



Proceedings

**17th National Conference on “Role of Engineers in Achieving SDGs”
held on November 29, 2019 at New Delhi**

Summary

The 17th National Conference on ‘Role of Engineers in Achieving SDGs’ was successfully organised with the support of AICTE and Global Compact Network on 29th November 2019 at India International Centre New Delhi. The Conference was attended by over 200 delegates/invitees from Member Associations, Affiliate Members and other Institutions. The Conference was addressed by Shri. Suresh Prabhu, former Minister for Railways, Commerce and Industry and Civil Aviation and Dr. S.P. Singh, former Minister of State, Human Resource Development and HE Shri RK Mathur, Lt. Governor, Union Territory of Ladakh, through video messages. Prof M P Poonia, Vice Chairman of AICTE gave the Keynote Address. ECI also gave Distinguished Engineer Award to Shri Prabhakar Singh, DG CPWD during the inaugural session. NPET portal and AI portal on Digital Programme on Construction Management were also launched. The Conference discussed the Role of Engineers in achieving SDGs in industry and infrastructure in one technical session and two technical sessions were devoted to the Role of Technology and Innovations in Achieving SDGs.

The ECI is grateful to our esteemed Patron Sponsor ONGC, and Main Sponsors: Power Finance Corporation; Bharat Petroleum Corporation Ltd.; Delhi Metro Rail Corporation Ltd.; Gas Authority of India Ltd.; Indian Oil Corporation Ltd.; JMC Projects India Ltd.; Kent Mineral RO; L&T construction; National Mineral Development Corporation; NTPC Limited; Oil India Ltd.; Petronet L&G, Power Grid Corporation of India Ltd.; Rural Electrification; Air[port Authority of India Ltd.; BEML Ltd.; Hindustan Petroleum Corporation Ltd.; NHPC Limited.; IRCON International, SJVN Limited; Bharat Electronics Ltd. Rites Limited; and IFFCO Ltd.

Salient Observations/ Recommendations

- India's path in achieving SDGs 2030 is well within reach and we must keep progressing towards sustainable use of natural resource like water solar energy and wind. All professionals: like engineers, doctors and lawyers have to work together toward developing sustainable lifestyle.
- SDGs are so vast and overwhelming in character as it touches all facets of life, economy and environment. It touches social equity and justice, poverty and everything to make the world liveable. In a way it defines business priorities to most towards adopting SDGs.
- It emphasized on the holistic approach of the integrated role of Government, business and societies to share responsibility and work on a common actionable path of sustainable development priorities of India's (1) poverty and urbanization, (2) nutrition and food security, (3) education and employability, (4) Health, Water and Sanitation (5) Skilling, Entrepreneurship and Job creation (6) Climate Change, Energy and Disaster Resistance and (7) Gender Equality and Youth Development.
- ECI with large no. of professionals on board can contribute substantially in developing innovative technologies to help India to achieve sustainable developments in energy, infrastructure, environment management and others and thus provide sustainable life to its citizens
- Without engineers we cannot achieve our SDGs. Our requirement is to build infrastructure, provide clean energy to industry and 130 Cr population for sustainable living. Without engineers we could not have achieved the level of development in India in the last five years.
- CPWD 's treasure of Manuals, Documents & Guidelines which are available as benchmarks, references for the Whole of India should be effectively utilised.
- In India we have 10,500 technical institutions which provide engineering, architecture, management and education in other technical fields. There are only about 26% of 12 class pass students go for higher education which is not a sustainable situation. Out of 37 lakh capacity only 13 lakh take up technical education and out of this only about 7 lakh get jobs through campus recruitment.
- Indian engineers working in advanced countries are dominating in all the fields, it is surprising why our industries are not accepting our engineers. It appears that we are not able to provide human resources that our industry needs. According to industry; firstly, the fundamentals of our engineers are very week, secondly, they are not practical and thirdly engineers are looking for good pay package which is creating a bad environment for sustainable education development. All the expert engineers should come out with suggestions to improve the quality of engineers.



- Role of engineers is very important towards design of better vehicles, roads and other relevant products like production of good quality fuel etc to keep pollution under control.
- Role of engineers in rural areas is more relevant where they can provide innovative ideas to double the income at the village level.
- There is no need to go for very high specifications as it will cause high carbon footprint but with innovations, we can reduce cost and increase not only the life of buildings in the Govt. sector but also make buildings aesthetically simple, acceptable and environment friendly.
- For business logistic cost is important, as 46% of the logistic is on transport. In India road transport cost is much higher as compared to China & US, which impacts the logistic cost in India. Rail transportation is more environment friendly and cost effective. Transport is one of the key drivers of economy with growth elasticity of 1.2. 65% of freight travels at an average 700 kms. A balanced model was suggested for transportation in India i.e. 25% by road and 70% by rail. Big Things are on Highways (6% at present), structural reforms in Railways and capacity augmentation of Railways by dedicated Freight Corridors is in right direction.
- The sub-surface zone is quite vital and needs to be cost effectively managed so that the goals of the society are met efficiently to meet SDGs. The achievement of SDGs is obstructed by insufficient life supporting infrastructure, it requires, unprecedented mobilization of resources, technology and engineering in partnership at all levels of knowledge. Trenchless technology has a huge potential to offer sustainable infrastructure below the ground for the current and future needs. It can play a great role in developing smart cities. It is relevant, as surface congestion is growing, maintenance cost is pretty high in terms of impact on environment and loss of time in movement of traffic which is unsustainable. Therefore, the key factor to achieve SDGs is to go for sub- surface construction using Trenchless Technologies, processes and procedures.
- India's action plan to fight climate change is quite positive. India's International Cooperation and sustainable development is well recognised, as UN says world cannot achieve SDGs without India.
- The volume of work in infrastructure is much bigger than any industry. Therefore, it is important to consider it, in proper AI perspective. A study of BCG and WEF shows that by the use of AI, Block Chain and other such latest technologies, we can achieve optimization of resources quickly and thus reduce the cost & time overruns by 25-50 %. In Highway sector, NHAI by adopting these technologies achieved 16% saving.
- The impact of AI in city planning is tremendous, as one can find all the layers of infrastructure / service mapped on GIS. Any addition can easily be analysed in terms of impact on other facilities. Singapore city is a good example a virtual city data / information is available on AI platform with quantum computer which simulates to give the desired result.



- With only 1% surface water (1.5% is glacier and groundwater and 97.5% is sea water), it is very important to preserve the surface water with many conservation methods like check dam, rooftop water harvesting, trenching in slopes and many more.
- India should concentrate on small innovations which can be used immediately. He gave example of small reactors with RTG developed by Canada which can generate captive power (can be kept in garage) with small quantity of uranium for 30-40 years in a small town.
- It is advocated that “GD Prod Consum Model” is more relevant today, as engineers contribute to all the steps in this system model. While explaining the engineer’s role in managing natural resources, it is said that engineers have to work together with all expert and community groups.
- It stressed on multi engineering skills that are needed for sustainable development.
- He emphasized on the decision-making role of engineers as one of key factor in creating sustainable infrastructure.



Inaugural Session

During Inaugural Session, Dr. Kohli Chairman ECI gave brief account of ECI activities and said that by now we have about 4000 Professional Engineers on the National Register. He mentioned that ECI has signed MoU with AICTE to support the cause of Internship for Graduates/Diploma students. He also briefly described status of Engineers Bill which is being processed by the Department of Higher Education, Ministry of HRD. He welcomed the dignitaries on the dias and expressed sincere thanks for the video message received from Shri. Suresh Prabhu, Lt. Governor Ladakh, Shri R. K. Mathur and Dr. S.P. Singh who could not be physically present due to their busy schedules.

A video prepared by UNGC was played which highlighted India's story on the achievement of SDG 2030 which aims at leaving no one behind. It shows that return on Investment on SDG is US\$ 30 billion per year (world figure). It is no more an aspiration but it is happening in India. LED Bulb has transformed India in conserving energy. India has targeted 25 solar parks to create capacity of 20,000 MW of energy. JAM (Jandhan, Adhar and Mobile) is transforming life of millions in India at much faster pace and is expanding business opportunities, helping in adapting new innovations and creating employment. This was followed by the messages from our honoured guests who could not come due to their busy schedules.

Mr. Suresh Prabhu, former Minister Railways Commerce & Industry and Civil Aviation in his message congratulated ECI for organizing National Conference on such an important topic and said that Role of Engineers in creating sustainable infrastructure and super structure is well recognized. India's path in achieving SDGs 2030 is well within reach and we must keep progressing towards sustainable use of natural resource like water solar energy and wind. All professionals like engineers, doctors and lawyers have to work together toward developing sustainable lifestyle.

Shri R.K. Mathur, Lt. Governor, Union Territory Ladakh, in his message congratulating ECI said that SDGs 2030 with 16 verticals and 169 targets touches all aspects of human life, economic and environment. He informed that India has made large no. of commitments to achieve these goals through several programs. Nation has mission to achieve Green India, mission to reduce carbon footprint, mission to improve eco system, mission to harness solar energy and mission to improve heritage and thus achieve sustainable divergent goals. He further said that ECI with large no. of professionals on board can contribute substantially in developing innovative technologies to help India to achieve sustainable developments in energy, infrastructure, environment management and others and thus provide sustainable life to its citizens. He emphasized that not only engineers but the entire community have to work in unison to achieve SDG 2030. He thanked the ECI for the opportunity to share his thoughts and said that this conference will provide opportunity to discuss ways and means to further strengthen and enhance the programs for the achievements of SDGs 2030. He wished success to the conference.

Congratulating ECI for organizing its 17th Conference on such an important topic, Dr. S.P. Singh former Minister, HRD, said that without engineers there is no development



and no life. Without engineers we cannot achieve our SDGs. Our requirement is to build infrastructure, provide clean energy to industry and 130 Cr population for sustainable living. Without engineers we could not have achieved the level of development in India in the last five years. Financial inclusion of 32 Crore poor people, linking 1 billion with Adhar and mobile technology has been made possible with the efforts of engineers.

During the Inaugural Session Shri Prabhakar Singh, DG, CPWD was conferred with the Distinguished Engineer Award for his outstanding contribution to the engineering profession and his services to the nation in areas of design of dedicated infrastructure and conserving environment. His citation was read by Shri. J.L. Narayan, ED, ECI. His contribution in strengthening technical arm of the Govt. of India is enormous. CPWD in the leadership of Shri. Prabhakar Singh developed Manuals, Documents & Guidelines which are available as benchmarks, references for the Whole of India.

During inaugural session, National Proficiency and Efficiency Test (NPET), an online portal developed by ECI and CIDC was launched by Shri Mahendra Raj, Vice Chairman ECI and President Indian Structural Engineer Association and Dr. M.P. Poonia, Vice Chairman, AICTE. Shri CM Singh, Former CMD, NHPC said that this provides an opportunity to engineering students to make self-assessment of their level of learning through a set of structured questions and take improvement measures to improve their weakness. This was followed by the launch of AI Portal and Digital programme on Construction Management developed by CIDC by the hon'ble Guest Dr. M.P. Poonia. Shri Akhilesh Srivastava, CGM, NHAI, explained as to how AI and Digital Construction Management Programme will enhance the capacity of the construction industry.

Dr. M.P. Poonia, Honoured Guest addressed the august gathering. He apprised that in India we have 10,500 technical institutions which provide engineering, architecture, management and education in other technical fields. There are only about 26% of 12 class pass students go for higher education which is not a sustainable situation. Out of 37 lakh capacity only 13 lakh take up technical education and out of this only about 7 lakh get jobs through campus recruitment. He informed that our engineers working in advanced countries are dominating in all the fields, it is surprising why our industries are not accepting our engineers. It appears that we are not able to provide human resources that our industry needs. According to industry; firstly, the fundamentals of our engineers are very weak, secondly, they are not practical and thirdly engineers are looking for good pay package which is creating a bad environment for sustainable education development. He cited example of bad air quality, according to him role of engineers is very important towards design of better vehicles, roads and other relevant products like production of good quality fuel etc.

He emphasized on the role of engineers in rural areas where they can provide innovative ideas to double the income at the village level.

He also gave example of initiatives taken by institutes to improve environment. This has been possible by bringing changes in the curriculum. He further informed that the Engineers Bill is in final stages. He suggested that all the expert engineers should come out with suggestions to improve the quality of engineers.



Dr. P.R. Swarup, DG CIDC, MS ECI, concluding the Inaugural session complimented Dr. Poonia for bringing out all the weaknesses in our technical education system. He also complimented Shri Prabhakar Singh, DG, CPWD for his contribution to CPWD and the nation. He invited suggestions for improving hands on experience of students. He finally thanked dignitaries on the dais, organisers and all the delegates from Govt. Private Sectors, Institutions and the media for making the event meaningful.



Technical Session - 1

This session was devoted to the Role of Engineers in achieving SDGs in Industry and Infrastructure. Chairing the session, Shri Ajay Sigh, Chief Executive, DRDO said that it is the time not to preach but to implement the sustainability aspects. He requested delegates to implement what you learn today in your organization. He said that there is no need to go for very high specifications as it will cause high carbon footprint but with innovations, we can reduce cost and increase not only the life of buildings in the Govt. sector but also make buildings aesthetically simple, acceptable and environment friendly.

This session was co-chaired by Shr. S. Ratnavel, Past President of ACCE(I) and Treasurer ECI.

Mr. Vinod Pandey former Director, Govt. & External Affairs, CSR-BMW Corp India, Vice President (NR) GCN, India presented an overview on sustainable development goals. He said that prior to SDGs, we had MDGs which were only meant for developing countries. There was no shared responsibility for implementation. Present SDGs reflect as to how we can have a world that is liveable. He briefly introduced UNGC, an organization which provides interface between the multilateral agencies and the businesses for fast implementation of SDGs. UNGC launched in Dec 2000 and registered as a society in Nov 2003. It has a pan India membership of 262 leading business and non-business participants and 390 signatories. It has 8 local chapters. This platform aligns stakeholder responsible practices of 10 UN principal and SDGs. UNGC with the help of all the member countries together discussed the agenda on the future we want and decided on 16 goals along with 169 targets. It is so vast and overwhelming in character as it touches all facts of life, economy and environment. It touches social equity and justice, poverty and everything to make the world liveable. In a way it defines business priorities to most towards adopting SDGs. UNGC analysis brings the fact that 50% contribution is going to come from India. He informed that Niti Aayog is the coordinating agency for implementation of SDGs in India. He went through the goals and informed about the India's laudable initiatives affecting millions in the lower strata of population. He emphasized on the holistic approach of the integrated role of Government, business and societies to share responsibility and work on a common actionable path of sustainable development priorities of India's (1) poverty and urbanization,(2) nutrition and food security, (3) education and employability, (4) Health, Water and Sanitation (5) Skilling, Entrepreneurship and Job creation (6) Climate Change, Energy and Disaster Resistance and (7) Gender Equality and Youth Development.

One of the delegates raised questions about the poverty and portable water availability, he said situation has not changed since 1971. Mr. Pandey replied that depending solely on government, is expecting too much.

Mr. Ajit Kumar Mishra, CPM from Dedicated Freight Corridor Corporation Ltd. focussed his presentation on effect of transportation made in achieving SDGs targets with respect to the role of engineers. He emphasized on the need for sustainable transport as it has staggering Social, Environmental and Economic costs. Every year 1.24 million people die in road accidents, 3.5 million die prematurely due to outside pollution



including those from transport sources. Transport alone contributes 23% to pollution. Loss due to road congestion account for 0.7% to 10% of GDP (Beijing, Sao Paulo China). Passengers in 1957 India used 26% road transport and 74% used rail transport this changed drastically now, as only 13% use rail transport and 74% use road transport. For business logistic cost is important, as 46% of the logistic is on transport. In India road transport cost is much higher as compared to China & US, which impacts the logistic cost in India. Rail transportation is more environment friendly and cost effective. Water transport is cheaper but it has limited options. Two- third of India's freight travels long distances that structurally suitable for rail and waterways, but due to various reasons it travels via road transport. He gave definition of sustainable transportation which is considered; safe, affordable, accessible, efficient, and minimises consequences on environment. Sustainable transport which is covered in SDG 7 has 5 targets. Transport is one of the key drivers of economy with growth elasticity of 1.2. 65% of freight travels at an average 700 kms. He suggested a balanced model for transportation in India i.e. 25% by road and 70% by rail.

He suggested action plan to lesser adverse impact which include: Avoid-Shift improve approach, policies to boost Rail Transport through funding agencies/Government Agencies, Big Things are on Highways (6% at present), structural reforms in Railways and capacity augmentation of Railways by dedicated Freight Corridors.

Chairman IIPE, raised issues of lack of hand to hand connectivity. It is quite difficult to approach railway officials; railways do not have private operators to boost efficiency. It was clarified that a Multi-Model Transport system is developed for long distance travel. Containers are transported to nearest dry port which are picked up by the concerned parties. For about door service, we have roll on rail off facility whereby truck is loaded on rail carriage and on arrival driver takes the truck to desired destination.

Another issue was raised by the delegate from Gas corporation of India, on the policy for use of gas for railways traction. It was clarified that rail transport in India is costlier than other countries like China or US due to factors of inefficiency, shift from diesel traction to electric, cost of capital and off course certain policies.

Shri Rajkumar Kacharla, Chief Coordinator, ECI Hyderabad in his presentation said that main objective of SDGs is "leave no one behind" in India it is 'Sabka Sath Sabka Vikas', which are supported by flagship programs; Swatch Bharat, Make in India, Skill India, Digital India, Smart Cities, Namami Gange, Linking of Rivers, Pradhan Mantri Gram Saksham Yojna, Jal Shakti, Ujjwala Yojana, Discom Assurance Yojna, Gramin Bhandaran Yojana, Din Dayal Upadhyay Antodaya Yojana, Saksham, Sabal, Amrut, Standard India and Pradhan Mantri Awas Yojana.

These are monitored and evaluated through 60 indicators developed by Niti Aayog. He pointed out integration efforts are required to take 3 bottom lines of people, planet and business profitability. He said that civil engineers can play a greater role in employment generation by use of cost-effective technology to fight poverty and hunger. He touched on other goals, and appealed to the entire fraternity of engineers to work in unison to achieve SDGs. He sighted the water sector where total re-engineering is required. To address SDGs, education should focus on practical knowledge. Sustainable efforts are



required to make portable water available. It was suggested to conserve water in possible ways as it will take time to get to a level when we can be self-sufficient.

Shri Ratnavel concluded the session with his observation. He suggested to read the book on Economy of permanence. He also suggested to refer a model on the time line of development.

Technical Session - 2

The session was chaired by Prof. Dr. J.W. Bakal, president, IETE. He invited Prof. J.L. Narayan to introduce the speakers.

Dr. Niranjan Swarup, in his presentation said construction in the sub-surface zone is quite vital and needs to be cost effectively managed so that the goals of the society are met efficiently to meet SDGs. He invited engineers to join to promote trenchless technology which is environment friendly. Infrastructure development to facilitate achieving SDG is a daunting task.

The achievement of SDGs is obstructed by insufficient life supporting infrastructure, it requires, unprecedented mobilization of resources, technology and engineering in partnership at all levels of knowledge. He invited to join ECI mission to work unitedly on these fronts. He then introduced role of trenchless technology as to how it facilitates rehabilitations with replacement remotely. Trenchless technology has a huge potential to offer sustainable infrastructure below the ground for the current and future needs. It can play a great role in developing smart cities. It is relevant, as surface congestion is growing, maintenance cost is pretty high in terms of impact on environment and loss of time in movement of traffic which is unsustainable. Therefore, the key factor to achieve SDGs is to go for sub- surface construction using Trenchless Technologies, processes and procedures. India is already investing about Rs. 7500 crores every year using latest trenchless technology. He pointed out the scope of R & D and Patenting technology and processes. He also highlighted the challenges and usage to overcome them, particularly in managing lightening weather conditions.

Questions was raised about problems experience in metro projects, was aptly clarified with suggestions for detailed survey and investigations.

Professor J L Narayan in his presentation said that the concept of sustainable development is continuously changing from nature's closed cycle to closed human ecosystem to national and international development. He informed that India's achievement of SDGs over the last five years is quite laudable as the government has been ensuring that the people at the "bottom of the pyramid" get the benefits that are due to them through the trinity of initiatives. According to 2019 global Multi - Dimensional Poverty Index (MPI), UNDP, India lifted 271 million people out of poverty between 2006 -2016. He covered all the SDGs and informed how India has progressed. India's clean energy access has given boost to manufacturing and capacity building to help the developing world to harness solar energy. India's action plan to fight climate change is quite positive. India's International Cooperation and sustainable development is well recognised, as UN says world cannot achieve SDGs without India.

Mr. Akhilesh Srivastava made his presentation on Application of AI in construction management. We have adopted new technology in many sectors like banking, transportation and manufacturing making life easy. But least in construction, as it continues with same old practices leading to time and cost overruns. He gave an example of multi-storey building in Japan built in 18 Days. The volume of work in infrastructure



is much bigger than any industry. Therefore, it is important to consider it in proper perspective. This is not only the reason for delays off course, there are many challenges which contribute to delays. A study of BCG and WEF shows that by this use of AI, Block Chain and other such latest technologies, we can achieve optimization of resources quickly and thus reduce the cost & time overruns by 25-50 %. He informed that in Highway sector by adopting these technologies 16% saving was achieved. The impact of AI in city planning is tremendous, as one can find all the layers of infrastructure / service mapped on GIS. Any addition can easily be analysed in terms of impact on other facilities. Singapore city is a good example a virtual city data / information is available on AI platform with quantum computer which simulates to give the desired result.



Technical Session - 3

This session was also devoted to the role of technology in achieving SDGs. Shri N.K. Sinha former DG, Roads, Ministry of Surface Transport, Chaired this session. This session was co-chaired by Shri. Ranganathan Chandrashekhar, National President IPE and Prof. (Er.) O.P. Gupta, VSM, Acting Registrar CIAC.

Mr. Naresh Kumar, Advocate Arbitrator made a presentation on IPR for sustainable development. He said that in early days science and technology were used for human development but no rights were associated with IPR. After the formation of W.T.O. in which majority of the Americans were associated which embarked on the developing world to come up to the standards. First time IPR was introduced which covered Sociology, Economics, Science & Technology which are to be regulated by IPR; included Patents, Industrial Design, Integrated Circuits, Layouts, Undisclosed Secrets, Geographical Indicators, Anti-competitive Practices etc. He advocated to innovate technologies under IPR which are relevant in Indian conditions to achieve the SDGs be a developed for making India a US\$5 trillion economy. Since India is a resource rich country with vast technically qualified human resources, it must make inventions.

Ms. Minal Virendra Dehadrai, Director, Aquades Structural Consultants Pvt Ltd presented case a study of a live water project. She said that 97.5% of water is sea water, saline water, out of balance 2.5% only 1% water is surface water and rest 1.5% is glacier and groundwater. It is therefore very important to preserve the surface water with many conservation methods like check dam, rooftop water harvesting, trenching in slopes and many more. She chose a village with 500 people, Sonabury in Nagpur District (35 kms from Nagpur) in Maharashtra where farmers were leaving the area for want of water. On the natural slope in the catchment area a check dam, first of 800 cms was built in 2013. After the rains, the bore wells on both sides were charged and ground water level also raised to about 2 meters. This was all done with cooperation of villagers. Farmers now can grow vegetables and some crops with marketing facility of their produce which are sold in Nagpur. Sometime later more check dams (4 nos.) were made, this increased the catchment between the two check dams. Total catchment areas created was 15500 Sq. Mtrs, or 23250 cu m, and 35-40 acres was cultivated through this project. With these series of dam water level rose by 10 to 12 ft. Nearby villages and all the wells were comfortably charged. This is a success story as, in spite of bad rains in 2015, farmers could grow crops.

Shri Saripalli Suryanarayana, SrPE, ECI, informed that with genetically modified seeds and methods of irrigation we can save water for human consumption. He brought out certain facts down from media reports. He referred to some of the books available on UN website. He mentioned about consumption patterns that indicates that we are developed when we have certain level of cement, steel per capita consumption. India should concentrate on small innovations which can be used immediately. He gave example of small reactors with RTG developed by Canada which can generate captive power (can be kept in garage) with small quantity of uranium for 30-40 years in a small town. India and China are working together to harness business solutions in alignment with



sustainable infrastructure development, such as renewable energy technology among others.

He further discussed the role of engineers and said that “GD Prod Consum Model” is more relevant today, as engineers contribute to all the steps in this system model. While explaining the engineer’s role in managing natural resources, he said that engineers have to work together with all expert and community groups.

He further informed about battery and CD disposal & recycling technology, which is quite a difficult problem to handle. He gave example of group, which is working on it. He also gave example of handling city congestions without making change. He discussed how civilization and education system grew and changed. Lot of innovations were made in drainage systems in 18th 19th and 20th centuries which eliminated lot of diseases. He stressed on multi engineering skills that are needed for sustainable development.

Mr. Ranganathan Chandrashekhar, said that problems are opportunities to think and develop solutions. Optional utilization of resources is the best tool, Resources saved can be utilized elsewhere.

Prof. O.P. Gupta in his presentation made a reference to definition of sustainable development given by World Commission on Environment and Development which linked it to the natural eco system close loop cycle. He also referred to the code of ethics of the American Society of Engineers as quite relevant. Engineers while designing and implementing projects and engineering, sustainable ideas must also consider all state holders including the real beneficiaries. He read out all the parameters for consideration of engineers including engineering process and social engineering environmental aspects. He emphasized on the decision-making role of engineers as one of key factor in creating sustainable infrastructure.

A question was raised on the steel production which is highly energy consuming and at the same time it produces 3 ton of Co₂ for one ton of Steel. How this process is sustainable? Mr. Sarippalli explained the whole process but he was not sure of the level given by the delegate. Second question raised by Mr. Ratnavel about the differences between copyright and patent right. Mr. Naresh Kumar explained that all creative work like article, lecture is the copy right of the credits whereas patent is the right for innovation / invention for 20 years which one sell it or lease it for 20 years. The session was closed with thanks to the Chair / Co- Chair.