazhenthy

Sustainable development is the buzz word today; earlier for our forefathers this was a noble cause; they called it savings for the future. The role of engineers and technologies in sustainable development in the 12th Five Year Plan cannot be overemphasized; as the role of engineers and technologists for sustainable development is very critical. Countries which did not take the cause seriously, like the United States, have witnessed in the year 2008 their companies closing down and hence their economies collapsing. Due o this, there was also the global melt down. How did all begin? Living beyond their means by borrowing money left and right which they could not payback and consequently the financial institutions which had given this money collapsed. That's how it started.

India is the second fastest growing economy today. Many international agencies have predicted that India will overtake China by 2020 - 25. India has a population of 1.25 billion, and going by the trend in last decade, 1.7% is the rate of population growth; and if this trend continues, use of materials and resources judiciously is very much necessary. Everyone talks about sustainable development, but it is hardly followed. We do not think of conserving our scare resources. The role of engineers is very critical for this. We need to bring in synergy between the various engineering disciplines like metallurgy, mining, civil, electrical, mechanical, etc., and it is the duty of engineers belonging to these streams to contribute in bringing in this synergy for realizing the sustainable economic development of India.

Sustainable development actually means you consume today as much as you want but leave enough for future generation, don't consume more than it is necessary. Wastage should be avoided and no activity whether economic, construction, scientific can be justified which results in environmental degradation and pollution. If today we use resources without leaving enough of these resources for future use,

Shri L. Pugazhenthy, Executive Director, ILZDA and Past President ,The Indian Institute of Metals.

coming generations will be left without sufficient resources for their use. The coming generations will be placed at a disadvantage by our today's actions. Thus our lack of attention to sustainable development today, which means optimal use of resources, will not be environmentally viable.

Engineers will have to assess cost and benefits of any technology that they may develop, or carry out any improvement in methods of production, any new process development project, etc. All of these and new projects will have to be efficient in the use of resource including energy and hence sustainable. We will have to assess similarly costs & benefits of R&D projects. More attention would have to be given to minimize wastage in everything that we may produce and consume like metals, plastic, paper, glass etc. These materials would have to be recycled. We should also use more alternative sources of energy like tidal, biogas, solar, etc. We need to educate people on these alternative sources of energy.

Shri Y. P. Chawla

Enhancement of skills is vital to development of India. Whatever is being taught at corporate level is quite different from what is required? There is a lot of gap between the skills required and taught. Practical training is required to fill up the gap. Engineers have taken up the job of managers and entrepreneurs, etc, through acquiring additional skills. This development has lead to improvement of productivity. The 12th Plan has identified twelve strategies for development; and new skills are required in taking up these strategies. Due to shortage of skills, wages have gone up. Unless an institution is reputed, the teaching faculty is updated, and there is no gap between what is taught and what is required, output of such an institution is okay. But, the ground reality of India is different. A large body of Institutions of engineering education do not have quality faculty, infrastructure, and are not reputed institutions, output from such institutions is poor –both in the basic knowledge of engineering and skills.

For providing the proper education and training, even institutions like IIT's should up grade the technology of delivery by using more simulations in their teaching. We should establish more skill development institutes in the country. We should also involve private sector in this. The programmes that these institutions should take up including by those that are in the private sector should be certified by qualified agencies. For the working engineers modular courses can be taken up for improving their skills and for learning new skills.

India has a largest youth population. Therefore, it has the demographic advantage over rest of the world. This demographic advantage can be harnessed. With this, we can fulfill the demand of the country for the existing and new skills; we can also meet the demand for engineering skills abroad. We must not forget that the vertical mobility is possible only through continued up gradation. Though Indian education system is based on formal education through schools and colleges, one should go on improving his / her skills. This can be done by going for bridge programmes.

India, as stated above, has the advantage of having 50% population below the age of 35 years. We can contribute in bridging the skills gap in India as well abroad. So we must give priority to the skill development programmes and for this we must create a proper institutional mechanism including for certification. People belonging to the age group of 55-64 years are ready to work beyond retirement, whereas younger generation does not want to work post retirement. We must tackle this issue.

Shri Y. P. Chawla is Vice President, Indian Institute of Plant Engineers.

6 Technical Session - II

Opening Remarks by Session Chairman : Shri K.K. Kapila

The theme of this national conference is the strategy and challenges of the 2th Plan - the role of engineers and technologists. This is an ambitious and very articulate Plan; a road map for India during the next five year for development and job creation, apart from for realizing a higher growth rate of the economy. How to achieve this is the question? Are we prepared to play our role as engineers and technologists? What do we need to do more? How should we perform our role for ensuring that the targets are realized fully that have been set for the Plan? This is what should we discuss today. The canvas is big; we are covering all most all the sectors of economy which involves engineers and technologists-power, industry, roads & buildings, ports & harbours, railways, road transport, irrigation & agriculture, public health, and so on. The role of engineers & technologist is there in all these areas and in other areas also. Besides, we have to reform our engineering education system for making it more relevant to the current and future needs. We have also to reform our institutional infrastructure of training & development for skill development. We need to add ethics into the engineering curriculum; and it should be a compulsory subject. We should make engineers accountable for whatever assignments they are entrusted with.

Dr. V.M. Mayande

Agriculture is the base of rural economy. 12th Five Year Plan emphasizes on inclusive growth; and it applies also to agriculture. There are a lot of diversities in agriculture depending on the soil dynamics and climate; and agriculture produce changes in different states. Infrastructure development and agriculture commodity prices in rural areas are one of the factors affecting the agriculture production in the country. The role of agricultural engineers is to support innovation in agriculture, design–power and energy tools, design land and water structures, bring in innovations in food process technology, support bio-sciences research, support agro-based industries, develop rural engineering, and provide support to government for formulating appropriate policies.

Agricultural engineers have to face many challenges. These are: produce food for more than 1 billion population, and growing population requires more food; produce more food, more energy goods(PMEG) and ensure affordability of these goods. There is a lot of uncertainties of innovation in agriculture. These are technological, consumer and political. Advancement in sustainable agricultural engineering depends on the social, economic and environmental factors. Agricultural engineers will have to play a significant role during 12th Five Year Plan to sustain agriculture growth in India.

The core issues to be taken into consideration include : self sustaining rural technology, safe and enough food and water, harvesting renewable energy, and clean and healthy environment. Agricultural engineers would have to devise practical and efficient ways of

Shri K.K. Kapila, CMD, International Consultants and Technocrats Pvt. Ltd. and Past Chairman, Consulting Engineers Association of India.

Dr. V.M. Mayande, Vice Chancellor, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Krishi Nagar, Akola (MS), Maharashtra & President Designate, ISAE.

production, storing, processing and packaging of agricultural products, and develop systems which will solve problems. They will have to develop processes, machines, and skilled workforce for realizing self sufficient rural economy. They will also have to develop appropriate strategies for developing our rural areas through harnessing agro-based resources inter alia for the industrialization of these areas, apart from their environmental protection. They will have to explore opportunities related to practice of hybrid technology for pest control, for hazardous waste management, and environmental protection.

They will have to manage natural resources. This can be done by understanding mechanism of water and soil management, wet land protection, water control systems – dams, reservoirs, drainage and sewerage systems, usage of pesticides, waste water treatment and rain water harvesting. Food process engineering can be used for developing useful products. Usage of microbial processing will have to be increased. Treating agricultural waste will need new technology. This will have to be developed.

Information technology can be used for disseminating information like mobiles, internet multi media – radio, television, etc., for reaching people, creating awareness regarding the new and improved techniques which are available, usage of pesticides, and availability of hybrid seeds. The use of call centre created for farmers is a step in the right direction that the government has taken, and it is a successful example of the use of IT in agriculture.

Environmental engineering has a vital role to play in agriculture. For this we will have to develop technologies for optimum utilization of natural resources, devising energy conservation system, protecting the natural ecology, soil conservation, rainwater harvesting, protecting the forests, help in maintaining safe, healthy and green environment.

Agricultural engineering inputs during the 12th Five Year Plan will be highly critical and indispensable to avoid further decline in agriculture, for sustainable agricultural production and consumption, creating new agro industry network and supporting the existing net works. We will have to strengthen infrastructure for agriculture engineering education.

Dr. Anil Wali

Sustainable development and inclusive growth are the key issues of the XIIth Five Year Plan. Sustainable development refers to the environmental responsibility in general terminology. Usage of best technologies, best programmes that have been undertaken by the organizations are the examples of sustainable development which have been made popular by the Planning Commission. The core issues of sustainable growth are: intellectual capital, technology transfer, innovation, and eco system. The challenges are: globalization, petrol tariffs, demand and supply mismatch, need for creativity and innovation, energy needs and environment protection. Innovation is the most vital aspect in today's world. An organization will survive only if it is in a position to bring in the market environment friendly products for meeting various needs of the society. The organizations will evolve with time and they should try to develop technologies which are sustainable otherwise business will not make any headway. Innovation is closely linked to knowledge; and combination of innovations will lead to power, progress and empowerment. Emerging business models and knowledge economy, which comes from academia, will help develop products and processes which are sustainable.

Dr. Anil Wali, Managing Director, Foundation for Innovation and Technology Transfer, Indian Institute of Technology Delhi

Knowledge – academia- students – technology transfer – innovations are all interrelated. The challenge is to use green technology and develop products and processes which cater to the same. There are many dimensions in innovation. Engineers should be innovative, creative; and they should develop new technologies which are sustainable. This is the challenge that they should meet. Academia and industry relationship would need to be established on a sound footing for boosting our innovations. Academia has a vital role to play in mobilization of resources, and inclusion of various new techniques and other related aspects of management of our resources. We should include finance as a subject in engineering curricula. We should devise mechanisms to translate innovations into technologies. There is a good co-relation between the two. We should also learn from various examples where basic science from an academic environment has been transformed into phenomenal business venture. Research involved in innovations should also be sustainable on a long term basis. Organizations should try to incorporate this into their research and development work as a part of their long term goal. Thus they will be contributing to the sustainability in great measure, we should go for high impact innovations which have global impact; and then only our engineers will be recognized worldwide for their competence, intelligence and talent.

Shri B.I. Singhal

Historically speaking, after independence for three decades, there is no mention of urban transport. Neglect of urban transport is not right think to do in view the energy and environment considerations. During the Sixth Five Year Plan, urban transport was mentioned for the first time and some technical policy direction was given. In the Seventh Five Year Plan, nothing was mentioned on this sector. In the Eighth Five Year Plan, emphasis was on unified co-ordination body and consortium to finance the same. In the Ninth Five Year Plan, a headway was made by making investment in metropolitan cities on urban transport projects, private sector was given a leeway, and to finance the project national urban transport policy was brought out. In the Tenth Five Year Plan, transportation fund was set up with the grant of seed money. In the Eleventh Five Year Plan, stress was laid on the quality; and the thrust was given to improve capacity through technology up gradation and modernization. The goals of the 12th Five Year Plan are: infrastructure for urban transport, roads and building, walkways and cycle tracks, which are the most environmentally friendly modes of transport.

The TERI has projected that there will be seven times more energy consumption and pollution. There is an urgent need to reverse this trend. The Twelfth Five Year Plan has laid down the objective of inclusive and sustainable growth. A very wide consultative process has been initiated; and the feedback from which is that the following steps should be taken: implement projects with accountability, introduce total quality management at all levels, make sufficient provision for maintenance of already built roads, make investment in unified tolling, better safety of roads, improving bus services, public transport in small cities towns and districts, introduction of metros in urban areas through PPP wherever feasible.

Challenges are huge and three fold: very rapid urbanization, and existing deficit of services and infrastructure. The deficit has to be covered keeping in mind environment aspects. The importance of urban transport in raising the economic potential of cities has been recognised.

Shri B.I. Singhal, Director General, Institute of Urban Development, New Delhi

And the need for expansion of the quality urban infrastructure has also been recognised in the Twelfth Five Year Plan.

The city wide integrated and multi modal transport network would have to be developed. Some guidelines have been suggested on providing multi modal transport in cities based on their population- introduction of bus services for population more than 2 lakh and above, introduction of rapid transport in cities with population more than 1 million, starting of rail transit for cities with population more than 2 million, starting planning and construction of appropriate transport infrastructure in cities with population more than 3 million, and providing sub urban services in cities with population more than 4 million.

There is an estimate of 1 lakh crore per year in transport sector which includes 98% investment going for infrastructure and services. We need additional 1% for usage of technology to get the best of this investment. The last one percent needs to be used in developing an institutional framework to implement and manage all this, and on capacity building in urban transport. There is no dedicated agency at present in this sector. Urban transport is not recognized in the constitution. A dedicated agency should be set up at the central level to plan, implement, and operate the urban infrastructure and services. A separate department should be created for urban transport both at the state and central levels for administering and for policy formulation regarding matters concerning the urban transport. There is a need for huge, extensive and more importantly an effective institutional framework to be established. There is a need for capacity building of skills both at institutional and individual level. The Ministry of Urban Development has instituted a comprehensive system for capacity building, knowledge and database management, research and development, and managing ongoing services.

For financing projects, the following steps are suggested: user charges should be collected, support from government through tax concessions in dedicated levies, acquiring land, knowledge transfer, and private public partnership model to be adopted. Though it is felt that the PPP is subjective, it can be used in certain definite areas; it may not be feasible in rail transport because it is capital intensive; it can be used in bus transit projects on gross- cost basis. The quality of public transport should be improved; and with this improvement, people will be willing to utilize the public transport. IT should be used for traffic management, automation, fare collection, etc.

Shri R.P. Lahiri

There is a direct link between philosophy and engineering. Construction is hard core engineering; and there is a holistic link between professional ethics, quality and output. Lack of ethics will definitely result in low quality, untimely completion of projects and wastage of resources because of lack of responsibility and accountability, the tendency to evade things, and earn money by wrong means. Ethics plays a vital role in dealing with corruption especially in the construction sector where it is predominant. Professional ethics will lead to good quality and quantity of products and services. The 5000 years old ancient Indian proverb is : Treat the earth well, it was not given to you by your parents, it was loaned to you by your children, we do not inherit the earth from our ancestors, we borrow it from our children. The basic fact of life as per old scriptures is: May all be happy, may all enjoy health and freedom from disease, may all have prosperity and good luck, and may none suffer or fall into evil ways. We should respect our fellow

Shri R.P. Lahiri, School of Engineering and Technology, Indira Gandhi National Open University, New Delhi

creatures, and live in harmony. The water bodies, air, land are to be free from all pollution helped by green energy. Our shanti mantra is peace on earth, space, water, plants, trees and herbs.

In the context of the XIIth Five Year Plan, what is to be done is : minimize green house emissions, subject of ethics to be included in the curriculum, inculcate professional ethics both at student / employer level, inculcate feeling of responsibility / accountability, self analysis, whether you are doing the right thing or not? Sustainable development is to ensure better quality of life today, tomorrow and day after; capacity to develop and implement, and sharing the benefit of prosperity among everyone. Even if 1% of population is starving, there is no development in the real sense. We can consider ourselves developed only when all are benefited by the techniques, schemes and there is all round development in both urban and rural areas. This is everybody's responsibility. To live and let live should be our motto. Professional ethics is the one's capacity to judge what is right or wrong; and follow the right path based on the moral values which is beneficial to all; and which brings about development and happiness to all. Right acts will promote good things; and if we follow right path, we can avoid dishonest and unfair conducts, unethical practices, fraud, negligence, conflict of interests, etc.

Adoption of professional ethics results in the following: proper planning and execution, reduction of time and cost overruns, education in life cycle cost, completion of projects in time, reduction of wastages, maintenance of quality right from the concept to completion of projects, putting the knowledge together, sanitizing it , packaging it and presenting it where it is needed. Our Engineers have immense knowledge. We need to showcase it to planners. We have lot of talent in our country, but it is scattered; it has to be brought together and put to practice so that we need not have to be dependent on western / European countries. We should develop techniques which will make us self reliant as well.

The following steps will help and engineers have a vital role to play in taking these steps: optimum utilization of resources, using environment friendly techniques of construction, rainwater harvesting, and proper connectivity of urban areas and drainage / sewerage system to take care of rain blockage. Ethics and values are important in life and they should be taught at an early stage. Value education, which used to be taught in olden days, should be renewed and adopted as a part of syllabus / curricula in educational institutions. It will help in developing the character and behavioural pattern of students. Value system helps us to become better human beings. We can only achieve our targets when we as a nation strive together with better value system; and it applies to all disciplines and every human being of our country. Making everyone accountable to one's acts will also pave the way for a better value system of the nation.

7 Concluding Session and Panel Discussion

Dr. G.S. Yadava

The share of engineers in the 12th Five Year Plan is around 80%. Engineers should have a role, therefore, in building up the future plans of the country rather than looking for their role after plans are formulated. I will talk about two issues in the context of 12th Five Year Plan; one is the role of professionals in the society, and the second is the role of engineering institutions. Approvals are granted to open new engineering institutions by duly authorized authorities based on submission of plans and programmes, faculty details, infrastructure and type of lab facilities available or to be created. What is actually happening is different. A large body of engineering institutions set up based on these plans does not have the quality infrastructure, quality faculty and they lack in laboratory facilities. Although 30-35% seats all over the country in general remain vacant, adding new institutions is not correct. Only 25% of the engineers, who are being produced by the Institutes, are employable. The reason is that the engineering institutions from which they pass out do not have the quality infrastructure, quality faculty and laboratory facilities.

In this country, 31 branches of engineering were identified by AICTE where you are allowed to start the engineering courses. All these 31 branches are not required; rationalization of branches should be done depending on the requirements of the Industry and the other sectors of the economy. There should be break on setting up of new engineering colleges until we established their need. If we have to set up a new institution, it should be allowed only if is set up with quality infrastructure, quality faculty and quality laboratory facilities. For the existing institutions, not having quality infrastructure, quality faculty and quality laboratory facilities, it should be made mandatory that such institutions should improve these facilities within a given time limit. Unless these issues are addressed, the quality of engineers produced by such institutions will be poor. So, these issues must be taken up on priority basis in the 12th Five Year Plan.

All institutions including IITs, which are top institutes in the country, 20-30% (around 1200) faculty posts are lying vacant. The situation in other institutes is quite pathetic, due to non-availability of faculty; even non engineers are heading the engineering branches. How can we expect quality from engineers who come out of such institutes where they are taught / trained by a person who does not have the basic qualification in engineering? Efforts should be made to locate quality faculty and recruit this faculty in the vacant posts.

Skill development is another issue which needs to be addressed. The availability of skilled engineer technicians is a cause for concern. We need to address this issue. This can better be done by improving the quality of the existing institutes. It should be made obligatory for engineering colleges that they should impart training to villagers or other people who come forward for it. As a matter of fact new institutions should be created with education and training facilities for engineer technicians, diploma engineers, graduate engineers and postgraduate engineers under one roof.

Dr. G. S. Yadava is Council Member, IEI & Past Chairman, Delhi State Centre, IEI.

The pattern of current education after 10th class can be converted into vocational course instead of covering the conventional syllabus during the 11th and 12th class. After this, a certificate on the vocational course pursued during the 11th and 12th class can be issued. With this certificate a student can get employment in an industrial unit. After a couple of years working experience, s / he can go for diploma / degree course in engineering. We must consider this option. In many developed countries students normally go for engineering education via this route. Planning Commission should fix the number of quality technicians that every existing institution should produce every year with the available infrastructure facilities in the country.

With the rapid urbanization, the consumption of energy is increasing day-by-day. About 60-65% of power we are using is coming from thermal power plants. Coal is the main fuel of thermal power plants. We import a large quantity of coal for meeting our demand for the fuel from thermal plants. We do mine coal in India, but it is not adequate for meeting the total demand of our country. So we depend on imports as well. Besides, domestic coal is generally with high ash, it needs to be blended with low ash imported coal. So we should develop thorium-based nuclear power with the urgency that it demands. So our future requirement of power should be of nuclear energy. We should try to tap the nuclear energy. We have to create awareness regarding the safety aspects of nuclear energy and adopt better technologies.

The other issues are ethics and innovation. These are vital issues for our society today; and these need to be addressed. Ethics should be taught in all classes' right from the primary stage. It should be taught as a compulsory subject in higher education, particularly in higher technical education, especially in engineering education. Our engineers should be able to take the responsibility for removing poverty, improve quality of life of the people and optimize on costs across the board. Innovations will play a major role in this.

We have to become a country of innovations-methods, procedures, systems, technologies, etc. Technological innovations in education has a vital role in today's society, and this is one issue which needs to be practiced by example rather than any thing else. Politicians and bureaucrats should also become innovators; and they should aim at good governance through innovations. We are the largest producers of engineers in the world.

Design aspects are another issue which needs to be addressed. Whatever is being produced in the country is based on the foreign designs, exception of Tatas in many cases apart. We are dependent on other countries for basic designs. A country which depends on the foreign suppliers for basic designs cannot be called emerging great power. Let me make it clear. We have got to address this issue with the seriousness that it demands. So we should think about it. We must ensure that emphasis is placed on in-house research and development and designing in future. We should be able to innovate and design on our own and produce goods of better quality and at cheaper prices. What it demands it should be provided. Professional institutions have a major role to play in addressing this issue.

The share of manufacturing sector needs to be increased. The share of manufacturing sector in China is 53%. The new manufacturing policy that the government has introduced must ensure this. Whatever workforce that we should have to enable raising the share of manufacturing sector, it should be of world class quality workforce. We should be able to produce products of world standards and at completive prices; in other words, we should produce better than Japanese,

Europeans and American products. Engineering institutions should produce students who are innovative and capable of producing products of world standards and at completive prices.

Dr K. K. Khanna

Role of engineers is predominant in any country's economy. No country can progress without prominent role of engineers. During the Nehru era, after independence and with the initiatives taken by the Planning Commission, many industries including Steel, fertilizer, chemical and heavy engineering were set up. Many dams such as Bhakra Dam, etc, were constructed. The role of engineer was to build plants. Engineers played a very active role in building new plants. Mostly new steel plants were built with foreign collaboration. Rourkela Steel Plant was built with German collaboration, and Bokaro and Bhilai steel plants were built with Russian collaboration. Indian engineers acquired experience and skills through these collaborations - in construction and operation.

Later on with this experience, Indian engineers could take up expansion programmes of iron and steel industry both in the public sector and in the private sector, though there was a very small capacity in the private sector then. With the liberalization of economic policies, the role of private sector increase many fold. The role of engineers in building up of new industries, modernization and expansion of the existing industries also increased. But we remained dependent on foreign suppliers for the basic designs; while as we built our competence in detailed designs and in building new plants based on these detailed designs. We remain in this position even today also. We must reverse this position; sooner the better; our dependence for the basic designs on foreign suppliers makes us 2nd class engineers and, therefore, we must make all efforts to change this and acquire skills in designing things. The engineering education should enable it. If we have to reform the engineering education for this, we must do it.

For modernization and expansion of existing steel and other plants, we depend on multinational suppliers for the basic engineering and crucial & critical equipment which is not available indigenously. So this dependence is not giving us any freedom in setting prices or dictating our terms and conditions to the foreign suppliers. We must reverse this situation. The time has come that our engineers should be re-engineered so that they should be able to build up our steel, cement, fertilizer plants with most of our Indian technologies. We must develop our own in-house technologies. In this direction, the government has to play a very major role to enable it, as it involves a policy intervention.

We have engineering consultancy organizations such as MECON, EIL, EPIL, MN Dastur, etc, who have specialized in engineering technologies. Then we have some of the best consultancy firms including Tata Consultancy Company Ltd, in the private sector. All these engineering outfits in the public and private sector should come together and form a consortium which addresses our technological needs and the problems under one hub. They should aim at developing in house technologies based on requirements of the Indian industry today and in the future. As a matter of fact the consortium should also develop a long-term technological vision for India and work accordingly.

Our engineers should design and build new techniques which are adaptable to the present needs of the industry in general and mining industry in particular. Engineers should also play

Dr K. K. Khanna, Former Director & Board Member, Steel Authority of India Ltd (SAIL).

a major role in exploration of new and alternate mineral resources; one of the main resources is coal; and locating new coal deposits should be the priority in our scheme of things. India has not been geologically mapped and explored fully yet. Our mining engineers should come out with new ideas for exploration of minerals in the country including for hydrocarbons. While formulating Plans, Planning Commission should set targets based on linkage of inputs that will be required in achieving these targets.

Environment is also a big issue. Production of steel, power, cement leads to global warming if we don't use the right technologies that are available for producing these goods. We can't stop development, but we should devise ways to be sustainable and develop technologies which are environment friendly, which reduce emissions and generate no pollutants. How to maintain clean / green environment at minimum cost is a challenge for the engineering community. Engineers should meet this challenge. The development projects should be completed in time; and there should be no time and cost overruns. This is another challenge for engineers. India is country of excellence, but it is scattered. There are pockets of excellence. We need to club the pockets of excellence; and initiate the process of benchmarking of performance; and try to learn from others how we can improve ourselves; and come out with ways and means to make our country self reliant.

Shri G.C. Tallur

Civil engineering is a field of engineering sciences; it is related to design, construction and maintenance of buildings, dams, bridges, tunnels, highways and other structures; this is done by the use of physical laws, mathematical equations and theories of mechanics. Civil engineers utilize the available resources (expertise, materials, manpower) to complete civil engineering projects in the given time span keeping in view the expenditure, environmental issues, and physical hazards of these projects.

Engineers are not readily employable. Employers who want ready made engineers to handle their projects should join hands with the educational institutions to make engineers ready for employment. For this, I do agree that a hand–on-training for engineers is important for making them employable; it should be made a part of the engineering education.

We can save many crores if we ensure that the capacities that we have created are fully utilized. If we use our available natural resources optimally, we will become sustainable. Here proper planning and execution is the key. Coastal shipping is one of the areas where sustainable technologies should be used. These need to be embedded in the policies of the 12th Five Year Plan.

To quote Mr Bismark – a government is as good as its policies are. Policies define the way the country progress and develop. Good products will be backed by good processes which are based on the good policies. There has to be a policy in this country duly endorsed by the government that engineering projects should be headed by an engineer and technical projects should be headed by technologists. A policy which encourages engineer administrators should come into force.

Shri R. S. Goel

Role of Engineers is very important during the 12th Five Year Plan. There are two types of management modules which are followed in

Shri G.C. Tallur, B.E. F.I.E, Former Secretary, PWD, Government of Karnataka, Bangalore.

Shri R.S. Goel, National Convener, Coordination Committee of National Level Water & Hydel National Level Professional Societies.

various government departments. One which is quite successful in sectors like atomic energy, space, railways and telecommunication, and the other in decaying services like water, education, health etc. Scarcity of water, power and environment protection should be the key aspects which should be taken care of. Engineers and scientists should work together for the development of the country. We should also try to develop in-house technologies for production of power etc.

Session Co-Chairman's Concluding Remarks : Shri J.S. Saluja

We realized some targets set for the 11th Five Year Plan, and we missed the other targets. So we must study what we have achieved in the 11th Plan, and what we have not. We should further study the Plan as it has been implemented and find the reasons for not realizing the targets. We will some lessons from this exercise. These lessons that we have learnt from this exercise should be made use of in the 12th Plan. Engineers & technologists should be allowed to define their role; and they should also be allowed to work out their strategies in the 12th Plan. In other words, engineers & technologists should be allowed to take part in decision making both for the policy making and implanting these policies through taking up projects. Engineers & technologists should become innovators, technology developers, and in the modernization & up gradation of technologies wherever considered necessary by them. Engineers & technologists should take more interest and play a role in developing our rural India. Coming to engineering education, this needs a reform; it should be made multidisciplinary and multi skilled; more practical; case study-based; with mandatory project-based industrial training during the course; and after the course there should be a mandatory paid internship of six-to-one year in an industrial unit for students. Engineering profession should be regulated. Industry should be allowed to set up engineering colleges in the country.

Session Chairman's Concluding Remarks : Prof. S.S. Chakraborty

Our engineers & technologists have shown their worth abroad, but in India no body is interested to know what they have achieved here. Perhaps engineers & technologists are indifferent to their achievements here; perhaps they do not enjoy prestige here; perhaps engineering profession is not recognized as a profession in India; perhaps engineers & technologists are not united and are not fighting for their positions. There may be any reason for this. The fact of the matter is that in India no body bothers for them because they are being controlled by so called non technical people. Engineers & technologists are not recognized; while as they are duly recognized abroad. I want to give a message to the engineers & technologists. The message is that we should bridge the gap in connectivity- physical, mental and social- which seems to be there today. Engineers & technologists should be communicative, open, transparent, bold to the point of accepting their faults and also conveying their achievements, and their points of view on technical matters entrusted to their charge to those who matter. Engineers & technologists should be allowed to take decisions on matters on which they are only competent to take decisions.

Shri J S Saluja, Managing Director, SCPL, New Delhi, National Vice Chairman, Indian Institution of Plant Engineers and the Member Board of Governors, ECI.

Prof S S Chakraborty, Chairman-cum-Managing Director, Consulting Engineering Services (I) P Ltd, New Delhi.

8 Technical Presentations

Re-engineering Technology Delivery Systems in Construction Industry – A Futuristic Perspective

Sanna. Ratnavel.

Member, Board of Governors,
Engineering Council India, New Delhi.
CEO
Sceba Consultancy Services,
Madurai..

Expectations

- Engineering is a profession in which knowledge of the mathematical and natural sciences is applied to develop ways to use the materials and forces of nature economically for the benefit of humanity.

Role of Civil Engineers

- Civil engineering is one of the broadest of the engineering disciplines, extending across many technical specialties.
- Civil engineers plan, design, and supervise the construction of facilities essential to modern life.
- These facilities vary widely in nature, size, and scope and include space satellites and launching facilities, offshore structures, bridges, buildings, tunnels, highways, transit systems, dams, airports, harbors, water supply and wastewater treatment plants.
- Civil engineers work in diversified areas such as structural engineering, geotechnical engineering, water resources and environmental engineering, transportation engineering, ocean and coastal engineering, and construction engineering.

Sample Of Related Role

Airport Engineer	Geologist	Production Engineer
Bldg. Construction	Hazardous Waste Specialist	Public Utilities Manager
Inspector	Hydraulic Engineer	Railroad Engineer
Cartographer	Hydrogeologist	Sanitary Engineer
Cooperative	Industrial Traffic Manager	Structural Engineer
Extension Agent	Irrigation Engineer	Transportation Engineer
Design Engineer	Landscape Architect	Urban/Regional Planner
Director, Traffic and Planning	Meteorologist	Waste Management Engineer, Radioactive Materials
Drafter, Civil	Mining Engineer	Water Pollution Control
Drafter, Structural	Natural Resources Manager	Water/Wastewater Plant Supervisor
Drainage Design Coordinator	Oceanographer	Waterworks Engineer
Environmental Engineer		
Forest Engineer		
Geological Engineer		

Types of Employers

Private and Non-profit Organizations	
Architectural Firms	Hospitals
Auto Industry	Hotels
Banks	Insurance Companies
Colleges and Universities	Manufacturing Firms
Construction Firms	Pharmaceutical Companies
Consulting Firms	Public Utilities
Electronics Manufacturers	Research Facilities
Engineering Firms	Retail Organizations
Environmental Organizations	

CONSTRUCTION COMPONENT OF INVESTMENT IN VARIOUS SECTORS OF ECONOMY

S NO	Sector	Construction as % of total
1	2	3
1	Agriculture and Allied	34
2	Rural Development	40
3	Poverty Alleviation Programs	42
4	Irrigation, Food Control and CAD	80
5	Environment and Forests	60
6	Power (Generation and distribution – Hydro, Thermal, Nuclear, Unconventional)	50
7	Housing	100
8	Roads and Buildings	100
9	Highways and Water Ways	80

S NO	Sector	Construction as % of total
1	2	3
10	Ports, Docks and Lighthouses	50
11	Railways	42
12	Communications, Information and Broadcasting	40
13	Micro, Mini and Small scale Industries	25
14	ORGANIZED INDUSTRY	30
15	Minerals and Mining	42
16	Education and Culture	30
17	Social Welfare	21
18	Welfare of Backward Classes and Scheduled Tribes	12
19	Craftsmen Training	45
20	Labor Welfare and Sports	45

S NO	Sector	Construction as % of total
1	2	3
21	Health (Both Preventive and Institutional)	37
22	Urban Development, Water Supply, Sanitation, City Level Services	70
23	Scientific Research	20
24	Civil Aviation	42
25	Tourism, Hotels and Hospitality Industry	60

Average construction component of investment = 47.48 %

GDP and Engineers

For example Contribution of civil engineering:
Estimated Total Gross Domestic Product (GDP)
and
projected GDP from Construction

Year	Estimated Total GDP	Annual Increase (%)	GDP from Construction	% Share of Construction in Total GDP
1	2	3	4	5
1995-96	951458	–	51379	5.40
1996-97	1003545	6.0	56476	5.60
1997-98	1071075	6.2	62122	5.80
1998-99	1139624	6.4	68377	6.00
1999-2000	1209002	6.6	74896	6.20
2000-01	1304642	6.8	83497	6.40
2001-02	1395967	7.0	92134	6.60
2002-03	1496477	7.2	101769	6.80
2003-04	1607216	7.4	112505	7.00
2004-05	1729364	7.6	124614	7.20
2005-06	1864255	7.8	137955	7.40

NICMAR

State and Local Bodies Lacks In Reaping Potentials of
In-house Engineers....
And Public Money is spent without any care.

Civil engineering is about community service, development, and improvement –
the planning, design, construction, and operation of facilities essential to modern life, ranging from transit systems to offshore structures to space satellites.

Civil engineers are problem solvers, meeting the challenges of pollution, traffic congestion, drinking water and energy needs, urban redevelopment, and community planning.

Few Examples

- Just After Completion
- Before Tenement Occupation few years back

Turned into Ugly Face

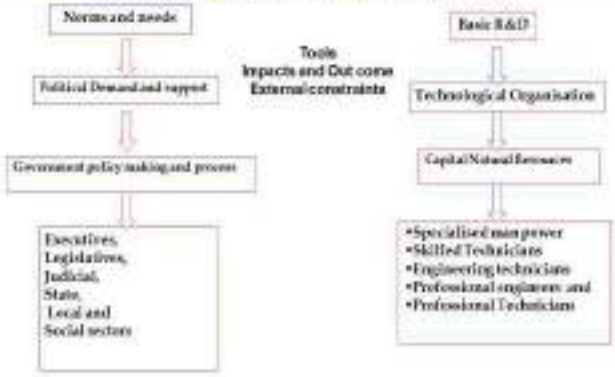
With in the few years after completion

Even before Occupation…

Government tenement building

Technology Delivery System.

The following are demanding Engineers leadership



Technology Delivery System(TDS) Must get clearance from the following

EPISTLE

E Economical
P Political
I Institutional
S Societal
T Technological
L Legal
E Environmental

All schemes floated by centre are mostly misunderstood by local bodies

- Most of the infrastructure undertaken by State and local bodies are hardly making any returns in lack of systems approach
- Every investment requires rehabilitation or retrofitting when the project is in operation
- The Wastage Estimated as More than 40% in all Construction activities in India.

Where is Value System Design?

- Need Analysis
- Project planning
- Program planning
- Life Cycle Assessment in Investment and Maintenance
- Technology Forecasting
- Technology assessment & Auditing
- Productivity Measures

- All the above are Absolutely Missing in Capital Creation

Non Engineering Attitudes

- Engineers are under the control of non-technical administrators, the so-called generalists.
- Project proposed over night with key words from the central schemes.
- Usually non engineering methodologies are Forced with thumb rule methods with the back door entry consultants.

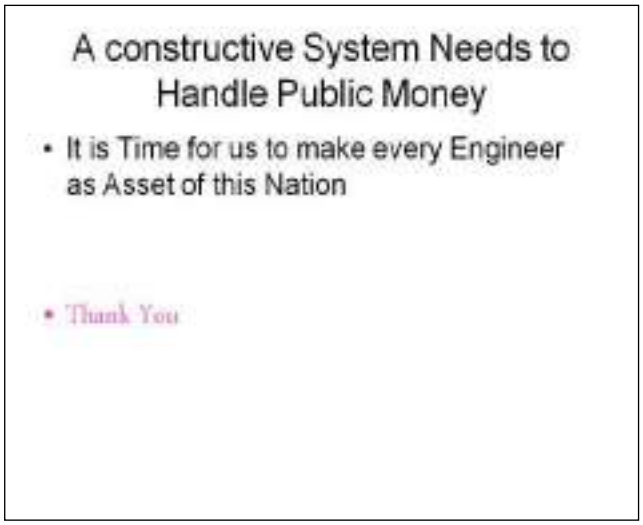
Value Engineering Council

- A system need to be developed under the monitoring of Planning Commission for quality assurance to reap the maximum benefit in our Capital Investment in the name of infrastructures.

Quality Is System- Not Money

- Existing Ingredients in Spending Public Money
- Leakage
- Wastage
- System requirements to harness the following ingredients
- Innovation
- Forecasting
- Assessment
- Assurance

Madurai Meenaksi Temple is a classic Example for Systemic Approach


A constructive System Needs to Handle Public Money
• It is Time for us to make every Engineer as Asset of this Nation
• Thank You

SUSTAINABLE DEVELOPMENT - CRITICAL ROLE OF ENGINEERS & TECHNOLOGISTS

28 November 2011, New Delhi
9th National Conference, ECI

I Pugazhendhy
Past President
The Indian Institute of Metals &
Executive Director
India Lead Zinc Development Association

SUSTAINABLE DEVELOPMENT

..... a development process that caters to the needs and security of both the current and future generations .....

GOAL OF SUSTAINABLE DEVELOPMENT

No economic or scientific activity can be justified if cost of environmental degradation and/or resource depletion it causes is such that future generations are worse off than we are today

GROWING PRODUCTION & RESULTANT FALLOUTS

- Pollution
- Health Risks
- Global Warming /Climate Change
- Deforestation
- Species Extinction
- Water Table Receding

and many more .....

SUSTAINABLE DEVELOPMENT HOW IT MAKES BUSINESS SENSE?

- Optimal use of materials & methods
- Best use of energy
- Lower production costs
- Product quality upgradation
- Improved brand image
- Increased customer acceptance
- No damage to environment
- Corporate Social Responsibility

ROLE OF ENGINEERS IN SUSTAINABLE DEVELOPMENT

- Strike balance between benefits of manufacturing and the associated costs/damages
- New and improved methods be developed to reduce production costs & environmental damages
- Transform production systems more resource and energy efficient

Continued .....


ROLE OF ENGINEERS IN
SUSTAINABLE DEVELOPMENT
• Economic & efficient utilization
• Reduction of wastages, excessive usage etc.,
• Recycling & reuse of materials
• Substitute by alternates
• Create greater awareness
• Enable Inclusive & EQUITABLE growth
IIM
ILZDA

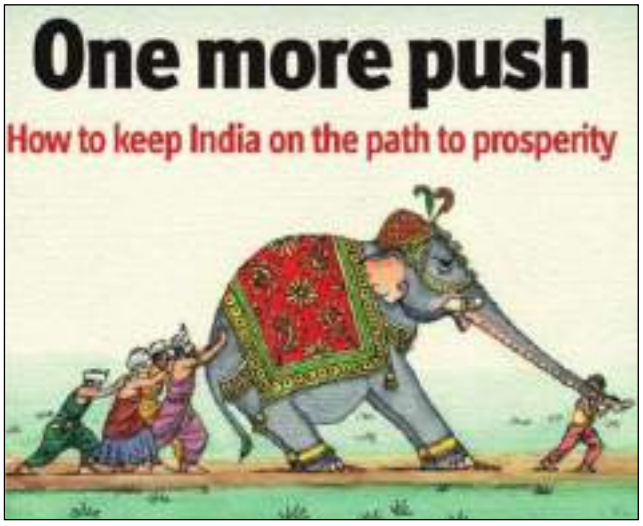
Enhancing Skills and Faster Generation of Employment – Role of Engineers & Technocrats

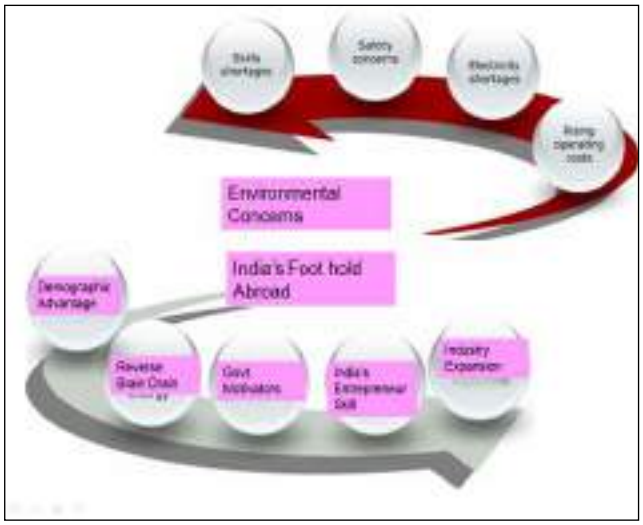
YP Chawla
Consultant –
Skill Enhancement &
Initiative Energy Sector

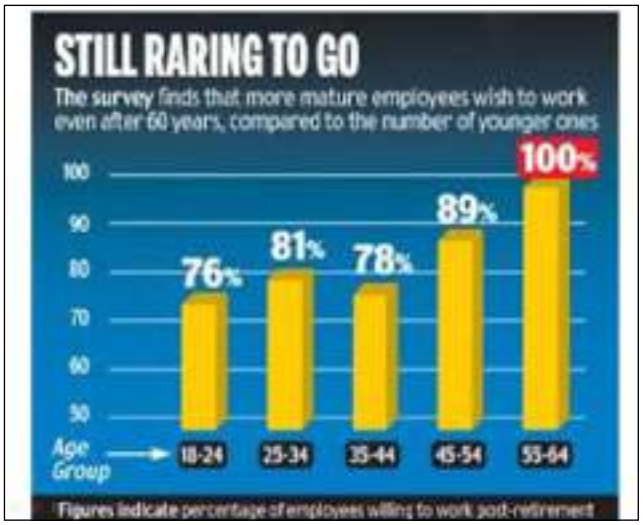
- Strategy Challenges of the 12th Five Year Plan
- **Enhancing the Capacity for Growth (needs Enhanced Skill Sets)**
- **Enhancing Skills and Faster Generation of Employment**
- Managing the Environment
- Markets for Efficiency and Inclusion
- Decentralisation, Empowerment and Information
- **Technology and Innovation (needs Enhanced Skill Sets)**

- Securing the Energy Future for India **(Shortage of Manpower for Projects Dev.)**
- Accelerated Development of Transport Infrastructure
- Rural Transformation and Sustained Growth of Agriculture
- Managing Urbanization
- **Improved Access to Quality Education (will lead to Enhanced Skill Sets)**
- Better Preventive and Curative Health Care **(additional Manpower with High Skill is required)**

- *Technology related skill gaps (if not corrected) will damage the Indian Economy - Studies warn.*
- *75% of Technical Graduates & 85% of General Graduates are Unemployable*
- *India Aspires to be a Knowledge Superpower. In Asia Pacific market Employers (45%) facing difficulty in Job filling -Lack of Available Talent*
- *Fast action on taking advantage of its demographic strength which is >50 % Population < 35 Yrs.*







National Skill Dev. Mission- Initiative

GoI Agenda 2022 : Target -500 Mn. Fully Skilled

Education Bills on the Anvil : (may be of use to Apollo later)
Foreign Education Providers , Education Tribunal ; Accreditation ; Education Malpractices ; Higher Education & Research.

National Policy on Skill Development (Min. of Labour & Employment 23 Feb 2009) Philosophy

❑Demand Driven System ;

❑Training Technology –Modular/credit based Learning, E-Learning.

Back Ground

- 75% of Technical Graduates & 85% of General Graduates : **Unemployable** by India's High Growth Global Industries (*The Wall Street Journal*) and India Aspires to be a Knowledge Superpower.
- Asia Pacific Employers (45%) facing difficulty in Job filling because of Lack of Available Talent *(Talent Shortage Survey 2011)*
- India's demographic Advantage : >50 % Population < 35 Yrs
- Current Skilled Manpower Gap in 20 Industry Sectors.
- Making Ready 500 Mn. Skilled Hands by 2022 from 4.3 Mn. In 2008-09 & 40 Mn in 2013-14, **possible if Training Infrastructure ready in next 3 Yrs.**

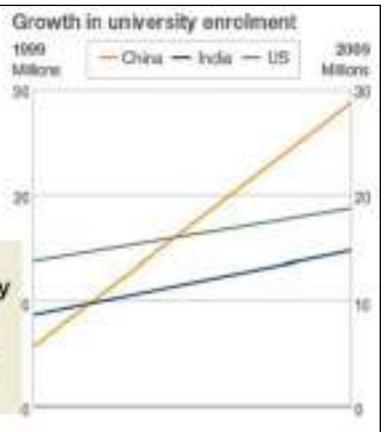
Back Ground

- **Education - A 150 bn USD Industry in India**
- Skill Shortages / Deficit Reported in : Automobile (35Mn.), Power, Steel, Construction, Infrastructure, Textile , Retail – organized & unorganized(24 Mn.) , Health Care, Education, IT/ ITES.
- Plain Vanilla Courses – BE, BSc, losing value
- Meeting Attrition / Arresting Attrition – offering Education enhancement in Part Time while in Service
- Training for Specific needs of the Industry – **Maintenance Engineers - Placement Services**
- Implementation of programs in the Industry like Quality, Automation, Energy Efficiency etc.

Sector- Wise Employment (Recently Published Data)			
Industry	Employment % in Industry		Value added per Worker in Rs. / Annum
	1983	2006-07	2004-05
Agriculture	65.42	50.19	20,937
Mining	0.66	0.61	170,801
Manufacturing	11.27	13.3	355,318
Electricity	0.34	0.33	228,650
Construction	2.56	6.1	59,193
Trade, Hotels	6.98	13.18	75,080
Transport	2.88	5.06	110,403
Various others	9.89	11.23	
Total	100%	100%	No Data

India will need **1,000 more universities and 45,000 more colleges to cater to an estimated 40 million students by 2020.**"

Mind the Gap:
Skills Gap / Employability / India / Engineering Graduates:
70 % of them would not be employable



Caution: Men Not At Work
Joblessness in India is officially only about 8%, but that's a mirage created by chronic underemployment

Motivators!!

- Govt. permitting - Imbibing of Govt. Resources / Infrastructure
- Allowing Blend of Private Sector Best Practices in the Education Curricula.
- Adding Private Sector's – Training Kits for Igniting the Minds for an Holistic Approach in Education
- **Achieve Inclusive & Sustainable Growth in Education**
- Working on 3 E's (Education – Employment – Employability
- India's Agenda 2022 " Higher Education Sector"

Programs Philosophy

- Modular Courses
- Open Architecture
- Mkt. Demand based
- Bridge Program for ITI -(ITI type Programs planned for breaking to < 6 months for modular & scale it up for Diploma & beyond).

  Certificate(16 Credits), Diploma (32 Credits), Advanced Diploma, Associate Degree , Post Graduate (64 Credits &+)
- Educational Enhancement for Working Professional – Part timers – ITI to Diploma, School leavers to Diploma Engg., Diploma to Engg. Degree etc.

Program Philosophy...Contd.

- E Learning
- Judicious Blending of Class Room , Industry Hand's on Exposure and E learning.
- Self Learning & Self Education Kits
- Net Working & Collaborative Approach with Experts.
- Flexi Learning Programs - Training Retraining & updating the skills , Training & Qualification.
- In due course also to adopt Technology Enabled Education – Video Conferencing

- **Government to aggressively support:**
- **• Driving Development, transforming future.**
- **• Effective Policy & Regulatory Environment – Policy of Ash Utilization by the Developers.**
- **• Inter Govt. Dialogue for Resource acquisition overseas.**
- **• Facilitating Sustainable Industrial Development through Providing Platforms for Inter**

- Industry Dialogue amongst Core Sector players.
- Developing Skill Enhancement Players under " National Skill Enhancement Mission"
- Focusing on development of Infrastructure- Roads, Rail & Ports.
- Reduction of Power Losses in Transmission.
- Helping the Power Transmission Companies, Distribution Companies and Generation
- Companies to get reasonable returns, avoiding heavy Political returns by Free / Cheaper Power
- Incentives for Energy Efficiencies
- Incentives for Industrial Automation.
- Enabling Development of Smart Grids.

Conclusion

- Industry to tailor the Candidates while they are being shaped in the Engineering Colleges instead of them coming and joining to save on time and cost.
- Investment on Retraining on Skill Sets of today's need.
- Feed back on our requirements to the Academia

Conclusion Contd.

- "If you are planning for a Year, sow Rice
- If you are planning for a decade, plant tress
- If you are planning for a life time, Educate People ..... and if planning for generations, inculcate the Skills

Thanks for your Attention

Sustained Growth of Agriculture: Role of Agricultural Engineers in the 12th Plan

Dr. V. M. Mayande
Vice Chancellor
Dr. Panjabrao Deshmukh Krishi Vidyapeeth,
Akola MS India 444 104

Agenda

- Indian Agriculture
- Agricultural Engineering
- Strategies during 12th plan
- Summary

Indian Agriculture

Challenges and Issues during 12th plan

- Climate Change
- Food Security
- Shrinking Resources
- Profitability
- Infrastructure

Growth rate of Agricultural sector

		5.14	4.16	5.88	-0.18	6.44	5.41
		12.79	13.38	15.79	11.05	17.26	23.15

Source: Central Statistical Organisation (updated as on March 2011)

Agriculture and Rural Development

- Agriculture: a base of rural economy
- Diversities and Local Issues
- Rural Infrastructure
- Socio-Economic and Policy Issues
- Agriculture Commodity Prices

Extent of Engineering & **Technology** Support during 12th plan will decide **Sustainability of Agriculture**

Agricultural Engineering in India

- Branch of Engineering

"**Application of Engineering principles in agriculture**"

- Branches:
  - Farm Power & Machinery,
  - Land and Water Engineering,
  - Agro-Process Engineering
  - Rural Engineering,
  - Biological Engineering
- **Education, Research, Industry**

Role of Agricultural Engineers

- Support Innovations in Agriculture
- Design Power & Energy tools
- Design Land and Water structures
- Innovations in Food Process technology
- Support Agro-based Industries
- Support Bio-Sciences research
- Rural Engineering
- Policy support

Challenges of Agricultural Engineers

- Produce food for more than 1 billion population
- Growing population requires more food, water, energy, goods (FWEG)
- FWEG affordability
- Limited resources demand we do more with less, without degrading our natural world

Uncertainties of Innovation in Agriculture

- Technological
- Resources
- Supply
- Competitive
- Consumer
- Political

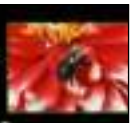
Advancement in agricultural engineering for sustainability

Food and Bioprocess Engineering
Information & Electrical Systems
Structures & Environment
Biological Engineering
Natural Resources
Rural Engineering
Energy
Forest Engineering
Aquacultural Engineering
Safety, Health, Ergonomics
Nursery & Greenhouse Engineering
Power Systems & Machinery Design

Agricultural Engineers will have to be assigned significant role during 12th plan to sustain agriculture in India

- Self sustaining rural economy
- Safe & enough food and water
- Harnessing renewable energy
- Healthy environment

What Agricultural Engineers can do ?



- Practical & efficient solutions for producing, storing, transporting, processing, and packaging of agricultural products
- Solve problems related to systems, processes, and machines that interact with humans, plants, animals, microorganisms and biological materials
- Develop solutions for responsible, alternative uses of agricultural products, byproducts, wastes and natural resources

Rural Engineering

Applying engineering practice to develop self sufficient rural economy

- Technology deployment
- Rural growth strategies
- Integration of technology
- Rural industrialization
- Environmental protection


Biological Engineering
Applying engineering practice to problems and opportunities presented by living things and the environment
• Pest control
• Hazardous waste treatment
• Environmental protection
• Bioinstrumentation
• Bio-imaging
• Plant-based pharmaceuticals and packaging materials


Natural Resources
Improving conservation by understanding the complex mechanics of soil and water
• Wetlands protection
• Water control structures: dams, reservoirs, floodways
• Drainage
• Erosion control
• Pesticide and nutrient runoff
• Crop water requirements
• Water treatment systems
• Irrigation


Food and Process Engineering
Using microbiological processes to develop useful products, treat municipal, industrial, and agricultural wastes, and improve food safety


Information Technologies in Agriculture
Perhaps the most versatile specialty area, it's applied to virtually all others
• Global positioning systems
• Machine instrumentation and controls
• Data acquisition and "Bioinformatics"—biorobotics, machine vision, sensors, spectroscopy
• Electromagnetics


Structures & Environment
Engineering a healthy environment for living things
• Animal housing
• Grain storage


Power Systems & Machinery Design
Improving efficiency and conservation in agricultural, food, and biological systems


Energy
Developing renewable energy sources, devising energy conservation strategies to reduce costs and protect the environment


Aquacultural Engineering
Preserving our natural fish populations and habitats through improved aquacultural practices
• System design for fish farms
• Water quality, machinery, feeding, ventilation
• Pollution reduction and water conservation
• Ecological reuse or disposal of waste
• Product harvesting, sorting and processing


Nursery & Greenhouse Engineering
A microcosm of large-scale production agriculture, with similar needs
• Irrigation, mechanization
• Disease and pest control
• Temperature, humidity, ventilation control
• Plant biology: tissue culture, seedling propagation, hydroponics


Forestry
Applying engineering principles to forestry management and conservation
• Machine-soil interaction and erosion control
• Operations analysis and improvement
• Equipment design
• Wood product design
• Access systems design and construction


Safety, Health and Ergonomics
Making agriculture safer, more efficient, and more economical


SUMMARY
•Agricultural Engineering input during 12th plan will be highly critical for sustenance of Agriculture in India
•Significant support to built supportive infrastructure for Agricultural Engineering Research, Education, Agro-indusry network is indispensable to avoid further decline of Agriculture during 12 th plan.

Innovation & Technology Transfer for Sustainable Industrial Growth

An interface viewpoint ...

Anil Wali, FITT, IIT Delhi

28.11.11, ECI, N Delhi

Genesis...

- **Hans Carl von Carbowitz ..**
  "Sylviculture oeconomica", 1713
  - concept of sustainability
- **Rachel Louise Carson..**
  "Silent Spring", 1962
  - environmental philosophy
- **Brundtland Commission ..**
  "Our Common Future", 1987
  - sustainable development

Nature....
- runs on sunlight
- uses only the energy it needs
- fits form to function
- recycles everything
- rewards cooperation
- banks on diversity
- demands local expertise
- curbs excesses from within
- taps the power of limits

"The ability to provide for the needs of the world's current population without damaging the ability of future generations to provide for themselves"

Sustainable Industrial Growth .....

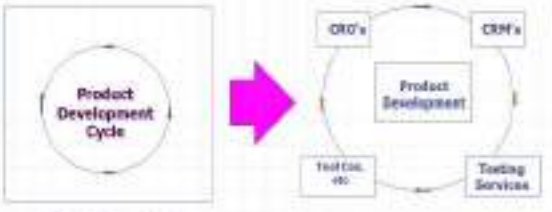
- Growth
- Competitiveness
- Conservation
- Resource efficiency
- Capacity building
- Organizational longevity
- Societal acceptance
- Recycling
- Best Practices
- CSR .....

Elements of the "new" economy

- **Intellectual capital**
- **Open Innovation**
- **Technology Transfer**
- **Entrepreneurial Ecosystem**
- **Sustainability**
- **ICT infrastructure**

Some challenges ...
- **Globalization**
- **Environmental compliance**
- **Federal regulations, quotas, tariffs, subsidies etc**
- **Demand - Supply mismatch, lean retailing etc**
- **Constant need for innovation**
- **Mass production, co-creation / designing, customization**
- **Supply chain, production etc**
- **Intellectual Property, standards, product liability etc**

Emerging Business Models...



An Integrated Company

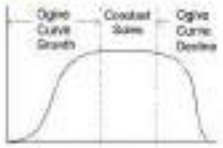
Closed loop

Distributed Companies

Outsourced / Networked

Why innovate..?

- **Almost all products follow a "life-cycle curve" having a characteristic shape:**



- **If an organisation does not continuously introduce new ('right') / improved products / services it will eventually be on a declining business curve.**
- *'Right' product /service - one that becomes available when the market needs it and is more competitive.*

Innovation..

- *"knowledge is the only meaningful economic resource"*
  ...Peter Drucker
- Knowledge + S&T Innovations → progress and empowerment
- *Innovation implies renewal and/or value creation and in a broad sense can include new / better products, business processes, governance models etc.*
- **S&T innovations involves two distinct stages – generation of new ideas or 'inventions' and converting the ideas into utilities**

KNOWLEDGE ECONOMY

Academia is repository of Knowledge that is driving:
Innovation Competitiveness Economic development
eg
- MIT (Route 128) and Stanford University (Silicon Valley)

Industry and other organizations are increasingly seeking collaboration with academia as a **source of new knowledge as well as expert support** for their tasks of **product, process and policy development**

Knowledge transfer

S&T knowledge flows from Academia to Industry primarily via:

– Spillovers
- Consultancy
- Research partnership
- Movement of students, scientists etc.

– Licensing

– Spin-outs

Technology Transfer .....

Technology transfer (and commercialization) is defined as the transfer of results of basic and applied research to the design, development, production, and commercialization of new and improved products, services or processes. That which is transferred is often not really technology but rather a particular kind of knowledge that is a precursor of technology. The transfer process emphasizes the value and protection of the intellectual product of the researchers.

Components...
- Technology Assessment
- Validation
- Test Samples
- Demonstration
- Post Transfer Consultancy
- Turnkey arrangement
- etc

Models...
- Sale Agreement
- License Agreement
- Material Transfer Agreement
- IP Assignment
- Joint venture partnership
- Industrial Consultancy
- Academic spin-off

"Innovative, non-regulatory, economically driven approach towards sustainability"

Clean Chemical Technologists view the entire life cycle of our material / energy processes as an opportunity for design innovation at the hands of scientists / engineers

Industry	Product Tonnage	$ worth of product
Oil refining	10^6 - 10^8	~ $1
Bulk chemicals	10^4 - 10^8	$1 - $5
Fine chemicals	10^2 - 10^4	$5 - $50
Pharmaceuticals	10^1 - 10^3	$25 - >$100

Moving beyond 'Jugaad'....
...towards high value & impactful innovations

Is India a laggard in innovations ?

- No Intel, Google, RIM or an Apple !
- 0.74% of Indian origin scientists among all science laureates from 1901 to 2009
- Little of us in the top 50 inventions in last 50 years *(Popular Mechanics, 2005)*
- Global Innovation Index – ranks India @ 56
- Weak high technology manufacturing

Dimensions of Innovation

...implications for firms

4Ps of Innovation

Product innovation: changes in product/services that an organization offers eg: Windows 7 (improving on existing software), Toyota Prius (hybrid engines), etc.

Process innovation: changes in way in which they are created and delivered eg: FDI, eBay, etc.

Position innovation: changes in the context in which the product/services are introduced eg: Tata Nano car, One Laptop Per Child project, low-cost airlines, etc.

Paradigm innovation: changes in the underlying mental models which frame what the organization does eg: Cirque du Soleil (redefining circus experience), IBM moving from a hardware to a service provider, microfinance, etc.

IPRs – *innovate, prosper & grow*

Intellectual property protection

- Benefits the economy - *sectors that rely on IPR represent significant part of developed / developing economies*
- Promotes innovation - *effective IPR increases funding for R&D and other innovation activities : firms realize more value from innovations protected by IPR*
- Helps to monetize inventions - *IPR-driven firms generally succeed better and have higher market value*
- Helps SMEs
- Benefits consumers & society

In EU countries copyright-based industries & inter-dependent sectors alone account for appx. 4-11% of GDP

IPRs – a vital determinant in the knowledge economy

University Roles ....

In the past....	Today, the roles include...
• Education	✓ Resource Mobilization
• Research	✓ Technology Commercialization
• Knowledge dissemination	✓ Collaboration with industry
	✓ Entrepreneurship

Industry : Shareholder value, product, innovation....

Industry-Academia interaction a kind of PPP

Through an institutional set-up, university can provide a felicitous ecosystem for encouraging creativity encompassing technological innovations

S&T Parks

- Normally industrial estates with or without University links, Thematic Establishments,
- Attractive to Businesses in terms of hassle-free infrastructure

Examples : **ICICI KP, TechnoPark, Int. Biotechpark**

Business Incubators

- Strong University Links & enabling academic start-ups, Subsidized facilities to total support, Enabling formation of Technology Companies

Examples : **TBIU (IIT Delhi), SIME (IIT Mumbai) etc**

Technology Licensing Offices

- For facilitating Industry – University Engagement (flexible model), Enabling seamless technology development / transfer, Capacity Building for user groups eg: Industry

Example : **PITT (IIT Delhi)**

Correlation of a country's growth competitiveness, technological innovation & ability to absorb transferred technology with successful university-industry ties

Incubation

- Concept of growth through innovation and application of technology
  - *-helping transform a nascent idea to a viable business proposition by providing a nurturing environment and support*
- Among IT models, business incubators and related support systems have emerged as highly effective methods for economic growth
  - *promoting entrepreneurial culture*
  - *increasing competitiveness*
  - *growing innovation capacity and competitive advantage*

How improbable became the realty ?

Story of basic science from an academic environment turned into a Phenomenal business success. Story of an industry starting from scratch.

Foundation for Innovation & Technology Transfer (FITT) .....IIT DELHI

a benchmark University To7 set-up in the country

- It's a pioneering Organization in India
- It is financially and administratively autonomous of the Host Institution
- It was started in 1992 with support from MHRD, Govt. of India

•Promote and engage in goal oriented R&D and undertake cooperative programs with industry.
❑Ensure that promising research findings do not lose out due to inadequacies in research design/resultants, deficiencies of delivery systems or lack of economic incentives

Innovation to sustain business

- Earlier, a company could stay competitive by optimizing costs, delays and quality.
  Today competitiveness depends more on developing and managing capacity for innovation.
- Firm level advantages :
  - address evolving market needs
  - offer wider choice of products/services
  - improve quality / reliability of existing offerings
  - access new markets
  - reduce environmental damage
  - satisfy legislation, regulations and standards
  - increase production flexibility
  - reduce obsolescence

Sample : Organizational Innovation Framework

Set Innovation Objectives

Conduct Business analysis

Appraise Internal Resources / Capabilities

Identify Potential Innovation Development Areas

Identify Partners, if any

Identify & Initiate Development Programs / Capability Building Actions

Open Innovation...

- Some of the largest IP driven firms like Philips, IBM, Microsoft, HP etc have embraced the open innovation model
- Merck emphasizes the need to tap into knowledge from universities, research institutes, and companies worldwide - *create "virtual labs" to incorporate outside information*
- Google engineers are required to allocate 20% of their time working on any project idea of their choice.
- 3M's 'Friday Time' or 15% of their time earmarked to pursue independent projects
- Intel funds university research actively without specifying the area of research precisely. It also protects itself by acquiring a royalty-free license to any university Patents resulting from its sponsored research.
- SMEs pursue open innovation primarily for market-related motives such as meeting customer demands or keeping up with competitors.

Desirable interface attributes

.....to foster technology transfer

Academia ought to

- take industry help to enrich the value of its knowledgebase
- move from short term project based to long term trust-based relationship
- have complementary collaboration to bridge lab-market gaps

Industry ought to

- ✓ involve in R&D / Technology Development from the beginning
- ✓ put academia higher in the pecking order as sources of knowledge

Thanks ..

Engineering Council of India

9th NATIONAL CONFERENCE

CHALLENGES OF THE 12TH FIVE-YEAR PLAN- ROLE OF ENGINEERS AND TECHNOLOGIES

Presentation
By
R. P. Lahiri
B.Tech.(IIT, Kharagpur), MBA(F), B.G.Law,
ISO 9000 Lead Assessor (U.K)
Ph.D Research Scholar in Engineering
School of Engineering and Technology
Indira Gandhi National Open University
Maidan Garhi, New Delhi-68
011-22770157, 9868918947
E mail : rplahiri@gmail.com

Presentation
on

The Role of Professional Ethics for Quality and Sustainable Development in Construction

"Treat the earth well : it was not given to you by your parents, it was loaned to you by your children. We do not inherit the Earth from our Ancestors, we borrow it from our Children."

/Ancient Indian Proverb /

ॐ सर्वे भवनतु सखिनः, सर्वे सन्तु निरामयः
सर्वे भद्राणि पश्यन्तु, मा कश्चिद दुखभाग भवेत्.

May all be happy.
May all enjoy health and freedom from disease.
May all have prosperity and good luck.
May none suffer or fall on evil days.

"Man to respect his fellow creatures,
Living in harmony,
The water bodies, air, land are to be free from all pollution;
Helped by 'green' energy"

Shanti Mantra (encrypted)
Peace on Earth.
Peace in Space.
Peace in Water.
Peace in Plants, Trees and Herbs.
May there be Peace in me, Peace alone!

Abstract

Construction industry in India is the second largest economic sector after agriculture.

The proposed planned outlay in 12th five year plan (2012-2017) is around Rs. 44 Lack Crores.

The Global outlay of construction in 2005 was USD $3.22 trillion.
Estimated cost of curruption was USD $1.5 Trillion.

The energy used in construction represents approximately 50% of green house emissions.

Introduction

Sustainable development practices in construction is of tremendous need.
Quality (Doing right first time and every time) is key to sustainable development.
Professional ethics (Do what is right), moral value judgment, is the essence of quality.

Sustainability in Construction

Sustainable development is to ensure better quality of life for every one present and future generation.
Fulfillment of Social and economical goals
Sharing by all the benefits of economic prosperity
Less pollution
Efficient use of natural resources.

Professional Ethics

Professional ethics is moral principle for Judging good or bad, right or wrong
Right act that promotes good is ethical act (Dharma Rakshati Dharmam)
Dishonest and unfair conducts are "Endemic" in Construction
Unethical practices: Fraud, Neglegence, Conflict of Interest, Breaches etc;

Professional Ethics

Constructional Professionals are to promote, ensure and safeguard others well being. Ethical behaviour are a set of principles, attitudes and character of fairness to clients, colleagues and public.
Ethics is right of an employee to refuse to partake unethical conduct when forced by an employer.

Quality

Quality is adhering to cost, time, drawings and specifications.
Cost of construction should be life cycle cost.
Durability, usability, use of renewable energy products, less wastages, development and use of new non-quarried materials are important aspects of quality

Strategies for Sustainable Development

Scarce National Resources like funds, land, human, air, water, materials and quarry shall be most judicially utilised.
Construction at all levels of starting from concepts to commission through tendering and execution must be completely eradicated.
Forests should not be logged off for timber.

Strategies for Sustainable Development

Improved design and construction techniques should be meticulously adopted.
Non-standard quality of materials and workmanship should be totally avoided.
Landfill tax, aggregate levy, climate change levy should be inducted.

Strategies for Sustainable Development

Improved design and construction techniques should be meticulously adopted.
Non standard quality of materials and workmanship should be totally avoided.
Landfill tax, aggregate levy, climate change levy should be inducted.
Oath of integrity shall be signed by all construction players
Integrity assessors with adequate qualifications, experience and ethics background shall be appointed.


Planning for 12th Five Year Plan
12 Priorities Defined – Sectors & Financials outlays Fixed up
Selection of Technologies & Strategies for Implementation
Role of Engineers & Technologists
Govt.'s Role (Polity)
Govt.'s Role (Bureaucracy)
Role of Other Disciplines
Implementation
PMC
Mid Course Correction
Policy Targets & Execution Delivery with an Holistic approach :
to Match Why Targets are to be reduced every time
Journey During 12th Plan and Way Forward for next Plans

9 List of Delegates

1. Shri A. K. Jain
Steel Furness Association of India
New Delhi

2. Shri A. K. Mishra
General Manager
Eastern Coalfields Ltd.
Burdwan, W.B

3. Shri A. K. Soam
AE(C) CW Sahibabad-II
New Delhi

4. Shri A.L. Aggarwal
Former Chief Engineer
MCD

5. Shri A.R. Purushottam
Sr. Manager (POSD)
Engineers India Limited
New Delhi

6. Dr. Abhimanyu Kumar,
ARD, Mechanical Engineering
School of Engg. Technology, IGNOU
New Delhi

7. Shri Abhishek
B.Tech. MBA(CSE)
IAMR, Ghaziabad (U.P.)

8. Shri Abhishek Kumar
PGDM Programme
IAMR, Ghaziabad (U.P.)

9. Shri Abhishek Pratap Singh
PGDM Programme
IAMR, Ghaziabad (U.P.)

10. Shri Abhishek Tiwari
B.Tech. MBA(CSE)
IAMR, Ghaziabad (U.P.)

11. Er. A C M Bhandari
Consultant, Mahatma Gandhi State
Institute of Public Administration, Punjab
Chandigarh, Punjab

12. Shri Adarsh Mishra
B.Tech. MBA(CSE)
IAMR, Ghaziabad (U.P.)

13. Shri Adusumilli Sudheer Babu
Senior Manager Civil
Lanco Infratech Limited
Gurgaon, Haryana

14. Shri Ajay Kr. Bhartiya
Int.M.Tech(ETC)
IAMR, Ghaziabad (U.P.)

15. Shri Ajay Kr. Prasad
PGDM Programme
IAMR, Ghaziabad (U.P.)

16. Ms. Akriti Dubey
Inderprastha Engineering College
Sahibabad, Ghaziabad (U.P.)

17. Shri Alok Kr Singh
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

18. Shri Alok Kumar
Chief Manager, Eastern Coalfields Ltd.
Burdwan, W.B

19. Shri Alok Shukla
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

20. Shri Amit Koul Machama
DM, Head Office
The National Small Industries Corpn. Ltd
New Delhi

21. Shri Amit Kr. Sharma
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

22. Shri Amit Kumar
Student
IAMR, Ghaziabad (U.P.)

23. Shri Amit Ranjan
Assistant General Manager
Project Management Group
Lanco Infratech Limited
Gurgaon (Haryana)

24. Shri Amit Yadav
B.Tech.MBA(Civil)
IAMR, Ghaziabad (U.P.)

25. Shri Amrendra Kumar Mishra
Advocate
Techo-Legal Consultant
New Delhi

26. Shri Anup Kumar
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

27. Mrs. Archana Raina
Vice President
Project Management Group
Lanco Infratech Limited
Gurgaon (Haryana)

28. Shri Arvind Meena
AM(C), NHPC Limited
Faridabad (Haryana)

29. Shri Arvind Verma
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

30. Shri Ashim Kumar Singh
Assistant General Manager
Project Management Group
Lanco Infratech Limited
Gurgaon (Haryana)

31. Dr. Ashish Agarwal
Associate Professor, SOET,
Mechanical Engineering
School of Engg. Technology, IGNOU
New Delhi

32. Shri Ashish Ranjan
PGDM Programme
IAMR, Ghaziabad (U.P.)

33. Shri Ashish Thapliyal
B.Tech.MBA(Civil)
IAMR, Ghaziabad (U.P.)

34. Shri Ashok Bhai Patel
PGDM Programme
IAMR, Ghaziabad (U.P.)

35. Shri Ashok K. Sehgal
Member
The Institute of Marine Engineers (India)
Faridabad (Haryana)

36. Shri Ashok Kr Shukla
DM, Head Office
The National Small Industries Corpn. Ltd
New Delhi

37. Shri Ashok Panda
Sr. General Manager Engineering
Lanco Infratech Limited
Gurgaon (Haryana)

38. Dr. Ashok Sahu
Principal Adviser
Planning Commission
New Delhi

39. Shri Ashwini Kumar Shukla
Assistant General Manager
Quality Assurance, Lanco Infratech Limited
Gurgaon (Haryana)

40. Dr. Gp Capt Atul Jain
HOD; Dept of MBA
IILM, New Delhi

41. Shri B Majumdar
Dy. Director
Construction Industry Development Council
New Delhi

42. Shri B. D. Sharma
AE(C) CW R.P. Bagh
New Delhi

43. Shri B. I. Singhal
Director General
Institute of Urban Development
New Delhi

44. Shri B. K. Sharma
AE(C) CW Gurgaon
New Delhi

45. Dr B. Bodeiah
Ex CMD (BVFCL)
New Delhi

46. Shri B. K. Chugh
Special Advisor, Govt. of NCR
New Delhi

47. Shri Bhanu Pratap Yadav
Int.M.Tech(ETC)
IAMR, Ghaziabad (U.P.)

48. Shri C. S. Singh
AE(C) ICD Greater Noida
New Delhi

49. Shri C.P. Arora
Vice President Engineering
Lanco Infratech Limited
Gurgaon (Haryana)

50. Shri Chander Verma
Chairman, Construction Industry
Development Council &
Treasurer, ECI
New Delhi

51. Shri Chandra K. Jain
LM, Geotechnical Society of India

52. Shri Chitta Ranjan Bose
Delhi

53. Shri D. Rajasekharan
AGM(Mech)
NMDC Limited
Masab Tank, Hyderabad

54. Shri Davendar Verma
B.Tech.MBA(Civil)
IAMR, Ghaziabad (U.P.)

55. Shri Deepak Kansal
Int.M.Tech(ETC)
IAMR, Ghaziabad (U.P.)

56. Shri Deepak Singhal
Officer Administration & Systems
Engineering Council of India
New Delhi

57. Lt. Col. Dev Raj (T.A.)(Retd.)
Life Member-CSI
Chief Administrative Officer (Retd.),
Ministry of Railways, Government of India
New Delhi

58. Shri Dharmendra Dubey
PGDM Programme
IAMR, Ghaziabad (U.P.)

59. Shri Dibya Lochan Behra
Manager Civil
Lanco Infratech Limited
Gurgaon (Haryana)

60. Shri Digvijai Nath
Chairperson
Arunachal Pradesh State Electricity
Regulatory Commission
Naharlagun (Arunachal Pradesh)

61. Shri Dipankar De
Chief Editor,
Journal of Agricultural Engineering
Indian Society of Agricultural Engineers
New Delhi

62. Shri G. D. Renwal
Sr. ED
All India Induction Furnaces Association
New Delhi

63. Shri G. P. Agarwal
AE(C) CW Bikaner-II
New Delhi

64. Shri G. C.Tallur B.E.F.I.E.
Former Secretary, PWD
Government of Karnataka
Dharwad (Karnataka)

65. Dr. G. S. Yadava,
Council Member & Past Chairman,
Delhi State Centre - IEI
Act'g Vice Chancellor, Lingaya's University,
Faridabad

66. Shri Gagan Deep Sharma
Dy. Manager
Satluj Jal Vidyut Nigam Ltd.
Shimla (HP)

67. Prof. Gajendra Singh
Past President
Indian Society of Agricultural Engineers
New Delhi

68. Shri Gajendra Singh,
Engineer (M)
NHPC Limited
Faridabad (Haryana)

69. Dr. Gopal Jadav,
Associate Professor, SOMS,
Mechanical Engineering
School of Engg. Technology, IGNOU
New Delhi

70. Shri Gopal O Joshi
Senior Manager - Civil
Lanco Infratech Limited
Gurgaon (Haryana)

71. Shri H K Tiwari
AM(C), NHPC Limited
Faridabad (Haryana)

72. Shri H L Chawla

73. Shri H.K. Jha
Managing Director
Western Coalfields Ltd.
Nagpur, Maharastra

74. Shri H.L. Choudhary
Group General Manager (B&A)
RITES Limited
Gurgaon (Haryana)

75. Shri Harish Kumar Pal
Associate Professor
IAMR, Ghaziabad (U.P.)

76. Shri Harish Pandey
Vice President - Engineering
Lanco Infratech Limited
Gurgaon (Haryana)

77. Shri Harpal Singh
AE(E) CO Engg. Division
New Delhi

78. Shri Hemant Kumar Labh
Associate VP (ITNL)
Mumbai

79. Dr. Himadri Roy
Associate Professor, SGDS,
Mechanical Engineering
School of Engg. Technology, IGNOU
New Delhi

80. Shri Himanshu Nagpal
AM(C), NHPC Limited
Faridabad (Haryana)

81. Dr. I. B. Singh
AIIMS

82. Dr. Indra Mani
Past Secretary General
Indian Society of Agricultural Engineers
New Delhi

83. Shri J S Saluja
M D, SCPL
Member, Indian Institution of Plant Engineers
New Delhi

84. Shri J. J. Lal
Former Chief Engineer
MCD

85. Shri J. K. Bhattacharya
Corporate Director
CES Pvt. Ltd.
New Delhi

86. Shri J. L. Narayan
Former Joint Advisor, M OSPI
Gurgaon (Haryana)

87. Shri J. S. Bahari
AE(E) Mayur Vihar Flat
Delhi

88. Shri Jaiprakash
CPWD

89. Dr Janardan Swarup
Ghaziabad

90. Shri Jaspal Singh
Manager, Strategic Planning
Lanco Infratech Limited
Gurgaon (Haryana)

91. Shri Jayana Srinivas Rao
Assistant General Manager- Civil
Lanco Infratech Limited
Gurgaon (Haryana)

92. Shri Jitesh Kumar
MCA V Sem (Section A)
I.T.S - Management & I.T. Institute
Ghaziabad

93. Mrs Jyothi Girish,
Sr. Manager (Project)
Construction Industry Development Council
New Delhi

94. Col. K. K. Chitkara, AVSM (Retd.)
Gurgaon (Haryana)

95. Shri K. K. Khanna
Former Director & Board Member
of Steel Authority of India Ltd (SAIL)
New Delhi

96. Shri K. B. Rai
New Delhi

97. Shri K. C. Panda
Bharat Heavy Electricals Limited
Ramachandrapuram, Hyderabad

98. Shri K. K. Kapila
CMD
International Consultants &
Technocrats Pvt. Ltd.
New Delhi

99. Shri K.P. Mehra
Member-IIchE
New Delhi

100. Er. K. S. Chauhan
RH Tech. Services
Ultratech Cement Limited
New Delhi

101. Shri Kali Charan
AE(C) CO Vigilance Division
New Delhi

102. Shri Kalyan Sarkar
Sr. Manager, Eastern Coalfields Ltd.
Burdwan (W.B)

103. Mrs. Kanta Lahiri,
Mechanical Engineering
School of Engg. Technology, IGNOU
New Delhi

104. Shri Kanwaljeet Singh Duggal
Supdt. Engineer
M.N. Dastur & Company (P) Ltd
New Delhi

105. Shri Khalid Shakeel
Manager, NTSC Okhla
The National Small Industries Corpn. Ltd
New Delhi

106. Shri Krishna Kumar Agrawal
Managing Director
M/s K. K. Agrawal & Associates Pvt. Ltd.
Consulting Engineers
New Delhi

107. Shri L. Pugazhenthy
Executive Director, ILZDA
New Delhi

108. Shri L. R. Batham
Member -ICC
Advisor- Technical (ESIC)
Delhi

109. Shri M. M. Lal
Senior Advisor
Construction Industry Development Council
New Delhi

110. Shri M. L. Wadhwa
CMD, TAFCON Projects (India) Pvt. Ltd.
New Delhi

111. Shri M. R. Sharma
AE(E) CW Karnal-III
New Delhi

112. Shri M.A. Khan
Chief Manager, Head Office
The National Small Industries Corpn. Ltd
New Delhi

113. Dr. M.K. Bhardwaj
Associate Professer,
School of Engg. Technology, IGNOU
New Delhi

114. Shri M.L. Chhabra
Manager, AHC- Sukhot
New Delhi

115. Maj. Gen. M. S. Ghai
Associate Director
Head Business Development
URS Scott Wilson India Private Limited
New Delhi

116. Shri Madan Pal
AE(C) CO Engg. Div.
New Delhi

117. Shri Mahmood Sayeed
Assistant Engineer (Civil)
U.P. Public Work Department (PWD)
Aligarh (U.P.)

118. Dr. Manoj Kulshrestha
Associate Professor
Indira Gandhi National Open University
New Delhi

119. Shri Manoj Kumar
D.D. News, Doordarshan
New Delhi

120. Ms. Meenu Arya
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

121. Ms. Nidhi Mathur
Chief Manager, NTSC Okhla
The National Small Industries Corpn. Ltd
New Delhi

122. Shri Mukesh Dham

123. Shri Mukesh Thakur
S M, Satluj Jal Vidyut Nigam Ltd.
Shimla (HP)

124. Shri N Venkateshwarlu
Associate Professor
Indra Gandhi National Open University
New Delhi

125. Shri Naresh Berry
Satluj Jal Vidyut Nigam Ltd.
Shimla (HP)

126. Shri Naresh Kumar
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

127. Shri Neeraj Moundekar
Int.M.Tech(ETC)
IAMR, Ghaziabad (U.P.)

128. Ms. Neha
B.Tech.MBA(Civil)
IAMR, Ghaziabad (U.P.)

129. Shri Nepal Singh
Manager, Head Office
The National Small Industries Corpn. Ltd
New Delhi

130. Ms Nitika Anand,
Manager, NTSC Okhla
The National Small Industries Corpn. Ltd
New Delhi

131. Shri Nitish Kumar Bajpai
B.Tech.MBA(Civil)
IAMR, Ghaziabad (U.P.)

132. Dr. Nivedita
Sr. Executive
Indian Society for Technical Education,
New Delhi

133. Gp. Copt. O K Dogra (Retd.) VSM
C E O India
AHC- Sukhot
New Delhi

134. Shri O P Gupta VSM
Sr Advisor
Construction Industry Development Council
New Delhi

135. Prof. O. P. Singhal
Head CSE,
Inderprastha Engineering College
Sahibabad, Ghaziabad

136. Shri P. B. Vijay
Former DG,
CPWD
New Delhi

137. Shri P. Kumar Agarwal
Inderprastha Engineering College
Sahibabad, Ghaziabad

138. Shri P. L. Diwan
Consultant
Intercontinental Consultants &
Technocrats Pvt. Ltd.
New Delhi

139. Shri P. N. Shali
Director
Engineering Council of India
New Delhi

140. Shri P. S. Chauhan
AE(E) CO, Maintenance Cell
New Delhi

141. Shri P. J. Singh
DGM (Structural)
Engineers India Limited
New Delhi

142. Shri P. K. Gandhi
Manager, NTSC Okhla
The National Small Industries Corpn. Ltd
New Delhi

143. Shri Pal Sandeep Rampyare
Int.M.Tech(ETC)
IAMR, Ghaziabad (U.P.)

144. Shri Pankaj Jain
Additional Secretary
Ministry of Statistics &
Programme Implementation
New Delhi

145. Er. Paritosh C. Tyagi
Ex-Chairman,
Central Pollution Control Board
Noida (U.P.)

146. Shri Parveen Kumar
D.D. News, Doordarshan
New Delhi

147. Ms. Pooja Gaur
B.Tech. MBA(CSE)
IAMR, Ghaziabad (U.P.)

148. Prof. Pooja Tripathi
Inderprastha Engineering College
Sahibabad, Ghaziabad

149. Shri Prabhat Kumar
General Manager
NTPC Bhawan, New Delhi

150. Ms. Prakriti
Int.M.Tech(ETC)
IAMR, Ghaziabad (U.P.)

151. Shri Pramod Kr Gupta
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

152. Shri Pranav Kumar
AM(M), NHPC Limited
Faridabad (Haryana)

153. Ms. Prapti Mulasi
Manager
Tata Services Limited
New Delhi

154. Shri Prashant Gupta
Inderprastha Engineering College
Sahibabad, Ghaziabad

155. Shri Prem Kumar
DM(M), NHPC Limited
Faridabad (Haryana)

156. Shri Pritima Kaushal
Director, Enablers
New Delhi

157. Ms. Priyanka Singh
Int.M.Tech(ETC)
IAMR, Ghaziabad (U.P.)

158. Shri Priyoj Kishor Pradhan
Manager, Health Safety and Environment
Lanco Infratech Limited
Gurgaon (Haryana)

159. Dr. Pronab Sen
Pr. Adviser (SP-Del. / Mah. Power &
Energy with Coal & PC Division),
Planning Commission, Govt. of India
New Delhi

160. Shri Puneet Kr. Sharma
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

161. Shri Puneet Meena
Int.M.Tech(ETC)
IAMR, Ghaziabad (U.P.)

162. Shri Puneet Verma
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

163. Shri R R Mallick
AM(C), NHPC Limited
Faridabad (Haryana)

164. Shri R.N. Mathur
Life Member-CEAI
Delhi

165. Shri R B Sahani
Manager (TS)
Indian Renewable Energy Dev. Agency Ltd.
New Delhi

166. Er. R. D. Gupta
New Delhi

167. Shri R. Prem Kumar
Academic Director
Automobile Society of India,
New Delhi

168. Shri R. S. Bhatia

169. Shri R. S. Raperia
EE(C) CO Engg. Division
New Delhi

170. Col. R. Singh
New Zealand

171. Shri R. K. Bagrodia
Member, IIchE
Managing Director, Winsome Breweries Ltd.
New Delhi

172. Dr. R. N. Maiti
AGM (R&D)
Engineers India Limited
New Delhi

173. Shri R.P. Luthra
IIchE (NRC) Member
Indian Institute of Chemical Engineers
New Delhi

174. Prof. R. P. Lahiri
School of Engg. Technology,
IGNOU
New Delhi

175. Shri R. S. Meena
Manager (Inst.)
Engineers India Limited
New Delhi

176. Shri Radhey Shyam Goel
National Convener,
Coordination Committee of National Level
Water & Hydel National Level
Professional Societies

177. Er. Rahul Goel
RH Tech. Services
Ultratech Cement Limited
New Delhi

178. Shri Rahul Gupta
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

179. Shri Rahul Sharma
Assistant General Manager
Business Development
Lanco Infratech Limited
Gurgaon (Haryana)

180. Shri Rajendra Prasad
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

181. Shri Rajesh Bisht
Satluj Jal Vidyut Nigam Ltd.
Shimla (HP)

182. Shri Rajiv Bhatia
Sr. Vice President - Engineering Department
Lanco Infratech Limited
Gurgaon (Haryana)

183. Shri Rajiv Goyal
Dy. GM (PS)
Indian Farmers Fertiliser Cooperative Ltd
New Delhi

184. Shri Ram Naresh Singh
AM(M)
NHPC Limited
Faridabad (Haryana)

185. Shri Rameez Khan
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

186. Shri Ramesh Chand
EE(C) CC Delhi
New Delhi

187. Ms. Rekha Swami
PGDM Programme
IAMR, Ghaziabad (U.P.)

188. Ms. Richa Wadhwa
Int.M.Tech(ETC)
IAMR, Ghaziabad (U.P.)

189. Ms. Rimpi Bansal
PGDM Programme
IAMR, Ghaziabad (U.P.)

190. Shri Rishish Jha
Senior Manager (ITNL)
The IL&FS Financial Centre
Bandra East, Mumbai

191. Ms Ritumala Gupta,
AM(Env), NHPC Limited
Faridabad (Haryana)

192. Shri Rohit Goel
B.Tech.MBA(Civil)
IAMR, Ghaziabad (U.P.)

193. Prof S S Chakraborty
Chairman-cum-Managing Director,
Consulting Engineering Services (I) P Ltd,
New Delhi

194. Shri S V. Ramana

195. Shri S. B. Singh
EE(C) CO Engg. Division
New Delhi

196. Shri S. C. Jha
Bharat Heavy Electricals Limited
Ramachandrapuram (Hyderabad)

197. Maj. Gen. S. K. Khetarpal (Retd.)
Consultant
Intercontinental Consultants &
Technocrats Pvt. Ltd.
New Delhi

198. Dr. S. L. Keswani
Managing Director
Chemprojects Consulting Pvt. Ltd.
New Delhi

199. Shri S. L. Swami
Chairman
The Institution of Civil Engineers (India)
New Delhi

200. Shri S. Ratnavel
Chairman,
Engineers Bill Task Force Committee;
Member,
Association of Consulting Civil Engineers
(India) &
CEO, Sceba Consultancy Services
Madurai

201. Shri S. S. Narang
New Delhi

202. Shri S. K. Balchandani
IIchE (NRC) Member
Indian Institute of Chemical Engineers
New Delhi

203. Shri S. K. Naskar
Sr. Manager (Civil)
Engineers India Limited
New Delhi

204. Shri S. M. Siddes
Manager (TS)
Indian Renewable Energy Dev. Agency Ltd.
New Delhi

205. Shri S.V.R. Subramanyam
AGM (ETD)
Engineers India Limited
New Delhi

206. Shri Saleem Ahmed
EE(E) CO - Maintenance Cell
New Delhi

207. Shri Samir Das
AGM (Arch.)
Engineers India Limited
New Delhi

208. Shri Sanjay Kumar
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

209. Shri Sankhadip Chowdhury
DM(C), NHPC Limited
Faridabad (Haryana)

210. Shri Santosh Kumar
Engineering Council of India
New Delhi

211. Shri Sashi Kant Singh
Int.M.Tech(ETC)
IAMR, Ghaziabad (U.P.)

212. Sayed Burhanuddin Shuttari
Chief Consultant
S.B.S. Associates
Aurangabad (Maharashtra)

213. Shri Shadab Ali
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

214. Shri Shail Bhardwaj
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

215. Shri Shaily Chaudhary
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

216. Er. Shashi Gaggar
Zonal Head - Tech. Services
Ultratech Cement Limited
New Delhi

217. Ms. Shilpi Jain
Deputy Manager, Strategic Planning
Lanco Infratech Limited
Gurgaon (Haryana)

218. Shri S. G. Baradkar
Manager Civil
Lanco Infratech Limited
Gurgaon (Haryana)

219. Shri Siddharth
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

220. Shri Soumitra Roy
Manager -Mining
Lanco Infratech Limited
Gurgaon (Haryana)

221. Er. Subhash Malhotra
Senior Consultant
Mahatma Gandhi State Institute of Public Administration, Punjab
Chandigarh (Punjab)

222. Dr. Subhasis Maji
Director (SOET), Mechanical Engineering
School of Engg. Technology, IGNOU
New Delhi

223. Mrs. Sujata Pal
General Manager(E&M)
Central Mine Planning & Design Institute Ltd.
Ranchi, Jharkhand

224. Shri Sumit Gambhir
MCA V Sem (Section A)
I.T.S. - Management & I.T. Institute
Mohan Nagar, Ghaziabad

225. Shri Sunil Kr Pandey
Professor & Chairperson - MCA Programe
Dept of Information Technology
I.T.S. - Management & I.T. Institute
Mohan Nagar, Ghaziabad

226. Shri Sunil Yadav
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

227. Shri Sunny Gogna
Engineer
Satluj Jal Vidyut Nigam Ltd.
Shimla (HP)

228. Shri Sushil Kumar Choudhary
Member, CEAI
Consultant, Line Design Forum
Jalandhar (Punjab)

229. Dr. T.C.A. Anant
Secretary & CSO
Ministry of Statistics &
Programme Implementation
New Delhi

230. Shri T. K. Sarkar
DGM (POSD)
Engineers India Limited
New Delhi

231. Shri Tarkeshwar Shukla
PGDM Programme
IAMR, Ghaziabad (U.P.)

232. Shri Tarun Kumar
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

233. Shri U. A. Patro
DGM (Elect.), Engineers India Limited
New Delhi

234. Dr. Uddesh Kohli
Chairman, Engineering Council of India
New Delhi

235. Shri Ujjwal Narayan Singh
Manager -Civil
Lanco Infratech Limited
Gurgaon (Haryana)

236. Shri Umesh Kumar
MCA V Sem (Section A)
I.T.S - Management & I.T. Institute
Mohan Nagar, Ghaziabad

237. Prof. V K Srivastava
Past President, IIChE
New Delhi

238. Shri V.P. Sardana
Advisor
Rathi Super Steel Limited
Noida (U.P.)

239. Shri V. Varadarajan
Scientist - G
Electronics & Radar Development
Establishment
Govt. of India Ministry of Defence, DRDO
Bangalore (Karnataka)

240. Dr. V. M Mayande
President - ISAE
Pune (Maharashtra)

241. Shri Vijay Kumar
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

242. Shri Vijay Kumar Gupta
Director
Member IEEE, BES, CSI, IETE
New Delhi

243. Shri Vijay Pal Meena
B.Tech. MBA (Civil)
IAMR, Ghaziabad (U.P.)

244. Shri Vijaysimha Kasi
Vice President Operation Planning
Lanco Infratech Limited
Gurgaon (Haryana)

245. Shri Vikas Jain
AM(E), NHPC Limited
Faridabad (Haryana)

246. Shri Vikas Rathore
B.Tech. MBA(CSE)
IAMR, Ghaziabad (U.P.)

247. Shri Vikas V. Swami
Manager Civil
Lanco Infratech Limited
Gurgaon (Haryana)

248. Shri Vikram Jayant
DM, BO Noida
The National Small Industries Corpn. Ltd
New Delhi

249. Shri Vimlesh Kr Bhatia
DM, Head Office
The National Small Industries Corpn. Ltd
New Delhi

250. Dr. Vineet Kansal
Director (IT)
ITS Engineering College
Greater Noida (U.P.)

251. Shri Vinod K. Tyagi
Technical Director
M.N. Dastur & Company (P) Ltd
New Delhi

252. Shri Vinod Sinha
Chief Manager
Central Mine Planning & Design Institute Ltd.
Ranchi (Jharkhand)

253. Shri Virender Kumar
AE(C) CO Purchase Division
New Delhi

254. Shri Virender Kumar Chaudhary
Satluj Jal Vidyut Nigam Ltd.
Shimla (HP)

255. Shri Virender
Construction Industry Development Council
New Delhi

256. Shri Vishesh Kumar
B.Tech.MBA(Civil)
IAMR, Ghaziabad (U.P.)

257. Shri Vivek Kumar
AGM (Oprns)
Steel Authority of India Ltd (SAIL)
New Delhi

258. Shri Vivek Thakur
IAMR, Ghaziabad (U.P.)

259. Shri Vivek Tiwari
Associate Professor
IAMR, Ghaziabad (U.P.)

260. Shri Y P Ramarao Chowdary
Senior Manager - Civil
Lanco Infratech Limited
Gurgaon (Haryana)

261. Shri Y.P. Kathuria
Japan

262. Shri Yogesh
B.Tech.MBA(CSE)
IAMR, Ghaziabad (U.P.)

263. Shri Yograj Singh
Engineering Council of India
New Delhi

10 Engineering Council of India (ECI)

ECI was established on April 4, 2002, by coming together of a large number of Professional Organizations / Institutions of engineers, to work for the advancement of engineering profession in various disciplines, for enhancing the image of engineers in society, by focusing on quality and accountability of engineers and to enable the recognition of expertise of Indian engineers and their mobility at international level in the emerging WTO / GATS environment. It has emerged as a common voice of its member organizations.

Objectives

The main objectives of ECI are to work for the advancement of engineering profession in various disciplines and for enhancing the image of engineers in the society. To this end, ECI is focusing on quality and accountability of engineers, professionalism and their mobility for delivering engineering services in other countries, with expertise of Indian engineers developed, recognized and accepted at the international level.

Tasks

- Representing Member Associations in government and non- government bodies, and interacting on common policy matters relating to engineering profession
- Working for the setting up of a Statutory Council of Engineers and later interfacing with it, providing support and inputs for developing systems and procedures for the registration of engineers, CPD, code of ethics
- Facilitating authorization of member associations to register engineers; assisting them in developing internal systems for undertaking registration, CPD, enforcing code of ethics; and providing common forum for CPD to support the member associations
- Assisting member associations in interaction with academic institutions and regulatory bodies in regard to their examinations, award of degrees etc
- Providing forum for exchange of information and experience among member associations, coordination, common thinking and views on important matters
- Helping in the analysis of existing education systems / bodies and making suggestions in order to make the education relevant for the engineering profession and employability
- Setting up a Resource Centre and Database of Engineers, which can provide necessary information required for the development of the profession
- Interacting with professional associations / bodies in other countries & international bodies
- Undertaking and supporting research for the development of the engineering profession

Engineers' Bill

ECI has facilitated formulation of a conscious draft Engineers' Bill for the consideration of the Govt. of India. Which lays down the criteria for the process of registration of Practising Engineers and provide necessary statutory framework for the same. The draft is being processed by the Ministry of Human Resource Development.

Membership

Membership of the ECI is open to societies / organisations of engineers who meet the following requirements :

- having been established statutorily or registered in accordance with law.
- having atleast 100 corporate members
- having existed for at least four years, and
- the accounts being audited annually.

Board of Governors

Chairman	
Dr. Uddesh Kohli	Chairman Emeritus, Construction Industry Development Council
Vice -Chairman	
Shri Mahendra Raj	President, Indian Association of Structural Engineers
Treasurer	
Shri Chander Verma	President, International Council of Consultants Chairman, Construction Industry Development Council & Indian Society for Trenchless Technology
Members	
Dr. S. S. Mantha	Acting Chairman, All India Council for Technical Education
Shri S. Ratnavel	Member, Association of Consulting Civil Engineers (India)
Dr. S. Gangopadhyay	Advisor, Head - RDPD, Council of Scientific and Industrial Research
Dr. P. R. Swarup	Director General, Construction Industry Development Council
Dr. S. Chatterjee	President, Consulting Engineers Association of India
Prof. P. Trimurthy	President, Computer Society of India
Shri Rajeev Kher	Jt. Secretary, Dept. of Commerce, Ministry of Commerce and Industry
Prof. D.V. Singh	Member, Indian National Academy of Engineers
Shri B. N. Puri	Sr. Consultant, Planning Commission
Lt. Gen. (Retd.) A.K. Puri PVSM, AVSM	Chairman, Indian Institution of Bridge Engineers (DSC)
Commander B.M. Bhandarkar	Chairman, Indian Institution of Industrial Engineering
Prof. V.K. Srivastava	Past President, Indian Institute of Chemical Engineers
Shri J. S. Saluja	Member, Indian Institution of Plant Engineers
Prof. Kasi Rajgopal	Chairman, The Institute of Electrical and Electronics Engineers Inc.
Prof. Niranjan Swarup	Executive Director, Indian Society for Trenchless Technology
Shri R. S. Prasad	ADG (Trg), CPWD, Ministry of Urban Development & Poverty Alleviation
Shri Lalit Gupta	Director (R&D), DGCA, The Aeronautical Society of India
Shri S.L. Swami	Chairman, The Institution of Civil Engineers (India)
Shri R.K. Gupta	President, The Institution of Electronics and Telecommunication Engineers
Dr. Sanak Mishra	Past President, The Indian Institute of Metals
Shri Ashok K. Sehgal	Member, The Institute of Marine Engineers (India)

Executive Committee

Dr. Uddesh Kohli *Chairman*	Chairman Emeritus Construction Industry Development Council
Shri Mahendra Raj *Vice Chairman*	President Indian Association of Structural Engineers
Shri Chander Verma *Treasurer*	President International Council of Consultants
	Chairman Construction Industry Development Council & Indian Society for Trenchless Technology
Members	
Dr. S. Chatterjee	President Consulting Engineers Association of India
Shri P.R. Swarup	Director General Construction Industry Development Council
Shri R.K. Gupta	President The Institution of Electronics and Telecommunication Engineers
Shri P. N. Shali	Director Engineering Council of India

Office Bearers of ECI

Dr. Uddesh Kohli
Chairman

Mr. Mahendra Raj
Vice Chairman

Mr. Chander Verma
Treasurer

Engineering Council of India

ECI has been formed by coming together of a large number of professional associations / institutes of engineers. The present members are :

1. Association of Consulting Civil Engineers (India)
2. Broadcast Engineering Society (India)
3. Computer Society of India
4. Construction Industry Development Council
5. Consultancy Development Centre
6. Consulting Engineers Association of India
7. Indian Association of Structural Engineers
8. Indian Buildings Congress
9. Indian Concrete Institute
10. Indian Geotechnical Society
11. Indian Institute of Chemical Engineers
12. Indian Institution of Bridge Engineers
13. Indian Institution of Industrial Engineering
14. Indian Institution of Plant Engineers
15. Indian National Group of IABSE
16. Indian Society for Non Destructive Testing
17. Indian Society for Technical Education
18. Indian Society for Trenchless Technology
19. Indian Society of Agricultural Engineers
20. Institute of Urban Transport (India)
21. Institution of Mechanical Engineers (India)
22. International Council of Consultants
23. The Aeronautical Society of India
24. The Automobile Society of India
25. The Indian Institute of Metals
26. The Institute of Electrical and Electronics Engineers. Inc.
27. The Institute of Marine Engineers (India)
28. The Institution of Civil Engineers (India)
29. The Institution of Electronics and Telecommunication Engineers
30. The Institution of Surveyors