



# WORLD SUSTAINABLE DEVELOPMENT SUMMIT 2018

Kolkata Regional Dialogue | February 28, 2017

## Summary Proceedings 'Urban Landscapes Transformative Approaches'

### Venue

Salon 175, The Bengal Club, 1/1 Russell Street,  
Kolkata 700071

## FOREWORD

The Kolkata Regional Dialogue, themed, 'Urban Landscapes: Transformative Approaches' was a first co-presentation of The Bengal Chamber of Commerce and Industry (BCC&I) and The Energy and Resources institute (TERI).

The Kolkata Regional Dialogue was the first in a series of dialogues to be hosted under the banner of World Sustainable Development Summit (WSDS) 2018. Similar dialogues are slated later in the calendar year in the Indian urban conglomerates of Mumbai and Bengaluru. This series aims to bring together experts working on myriad issues at the urban level, to discuss various facets and challenges we face and find solutions to them.

The day-long event featured 22 speakers and discussed important themes of Sustainable Waste Management – Transformative Approaches; Energy Basket of India- Innovations for Clean and Sustainable Practices; Urban Water Management and Transforming Habitats. The next few pages summarise the day's deliberations.

## ABOUT WSDS

The World Sustainable Development Summit (WSDS), TERI's flagship event, has been conceptualized as a single platform to accelerate action towards sustainable development and especially climate change. The WSDS series seeks to bring together the finest minds and leading thinkers of the world to focus attention on the challenge of sustainable development and has emerged as a landmark event addressing issues pertinent to the future of humanity.

WSDS builds on the 15 years legacy of the Delhi Sustainable Development Summit (DSDS) which was the leading forum for discussing sustainable development issues. The DSDS held under the aegis of the Ministry of Environment, Forest and Climate Change with support from the Ministry of External Affairs, Government of India was an epitome of Track 2 diplomacy .

With an aim of expanding the scope and reach of the Summit to the global community, DSDS has now transitioned to WSDS.

## Registration

### Inaugural Session

#### Welcome Address

- Mr. Sutanu Ghosh, President, The Bengal Chamber of Commerce and Industry

#### Opening Remarks

- Dr. Ajay Mathur, Director General, The Energy and Resources Institute

#### Special Address

- Mr. Nazeeb Arif, Executive Vice President Corporate Communications, ITC Limited

#### Special Address

- Shri Arnab Roy, IAS, Principal Secretary, Department of Environment, Government of West Bengal

#### Inaugural Address

- Shri Basudeb Banerjee, IAS, Chief Secretary to Government of West Bengal

#### Release of Chamber Publication

#### Closure of Inaugural Session

### Session 1: Sustainable Waste Management – Transformative Approaches

#### Moderator:

- Mr. Alope Mookherjea, Past President, The Bengal Chamber of Commerce and Industry

#### Speakers:

- Dr Suneel Pandey, Director-GGRE, TERI
- Mr. Sourav Daspatnaik, CEO, Swach Environment Pvt. Ltd.

### Special Session : Energy Basket of India- Innovations for Clean and Sustainable Practices

#### Moderator:

- Mr. Deb A. Mukherjee, Chairperson, Energy & Environment Committee; Chairperson, North East and Emerging Areas , The Bengal Chamber of Commerce and Industry

#### Speakers:

- Mr Rounak Bandhopadhyay, Regional Manager, West Bengal & North Eastern States, EESL
- Mr. Boben Anto, Chief Operating Officer, India Uniper Power Service Ltd.

### Film on UK-KMC Programme on Low Carbon and Climate Resilient Kolkata

### Session 2: Urban Water Management

#### Moderator:

- Mr. Arun Kumar Mukherjee, Chairperson Emeritus, Energy and Environment Committee, The Bengal Chamber of Commerce and Industry

#### Speakers:

- Mr Anshuman, Associate Director-WR & Forestry, TERI - Mr . B K Maity, Director General (Water Supply), Kolkata Municipal Corporation
- Prof. Somnath Sen from IIT Kharagpur, West Bengal
- Mr Nirmal Mallick, CEO, Naba Diganta Water Management Ltd. Kolkata





**Session 3: Transforming Habitats****Moderator:**

- Ms. Shakuntala Ghosh , Partner, Ghosh, Bose & Associates Architects

**Speakers:**

- Mr. Sanjay Seth, CEO, GRIHA Council, TERI
- Mr. Harsh Vardhan Patodia, Vice President, Credai National and Chairman & MD Unimark Group
- Mr. Debashish Das, BIM Manager, AECOM

**Valedictory Session****Special Remarks:**

- Mr. Sutanu Ghosh, President, The Bengal Chamber of Commerce and Industry

**Valedictory Address:**

- Dr. Sanjeev Chopra, IAS, Additional Chief Secretary to Government of West Bengal

**Closing Remarks:**

- Dr Annapurna Vancheswaran, Senior Director-SDO &YE, TERI

**INAUGURAL SESSION**

**M**r Sutanu Ghosh, President, The Bengal Chamber of Commerce and Industry, initiated the session by introducing the theme of urban landscapes—transformative approaches. As a complete definition of ‘sustainability’, he quoted a Korean proverb, “Take care of this Earth—which is not given to you by your parents but lent to you by your children”.

He went on to describe India’s constant growth for next 10–15 years with a hope to increase its economy by five times by the year 2030 and up to 10 per cent of annual growth to \$10 trillion. One needs to remember that India had embarked on the road to industrialization post-independence, that is, by the early 1950s. In this context, he mentioned three Acts—the Industries Act (passed in 1948); the Water Act (passed in 1948); and the Air Act (passed in 1981). He



From left: Mr. Sutanu Ghosh, Shri Basudeb Banerjee, and Dr. Ajay Mathur



also mentioned about the first notification on environmental appraisal in 1990 and 1994, followed by the one on September 14, 2006.

Advanced technology is one of the key elements in environmental preservation. And for this simple reason it includes control of pollution at source such as adoption of ultra-super critical technology for power plants. Gravitating IGCC in the next 20–30 years would be a step in the right direction. Sustainability engulfs resource and recycling and today, for the energy sector, the desired land consumption is less than 0.78 MW and the current norm for water is that it is less than 30 c cusecs for 1000 MW for essential commodities which are very scarce.

Micro-climatic issues to address heat and energy issues through reduction of impervious materials and enhancement of poor subsidized products are of paramount importance. Today, whenever buildings or structures are constructed, the total paved area has to be necessarily below 25%.



Opening remarks by Dr. Ajay Mathur, Director General, TERI

Next, **Dr Ajay Mathur**, Director General, TERI, in his opening remarks, expressed his thoughts on the formal partnership between TERI and the Bengal Chamber of Commerce and Industry and how the WSDS journey essentially ensures that we live in a world that continues to provide for us in the future. According to him, the discussion around issues of waste management, energy, water, or sustainable habitats is essentially centred on innovations; further, the new innovative practices taking place in Kolkata in West Bengal or in the North-East to address these issues were highlighted.

While the challenges across the world are similar in nature, the solutions need to be localized to ensure a degree of learning. He explained how the crux of WSDS 2018 lies in helping and providing information to pollinate ideas on sustainability across the world along with the creation of new partnerships via cross-pollination. He reiterated how human beings today



From left: Mr. Arnab Roy, Mr. Sutanu Ghosh, Shri Basudeb Banerjee, Dr. Ajay Mathur, and Mr. Nazeeb Arif

live in interesting times wherein the term ‘interesting’ highlight the fact that these are times of transition all over the world. However, the reasons for the transition differ and therefore, it becomes important to understand how people/communities/states/ countries are handling these transitions.

To illustrate this better, he cited the energy requirements of India and mentioned how current electricity generation is sufficient to tackle all the demands of national electricity of the country. Also, it will probably be twice of what it is today by 2026, however, there is also a chance of transition by 2026 in terms of use of adding new power capacity such as renewable plus battery renewable plus storage or gas. So if renewable energy and storage together are able to provide electricity together at less than five rupees a unit, that is what the price of kilowatt hour of electricity from coal will be in that particular year. The moot question therefore will be whether new capacity added beyond 2026 could be coal or renewable plus storage. These arguments in a sense present business opportunity as well as a transitional management issue. He hoped that the ensuing discussions shall help in understanding the transitions better.

**Mr Nazeeb Arif**, Executive Vice President, Corporate Communications, ITC Ltd, in his special address reiterated the transformative approach as a solution to overcoming challenges. In this regard, there is immense pressure today on waste, water, and sustainable livelihood in the urban landscapes. He emphasized how India, in the next five years will surpass China in terms of population combined with the fact that 70 per cent of the people will reside in cities and will account for 80 per cent of the energy demand.

Moving forward, cities are going to be of critical importance. As per estimates, from now on till 2050, the country’s population will increase to 1.7 billion such that 400 million new people will be added to the cities. This figure is similar to the population of the country at the time of independence. In this light, cities will be modernized and landscapes revamped; while the symptomatic challenges affecting transport, energy, and waste water will be addressed, the root cause lies elsewhere.





Mr Arif described how ITC has been carbon positive since the past 11 years; water positive for 14 years insofar as fresh water is generated and re-consumed at the plants; and recycling waste. Interestingly, this business model has also generated 6 lakh livelihoods.

He went on to discuss three significant issues in the context of the theme under discussion. The first of these was the growing inequities amongst the population. Since the last 50 years, world GDP has grown about 60 times to some \$74 trillion. Till last year, 52 people in the world accounted for \$3.6 billion; this year onwards, this figure was changed such that now 8 people in the world account for \$3.6 billion. Such an inequity cannot be easily ignored because many people are completely on the other side of prevailing economic development. Interestingly, the magnitude of this problem is worse in India because one-third of the world's poor resides in the country. Every year 12 million people join the workforce while only two million people get jobs. In this scenario, how are the livelihood concerns for the remaining 10 million managed? It is imperative that India addresses the problem of creating adequate employment opportunities in order to ensure smooth functioning of the economy. Interestingly, this scenario is not exclusive to India but is taking place across the world. In order to control India's growing GHG emissions, greater degree of tree plantation and controlled consumption of resources is the need of the hour. At the same time, conservation of current water resources is required since the water table, especially in urban areas is receding with each passing day and so is the quantity of water for drinking purposes. Mr Arif stressed on the need to 'create' water on a large scale with the help of community participation. In this context, he cited the example of Bhopal Lake which has been shrinking and polluted due to human activities in recent times. Differentiating between livelihoods are at one end and other thing is partnerships with the government at the other end. These are not stopped by the ITC alone but it has been decided to have PPP model which has been under operation in three or four states which is more beneficial to be able to build ideal rural and urban land structures. The last point which I need to spell out here more focus on sustainable cities. That is the important topic we have to discuss today. When we talk about low carbon low wastage we really get on war footing today.



Mr. Sutanu Ghosh, during the welcome address

For instance how we move about 47% and so the point is just not the generation of energy to make sure it is adequate. Even if we see hotels, the chulahs run in 600 rooms; super premium luxury' there should be more focus on 100% wind energy. We don't tell put your thermos down. We believe in responsible luxury. I am selling luxury. We are not selling eco hotels. So when you do that you need to provide luxury and in no way I will do it so responsibly. So here it is 100% renewable energy. We do similar for other hotels like we do here. About 21-22 ITC buildings are involved in this process. ITC Sonar in Kolkata was the first hotel in the world to earn carbon credits. That is the kind of philosophy we put in behind our reputation. So things can be done in urban landscape and this knowledge is going to create all the green buildings in similar manner. Some of you might have seen our residential quarters in ITC. And when we went for certification they asked why you want to make green building in residential flats.

The other thing is of course- waste management that we are generating. We generate waste and its recycling and development and that is not happening. So we have done couple of programs we are recycling the waste at the rate of 99.9%. but in cities we are today working in 500 municipal houses. We are working in lots of areas – South India – Delhi- Muzafarpur and so 13 lakh households would be able to do the recycling activities in terms of solid waste management. This year this figure become 34 lakh households. The point I want to make here is when talk about issues of sustainable development solutions can be found on scale. Solutions are in this room. And solutions are based with the partnership with government. Corporate- industry and civil society with the government. Instead of pointing on figures, whether the government is doing something industry is doing something, NGOs are doing something- when you join hands with that power solutions will emanate from people. That is what I want to say and leave these words with you. Thank you very much. (42.48).

**Mr Arnab Roy**, Principal Secretary, Government of West Bengal, in his special address, informed how all the departments of the Government of West Bengal are in the process of aligning their respective visions and objectives with SDGs 2030, comprising of 17 goals and 159 sub-goals. At the same time, the departments are finding measurable indicators which will enable in fulfillment of these goals. In order to ensure management of waste, energy, water, and habitats, it is imperative that major stakeholders/players are pushed towards achieving objectives. Significantly, it is a question of implementation and how to build motivation at the levels of the individual, city, and policy so that all the players are incentivized and motivated towards the goal.

**Mr Basudeb Banerjee**, Chief Secretary to the Government of West Bengal, in his inaugural address, spoke about the significance of timeframe in the context of climate change and sustainability. He mentioned how urban policies of the state government are stressing more on creating 'green cities' and investing in decisions for the same in place of creating 'smart cities'. He described how Siliguri, Dabrum (renamed Tiesta), Bhulpur (located in Virbhum district), Asansol, Kalyani (in Howrah), and Baripur are being mooted as 'green' townships. Mr Banerjee also highlighted the problem of urban migration (implying people who temporarily reside in urban areas) as highlighted in the Economic Survey Report. Besides unplanned structures and narrow roads and trees, there is also the problem of management of waste—solid and liquid.





## SUSTAINABLE WASTE MANAGEMENT— TRANSFORMATIVE APPROACHES

As part of the proceedings of the Kolkata Regional Dialogue, the inaugural session was followed by **Session I on Sustainable Waste Management—Transformative Approaches**. The session was chaired by Mr Aloke Mookherjea, Past President of The Bengal Chamber of Commerce and Industry and comprised of Dr Suneel Pandey, Director, Green Growth and Resource Efficiency, TERI, and Mr Sourav Daspatnaik, CEO, Swachh Environment Pvt Ltd, as speakers.

Mr Aloke Mookherjea initiated the session by speaking about decoupling the use of resources versus production such that technology is used to produce more with less investment. Quoting Albert Einstein about not being able to solve problems from the same level wherein the problem has been created, he spoke about how waste is an inevitable part of our lives and we need to learn ways to effectively manage it.

Next, Mr Sourav Daspatnaik, CEO, Swach Environment Pvt Ltd, in his presentation depicted the industry perspective of solid waste and water. Speaking about the SREY Group of Companies (established in 1989) and their presence in equipment finance, large infrastructure, and project financing, he described how the Group has been working with large financial institutions across the world. The respective business verticals are roads (the Group is the largest construction engineers of highways in India); environment infrastructure; hazardous waste municipal solid waste management; and integrated water and environmental infrastructure management.

He went on to elaborate how water scarcity is going to be a fundamental problem for mankind in years to come. There has been a 70 per cent drop in water availability in the last 60 years. Going forward, this deficit will certainly rise as the Indian metro cities are already witnessing water deficit. Some of these metros are billing the usage of water via installation of meters and people pay for water use either through water tankers or public water facility system. Interestingly, the pricing of water has been phenomenally high per KL basis. For instance, in Chennai, people are paying about Rs.44 per KL. Further, in the last 50 years or so, pollution has emerged in varied forms and water resources have been exploited. So, the psychology of reuse needs to be revisited. Mr Daspatnaik



Dr Suneel Pandey, during the Session: Sustainable Waste Management – Transformative Approaches



From left: Dr. Suneel Pandey with Mr. Aloke Mookherjea



Shri Basudeb Banerjee, during the inaugural address

He also described how West Bengal today has managed to stabilize the growth of its population; both birth and death rates have seen balanced growth. He went on to speak about concentration of the population and how the state is the most densely populated after Bihar in the country. In this light, he stated that policy making needs to take into account population pressure and challenges of urban migration and sustainability. Concluding, he expressed hope that the Regional Dialogue through the intellectual brainstorming will lead to sustainable solutions.

Thereafter, Mr Sutanu Ghosh released and introduced the Bengal Chamber of Commerce and Industry's publication titled Environmental Appraisals and Planning—Treaties, visualized as a handbook for those engaged in various industrial projects within the states and throughout the country.



Release of Bengal Chamber Publication



elaborated the modus operandi of his organization towards addressing infrastructural development in the form of reuse of water and shared some of the experiences. Currently, in terms of solid waste management, the available infrastructure is totally insufficient. As of today, solid waste is being dumped in the available landfills, resulting in extremely pathetic conditions; this requires major improvements. In this regard, he mentioned about the active adoption of the public-private participation approach to create new infrastructure facilities while at the same time rehabilitating older ones.

He elaborated how the Swachh Bharat Mission along with the government's other schemes and those of his own organization partially address the viability gaps both at the state and the centre levels. Private players are also have to step in and the elements of financing and opportunities need to take over. So these projects include both public and private financing besides efficiency-improving O&M practices and this is more important to deliver valuable results. Next, he described a case study where his organization, in conjunction with the Delhi Jal Board (DJB), was involved in India's largest PPP module for water in Delhi; herein SREY was the implementing and investing partner. The type of projects; challenges in terms of treatment and supply of water; proper sewage collection and disposal methods; augmentation and rehabilitation of existing infrastructure for improvement of efficiencies; and restructuring and strengthening of existing water infrastructure are the significant issues to be tackled.

He also mentioned about two other case studies; one with the world's biggest and largest water management company— RIVOLIA; and second with Nangli water supply project in Delhi. The latter is one of the largest public private partnerships in the domain of water in the country.

Next, **Mr Suneel Pandey**, Director, Waste Management Division, The Energy and Resources Institute (TERI), referred to the migratory 'floating' population which arrives in the city of Kolkata every day and the same in correlation with the per capita generation of waste. He went on to elaborate on the issue of resource efficiency and material use. In terms of resource efficiency of production of different materials, India continues to lag behind in terms of many developmental activities, thus implying the scope for achieving higher resource use efficiency. He cited the Global Waste Management Outlook Report, described as a waste and resource management report, released by UNEP (2016), discusses waste management in the global perspective. The resource part of waste can no longer be ignored and in order to sustain waste management in the long run, one needs to look at what resource, to what extent, can be exploited or recovered. Maximization of resource recovery and reduction of waste currently being disposed is also under purview.

He went on to speak about 'smart cities' and their issues. Identified as engines of economic growth, cities, in the process of providing livelihood and being hubs of manufacturing, consume resources for migrating population. In terms of consuming the resources, they also generate huge amount of waste. Therefore, the challenge for a city is managing waste management in a very limited area. In this context, one possible solution is a self-contained waste management system which means no waste from city administrative boundary can go outside the administrative boundary; in this regard, Bengaluru is a good example. Essentially,



From left: Dr Suneel Pandey, Mr. Alope Mookherjea, and Mr. Sourav Daspatnaik

cities need to devise strategies for successful implementation of the waste management system along with maximization of recycling. Cities also need to develop waste management facilities at the regional level in partnership with local organizations.

A significant waste management challenge in the city landscape is the addition of newer and increasingly toxic materials such as electronic items, automobiles, and the like. Even if composting of different types of waste takes place, one isn't sure if the ingredients of compost contain toxic or pesticide residues. Dr Pandey quoted examples of companies which are working on modulus cell phone design such that if one needs to enhance or remove or replace memory system, the entire phone need not be discarded. He also spoke about the lack of synergy in managing and treating two kinds of wastes. For instance, if sewage and solid waste are digested together, they create huge synergy. He further elaborated on the advanced technology options being utilized by scientists in France for waste management and recycling. He also spoke about construction and demolition activities adding to collection of waste and how usage of natural materials in construction activities shall aid in tackling waste.

#### SUSTAINABLE WASTE MANAGEMENT—TRANSFORMATIVE APPROACHES

**Mr Alope Mookherjea**, Past President, The Bengal Chamber of Commerce and Industry, The ITC has been focusing on. And I think we can end this session with a word from a shoe maker- who had last word on this. He said in this 21st century people have to come out with the new life style.

Our life style must be changed and consumerism cannot go on. If I have twenty shirts and if I have on in the mall I will buy it because I like it. That must go and new life time- new methods of production- steel, power, and cement cannot be made exactly the same like we are making today. It's not possible.

In fact those days gone with radical changes for the last 30-40 years. How he makes the steel today is not the way others imitated 30-40 years ago. Or Paper or Pulp and Paper, or anything else. So new life style new methods of production, and new patterns of consumption, with life styles for performance. That must be in front of us as the philosophy. And only then we can solve this problem of 'sustainability'.



## ENERGY BASKET OF INDIA: INNOVATIONS FOR CLEAN & SUSTAINABLE PRACTICES

### MODERATOR

MR. DEB A. MUKHERJEE- BENGAL CHAMBERS

### INTRODUCTION OF SPEAKERS

MR. ROUNAK BANDHOPADHYAY-EESL

MR. BOBEN ANTO- COO- IUPSL



From left: Mr Rounak Bandhopadhyay, Mr. Deb A. Mukherjee, and Mr. Boben Anto

**M**r Boben Anto CEO and COO of India Uniper – a joint venture of India Power and Uniper.

Mr. Rounak Bandhopadhyay –is responsible for EESL operations in north-eastern part of the country. He also leads the South East Asia operations of Energy Efficiency Services Ltd (EESL). EESL is joint venture of PSUs under Ministry of Power Government of India.

**Mr Deb A Mukherjee**, Chairperson, Energy and Environment Committee; Chairperson, North East and Emerging Areas, The Bengal Chamber of Commerce and Industry, initiated the session by introducing the theme of innovation for clean energy and sustainable practices. He reiterated the importance of acquiring knowledge on practices and solutions delivering on the ground. Describing the significant work of Energy Efficiency Services Ltd in the field of energy efficiency, especially taking up Demand Side Management (DSM) programmes at the national and state levels, Mr Mukherjee stressed on how the organization has helped market mechanisms create the right business models.

**Mr Rounak Bandyopadhyay**, Regional Manager, Energy Efficiency Services Ltd (EESL) began by introducing EESL as a joint venture of NTPC, Power Finance Corporation, Rural Electrification Corporation, and POWERGRID. Set up under Ministry of Power, Government of India, the organization is under the administrative control of Ministry of

Power Government of India and the authorized share capital stands at Rs.500 crore. As a super energy service company (ESCO), EESL is the largest energy service company in the world. He went on describe the national flagship programmes initiated by the organization; Unnat Jyoti which aims to ensure affordable electricity for all is one such programme wherein LED bulbs are being distributed at very affordable rates.

Presently, more than 50 lakh LED bulbs, the future of lighting, have been distributed in northern and western parts of West Bengal. In West Bengal only we have distributed more than 22 lakhs of LED bulbs. The main barrier to adopt LED lighting is cost and this is where EESL plays a significant role in bringing down the price of LED from Rs.500 to Rs.70. Today, it is possible to get LED bulbs in the local retail market between Rs100–Rs150 whereas the same bulbs are available at the counters of ESL at Rs.70 only throughout the nation.

Mr Bandyopadhyay further enumerated how a 100W incandescent bulb provides a certain degree of illumination; the same illumination is delivered by a 9W LED bulb. Therefore, there is 91W power saving per bulb. The target has been set at a total of 77 crore bulbs to be distributed throughout India by 2019 of which EESL till date has managed to achieve 21.35 crore. Following the success of LED bulbs, the organization has come up with two more appliance—a 20W LED tube light and a 50W energy-efficient fan. In fact, for LED tube lights, EESL's success comes second in terms of numbers.

He also described EESL's street light national programme wherein the Government of India had focused on replacing 3.5 crore conventional street lights by LED street lighting; till date, 70 lakhs such bulbs have been replaced. In the case of National Street Lights Programme, energy to the tune of 9000 million units and a sum of Rs 5500 crore from the government budget can be saved annually. The major barriers to these programmes are the high price of LED, insufficient availability, and lack of sufficient awareness. There are two service models—one is the upfront model and the other is the EMI model. As of now, incandescent bulb marketing is Rs.10. EESL came up with an innovative model where Rs.10 was to be paid upfront to use the LED bulb and the remaining amount was to be recovered from the electricity bill in 6–7 months.

He elaborated how the entire investment for the street light model will be borne by EESL and the same will be recovered in a time period of 5–7 years through result-oriented cost saving. Describing the win-win situation for the state and central government, Mr Bandyopadhyay mentioned that there is no upfront capital investment and no maintenance cost by the state government for seven years along with be significant energy savings. In addition, the consumer pays only if the energy savings are at least 50%. Further, he presented a review of the programme in terms of states where the Urja scheme is operational via a live dashboard (<[www.ujala.gov.in](http://www.ujala.gov.in)>), conceived as a real-time monitoring system, which is accessible from the mobile/computer and is updated automatically. No bulb/tube light/fan is distributed without entering the dashboard. So, till date, 21.39 crore such units have been distributed; out of this, 22 lakh bulbs and 2 lakh tube lights have been distributed in West Bengal alone while a total of 10 lakh have been distributed throughout the country. In the context of cost reduction, he spoke about saving energy from the refined coil and using permanent magnetic technology.



The latter technology is already available but is expensive in the retail market; it is here that ESL comes into the picture delivers consignments with reduced costs to the consumers. Fans are available at the counters of EESL at Rs.1150 whereas the market cost is almost Rs.2000 to Rs.2200.

He also mentioned about the EESL Street Lights National Programme wherein more than 717 lakh street lights installed in the country have managed to save a substantive amount of electricity along with reduction in carbon dioxide emissions. He also referred to the first aesthetically conceived Street Lights Project located in Vizag wherein EESL has installed 91,177 LED street lights. He also spoke about EESL's quality control mechanisms and sample testing methods. Every product of EESL has a three-year replacement warranty. If there is any discrepancy other than mechanical damage it will be replaced. In the case of street lights, there is a seven year O&M replacement warranty.

EESL's demand-side management procedures, particularly in the context of adequate and regular water supply, under the agricultural segment were also discussed. EESL has been instrumental in creating energy-efficient structures at the Bengal Chamber of Commerce and Industry, Coal India Ltd headquarters (New Delhi), NITI Aayog, India Habitat Centre, and Shram Shakti Bhawan along with signing a MoU with the Central Public Works Department for converting 14,000 buildings all over the country into energy-efficient ones. He also described how EESL is in the process of expanding and diversifying its operations in order to undertake national and global projects on a large scale.

**Mr Boben Anto**, Chief Operating Officer, India Uniper Power Service Ltd, initiated by posing the question of managing the current load and sustainable energy demand. Referring to the Energy Report, he mentioned how any sustainable and durable power is environment friendly and economical power is only sustainable power. So, if these are not accessible and sustainable, these modes may not last over a long period of time. In this scenario, UNIPER and India Power have joined hands in a 50:50 joint venture wherein the pursuit of technology is working in sync with the agenda of flexibility as well as renewable energy. UNIPER is a 100-year-old company having a power generation capacity of 40 MW and a presence in more than 62 countries in the world. The 70,000 MW power generation in the country is insufficient in meeting environmental norms. We also have 135 GW of power of which the share of renewable is only Rs.27 per unit. The idea is to incorporate a holistic and sustainable approaches, keeping in mind the right methodologies and policy methods. This is to ensure that all our needs attain economically sustainable power.

Harking back to the low demand for renewable energy in 2015, he reiterated that there has been a rise since then. This ratio is 2.8% per year considering that the growth of power has not simultaneously improved in rural areas.

Speaking about the acceptability ratio of sustainable power, he referred to the report of the 16-point programme on sustainable power. There are numerous power plants in India and on the surface, it may seem that there is no power problem. However, there is still no electricity and upon a visit to the grid, one sees an extremely low percentage of output scale or capacity factor. Is this attributed to lack of affordability or sustainability?

The economic survey report of any project describes that the scale of normal power projects is 80%; in India, the average scale of any power project stands at 60%. If one insists on percentage of costing on coal as well as costing on power, how does one sustain? Can we go for no power deal? Can we go for another grid failure? Can we sustain the current systems with electrification? Can we still say that the metro is jammed and there is no viable power sector in this? It is important to think on the available capacity and other parameters, such as reliability, flexibility, efficiency, and cost.

If these issues are not addressed in time, it will be tough to achieve environmental sustainability. Any business initiative cannot survive without profit; however, the profit should be preceded by ethics and asset management. Finally, Mr Bandyopadhyay, reiterated the importance of strategy for the Indian power sector along with imbibing the integrity of management. The asset integrity of each such system is possible while data menu as well as statistical processes by NASA Technology have been adopted by UNIPER to figure the win-win technology to find out security and safety of the assets.

In the pursuit of efficiency, the twin goals of economy and sustainability are tough to achieve simultaneously. In view of this, high energy as well as the procedure for storage will become the base on which the power scenario thrives. The scenario of technology and its sustainability will come in the process plan of deployment of technology. Interestingly, climate change mitigation, human resource planning, and people engagement go together.

This was followed by a short introductory address by Ms Sheobanti Poddar, British High Commission, and the film screening on the UK-KMC Programme on Low Carbon and Climate Resilient Kolkata. Ms Poddar spoke about development of a roadmap for low-carbon climate resilience in Kolkata by the Government of United Kingdom via the British High Commission. This particular project attempted to look at various scenarios since Kolkata is more vulnerable to climate change with high carbon emissions. The project initiated when former UK Prime Minister David Cameron visited the city and signed an MoU with Kolkata Municipal Corporation to help them integrate the mainstream of climate change with changing developmental plans. Funded by the UK Government, the project comprised high-level studies and ground-level surveys. Ms Poddar went on to speak about the scope of the programme in terms of three specific areas. The first area was creation of a cross-sectoral roadmap comprising of low carbon emission as a climate change solution, rooftop solar, a disaster management strategy, and climate smart mobility. The second area included the work by the parliamentarians—legislators and elected representatives—to sensitize people on evolution of future cities. The third area included improving institutional governance such that through capacity-building programmes, officials will be able to look at low carbon procurement and integration of climate change policy towards implementation of new projects across the city. One of the primary objectives of the programme has been to make the project inclusive to help acquire more jobs and also speak about policies and technology interventions which make long-term economic sense. Essentially, the whole idea rests on transformative thinking and being able to usher an era of change by bringing together the government—the elected representatives, parliamentarians, legislators—businesses, NGOs, civil society, and the media, on one platform to be able to look at a cleaner, greener, and climate-friendly city. Significantly, in this scenario, each player has a specific role to play.





## URBAN WATER MANAGEMENT

**M**r Arun Kumar Mukherjee, Chairperson Emeritus, Energy and Environment Committee, The Bengal Chamber of Commerce and Industry, initiated the session on Urban Water Management. He enumerated how in India, we have around 17% of the world's population and 4% of water resources. The average rainfall, also considered as a source of water, stands at 1160 to around 1110 mm in the world.

Eighty per cent of the total population in the country comprises about 366 cities out of which 13 cities have a population of over 2 million; 33 cities with a population of over one million; and about 340 cities with over 1,00,000 population. As of today, the average water is 125 liter per capita a day (LPCD) against the normal requirement of 210 LPCD. Most cities are water stressed and comprise only 4.3 hours of water supply on an average complete with 30%–35% water loss in the transmission and leakages, un-authorized connection billing, inefficiencies, etc.

The percentage of Non-Revenue Water (NRW), estimated to be around 35% to 60%, is huge and is contingent on the locations of cities and local areas. Infrastructure development and regulation have not sufficiently kept pace with urbanization and overall growth, resulting in the non-availability of safe and sufficient drinking water. Besides, the disposable 40 million lakh septic tanks contribute to about 80% pollution of surface water. Cities in India, particularly in the eastern part, had to face numerous urban water management challenges. Also, the north-eastern part (of the country) is seriously lagging in water supply, infrastructural development, proper operation and maintenance of existing structures, bad weather, and frequent landslides during monsoon, which further damage the operating system. For instance, Guwahati suffers from the problem of water logging, poor supply and maintenance of water supply works, and inefficient operation of water treatment plants. Apart from illegal boring, the ground water table is also under depletion. One of the major metros in India located in Kolkata depends on majority of its supply (upto 82%) from Hooghly River with some reliance on ground water.

Along many stretches of Kolkata, ground water is infected with arsenic which has further created problems for safe water supply management. The unregulated and unplanned growth in the real estate sector insofar as meeting their water needs from ground water is also responsible for the continued depletion of the water level. And 53% of bore wells show a ground water level decline of .13 meter per year in the city.

There is a strong need of developing an integrated climate resilient water infrastructure management in cities, thus, implying requirement of “smart cities” for green cities programme of the central and state governments. He reiterated the focus of the session around certain critical solutions to questions such as: How to bring about paradigm shifts in holistic urban water management taking into account the hydrological environmental and socio-economic concept? What institutional arrangements should be adopted? How can all the stakeholders be brought in the value chain to sustain an efficient, safe, and self-sustaining zero waste operating and distributing system? What are the ways to attract private investment in developing and running a water distribution infrastructure? He concluded by enumerating on the reforms in the electricity sector and their visible results.



Mr. Arun Kumar Mukherjee, moderating the session

The next speaker, **Mr Anshuman**, Associate Director, Water Resources & Forestry Division, TERI, began by sharing few PowerPoint slides on the different challenges of the water sector, particularly the urban water dimension along with the different kinds of opportunities/solutions. In this regard, he brought forth the TERI experience with different urban local bodies (ULBs).

Analysing India's available water resources, Mr Anshuman informed that the country has 1869 billion cubic meter of water and not all of it is completely exploited as on date. However, there exist multiple challenges with reference to the inefficient use of water compounded by pollution and so on.

Primarily, the three water-consuming sectors are irrigation and agriculture (80%), the domestic, and the industrial sectors, respectively. He went on to enumerate the challenges in the urban sector, particularly those in the domestic domain. Although two-thirds of the earth is water, the challenge still exists with reference to its availability and management. The challenge lies in terms of the quality and quantity of water. Urban water sector in our country is efficient, however, they are also classified by wastage of water/losses of water to the tune of 45%. The unaccounted water is in the range of around 35% to 60% and in some places it is beyond 60% as well; in Kolkata, the percentage is 35% and 95% for NRW. He attributed this to the absence of an accounting system, something along the lines of water auditing in the water sector.

In four cities of Madhya Pradesh—Jabalpur, Gwalior, Bhopal, and Indore—the percentage of unaccounted water and NRW is in the range of 38% to 48%.

He spoke about how present-day water management policies are not efficient in terms of making the urban sector more. Losing 40%–50% of water implies scarcity of water. Citing how most of the ULBs are actually generating huge losses, Mr Anshuman spoke about pricing, besides infrastructure, being a very effective tool as far as the water management demand



is concerned. Further, demand management largely comprises three or four pillars; one is technical—to manage leakage losses, etc., while metering is another. The range of metering is almost one-fourth of capacity on an average. With 20%–25% metering, the question arises as to how much water is going via pipes to the cities and zones and therefore, the required intervention is unclear. According to latest available information, India has been able to provide almost 91% in terms of accessible drinking water facility out of which 70% is available to households while the rest is accessible within a distance of 100 m.

Huge disparity exists in urban water supply. In some locations, the LPCD per capita per day of water supply is around 30–40 or even 90 while in some cases, it is more than 500. The other part of the challenge in urban sector is state of non-continuous supply of the water. According to the latest 2015 Report on the Millennium Development Goals (MDGs), there is no gap between demand and supply in the water supply systems in the urban and rural sectors. Citing an example, he elaborated how the population of Israel has increased four times since 1964 but its water demand remains the same because the country has been reusing 80% of their waste water and they remain within the same supply system. In the Indian context, metering and tariff are extremely poor. In this context, he mentioned about the National Water Mission goals set up by the Ministry of Water Resources, River Development & Ganga Rejuvenation, Government of India. These Goals refer to the much-needed water efficiency and balanced and optimum water usage in all sectors. He also stressed on a multiple and integrated approach which focuses on the technical aspect, besides the institutional, financial, and social ones. For effective water management, the significance of rational pricing, awareness on water conservation among consumers, and transparency in accounting system was also highlighted along with integrated water resource management restoration.

The next speaker, **Mr Nirmal Mallick**, CEO, Naba Diganta Water Management Ltd, Kolkata, described about the integrated PPP model project located in Sector 5 Salt Lake, Kolkata, focused on supplying water and extending sewerage services 24X7 basis since the past six years. Based on a BOT model, his organization partnered with the Kolkata Metropolitan Development Authority (KMDA), the Naba Diganta Industrial Township, and the Urban Development Department, Government of West Bengal who is also one of the facilitators of the project. The entire financing–design–construction has been carried out by private partners, TISCO & VOLTAS. Water is acquired through Kolkata Municipal Corporation (KMC) at Naba Diganta Industrial Township wherefrom the same is purchased and the sewage is stored, supplied, and ultimately disposed. In this way, the firm has managed to cover nearly 90% of the region and is running on a 24X7 basis. There is also a customer redressal system in place. Rated PPP+ by ICRA, the company is now under stable revenue system and is on the way to becoming a successful project in the urban utility–urban infrastructure sector.

He suggested that PPP as a model of operation is a good proposition for the government and the public, especially for those who want to invest in this sector in the long-term. In this regard, he reiterated the role of the government to make it more systematic such that more people can invest in the venture. This of course entails certain changes in the management system as well. Also, pricing needs to be revised such that water is supplied at a revised price, ensuring equitable water distribution to people, especially the poor and below the poverty line.

Mr Mallick also spoke about the creation of an enabling environment by the government such that there is a regulatory authority with legal framework under which the PPP operates. The private operators should also be empowered. Water and judicious usage are both significant to ensure its longevity.

**Prof. Somnath Sen**, IIT Kharagpur, West Bengal, initiated his address by introducing the theme as ‘new approach of water sensitive planning’ instead of addressing the same as water management. Referring to adopting a contemporary approach for stable urban development, he stressed on a transformative policy of water management and urban distribution planning.

By 2020, there will be a high rate of urbanization and infrastructure for water will pose a huge problem. He also spoke about population dynamics in terms of higher usage of water and environmental outcomes of depletion of surface and ground water. Migration also plays its role. As a consequence of the climate change scenario, several problems, such as water intake, inviting subsidence of settlement, increasing evaporation rate, increased use of water on air conditioners, and increased cost of treatment, exist, thus, resulting in a big shift from a water supply city to water sensitive city. Therefore, quick adaptation and multi-functional infrastructure, urban design, and motor planning go hand-in-hand. Essentially, water should be used minimally and integrating water cycle ought to be integrated and managed in the built-in environment with planning and urban design.

He also spoke about the optimization about the rainfall that falls on city catchments. For instance, in a city like Medinipur, with an amount of ` 1500 mm rainfall, the amount of water collected stands at 462 litres per capita per day while for Bakuda, it is 350 liters per capita per day. As for a water-sensitive area, he described it as one water is subject to reuse such that the wash basin water or rainwater or garden water can all be reused. Similarly, a water-sensitive commercial area is one where the parking area can be used as a water receptacle and is well utilized. He went on cite more such examples wherein the intended design of the function of proposed development matches the land use capability and the likely impacts of development from the existing environment work towards achieving sustainability. He reiterated how Kolkata is also a water sensitive city, particularly for storm water management, numerous techniques and alternatives are available.

**Mr B K Maity**, Director General (Water Supply), Kolkata Municipal Corporation, initiated his address by defining the responsibility of his organization for providing water in the KMC area, some part of the municipal area, and to Naba Diganta Water Management Ltd. Water supply and its distribution is similar to power supply insofar as similar meters are installed and the mindset is centred around the measurement of power consumption. He described a particular project conceived under the DB fund which digitizes the network and metering at the premises. He went on speak about undertaking extensive studies regarding pressure of water, details of the network, etc., although there is no reliable data regarding the duration of water supply.

Referring to the huge water loss, he spoke about how the same can be reduced by adopting super critical water management technology. This project is based on performance-based contract. For such technology, the first component is GPS as this system requires





digitization and documentation of all properties. Interestingly, the digitization of all assets and connections is an exercise in documentation of the assets. The second component is departmental audit and decision making process. Another significant component is customer's satisfaction and feedback. Customers' are the focal point (both commercial and residential) and their details along with consumption details will address consumers' issues. In this context, digitized knowledge will assist the future of the consumers. Creation of digital meter area is another component. After conducting survey research, various points of District Metering System (DMS), with hydraulic model and hydraulically module digital area, following the inflow and outflow of water system in each district area of DMS, will be installed. This is primarily to ascertain accurate consumption figures and losses, if any. The next one is metering and loss. Installation of meters and its connectivity to the water tap and its activity is linked to the force and inflow of water and its consumption directly is important. In case all meters are EMR-enabled, it shall be easier to obtain accurate figures of consumption and losses and the desired results. He also mentioned about obtaining details of O&M, repairing of pipeline and detection of helium gas leakage, parts' replacement of pipes and ducts, replacement of house service connections and pipes, identification of junction points in water consumption with internal audit, counselling and education to consumers, to reduce water wastage and saving of water.

The proactive measures in this regard are establishment of 24X7 water supply while taking steps for drastic loss reduction; upgradation and replacement, as the case maybe, of age old equipments and defective assets, and ensuring minimum pressure in water supply on a day-to-day basis at the fastest point through DMA.

Mr Maity also elaborated on further upgradation of the network layout in digitized version. In order to ensure the availability of ground water, the usage of bore wells and their operation has been encouraged. And here my suggestion is that if buildings or complexes are being constructed, then it shall be prudent to install individual metering connections. It has been suggested to install individual metering systems on buildings—commercial or residential or multiplexes. The tariff will be fixed unit-wise dependent on the service being provided. The quantity of water and the total number of units consumed in the locality will be significant.

## TRANSFORMING HABITATS

Now we know that by 2050 70% of the world's population we all will be urban. And even in India we are getting so fast, so many smart cities and lot of urbanization. So is this a good thing or bad thing? Now it would appear that it is bad thing. But if you look closely cities have done right which are key to our sustainable development. In fact New York city has one of the lowest per capita GST. Emissions in the world. So there are few things which need to be done. We have panelists here who can explain and expand the horizon. After that we can sum up and chalk out formal agenda for future because this is something of vital importance. Top all of us.

So first speaker- Mr. Sanjay Seth and I request him to make his presentation and share his perspectives.

The first speaker, **Mr Sanjay Seth**, CEO, GRIHA Council, TERI, began by congratulating the Bengal Chamber of Commerce and Industry for their work; he also referred to the theme of the present session 'Transforming Habitats' as the one for the GRIHA Summit, New Delhi on 2nd and 3rd March 2017. He reiterated how the emphasis is on not only on transformation but on acceleration and the change taking place. At a global level, urbanization is taking place a rapid scale and mega cities are on the rise. By 2030, of the 41 mega cities across the globe, 33 are in Africa and 7 will be located in India. In this context, he reiterated on the significance of following a resource-efficient rather than a consumptive path.

Further, Mr Seth spoke about the issue of water and its management and described how in the global fresh water reserves, around 6% or 7% are available in India. The average per capita energy consumption in 2011 was about .6 tonne oil equivalent and when compared to the global average, it is about 1.88 tonnes of oil equivalent. No country in the world has been able to achieve Human Development Index (HDI) of .9 or more without annual per capita of energy consumption. And India is going to achieve HDI per capita annual consumption of about 2.5 as per the assessments.



Ms. Shakuntala Ghosh, moderating the session



He also spoke about how one-third of global emissions are due to energy usage in buildings. He defined the GRIHA ratings as a tool created to quantify and assess the 'greenness' in a habitat. It ranges from concepts to commissioning, evaluation of a building, once it is 100% occupied and is in operational mode. Ratings, however, are inspirational figures and it is not feasible to ask people to follow the ratings.

The GRIHA rating system has been evolved keeping in mind current Indian practices and climatic conditions with the underlying principle being that what gets measured gets managed. It is a tool which helps in understanding the basics of a building from design stage till the operation. It is also used to evaluate emission reduction, thus, giving the tool an edge over other similar ratings. Socially inclusive in nature, the tool also analyses labor, health, and safety measures and covers all building typologies and approach spectrum.

He listed certain projects undertaken by GRIHA Council at Kolkata which have already been rated. In terms of savings, the office of Coal India Ltd has saved more than 38% electricity and 50% water, thus, showing how resource efficiency has been incorporated in the entire system. And, finally, renewable integration has been optimized else it would have been very fairly large but 140 kw solar PV has been instilled there as well.

Extending an invitation to the upcoming 8th GRIHA Summit, he mentioned uniqueness of the Summit in bringing together an integrated model of a 'green building' as green concepts are very hard for people to assimilate and understand. In addition the Summit will feature sessions focusing on technologies, construction practices, regulatory frameworks and policies that drive regulatory frameworks.

Next, **Mr Harsh Vardhan Patodia**, Vice President, Credai National and Chairman & MD Unimark Group, mentioned about how in the real estate industry, a lot of work is carried out in the built-in environment. The entire process, particularly new policy and business models, and ethos in India is focussed on creating affordable housing.

The evolution of urbanization has led the present-day smart cities to become unsustainable, especially in the developing world; and so, it is imperative that the focus is more on posterity, healthy living, wellness, and cleaner and greener cities. A framework for regulation and governance, transformation, innovation, and shaping the future of our cities needs to be created. In this regard, the Smart City initiative, by the Government of India, is the way to go. Regulations, which are definitely helping the real estate industry in the process of getting sensitized to sustainability, have been put in place. It is imperative to find a governance network where the urban planners and authorities need to regulate the operations and management of built-space in cities to become sustainable. So, there is a need to look at energy conservation, waste recycling and management, water conservation water management, air pollution management, emission management, greenery development, open space development, traffic management, heating and kitchen waste management, industrial pollution, and waste treatment. Besides reviewing the design, city, and building levels, it is important to use technology renewable resources and sources. He also mentioned about the government's role is doing its bit by giving incentives like lower taxation for green buildings.

Beyond this match has no meaning. While expenditure on the finishing and interiors of a building is part of the process, sustainability and transformation of habitats should receive higher priority. He focused on the psychological and philosophical part to transform the habitats into green buildings.

Next, **Mr Debashish Das**, BIM Manager, AECOM, initiated his address by introducing his organization (a US multinational corporation) as the biggest consultancy firm in the world in terms of volume and size, staff, and number of projects. He further listed the projects of the firm all over the world, majority of which are green buildings, such as the Olympic Stadium, Rio; Saudi Attache, UAE; SAS MERC Hospital, USA. Large infrastructure projects, ranging from sports facilities, ship yards, metro tunnels, metro networks, dams, etc. The overall idea to is make life easier for the community.

He spoke about computational billing, that is, the information management tie up with green buildings. He mentioned how in his organization, things are simulated in virtuality by building it with virtual breaks, virtual concrete, virtual energy, virtual water, and then test it out proto type it before actually building it. In fact for the first time in the construction industry, rapid prototyping technology has come in operation; this is akin to Integrated Project Delivery (IPD).

Mr Das went on enumerate how in five years' time, the UK government mandated that BIM is going to be employed in every single government or centrally-procured projects. He described how he has been creating/conceptualizing green buildings since the last 10–15 years and carried out projects in Birmingham (UK) and Energy Star (Australia); furthermore his association with the Clea Move Tech movement and GRIHA in addition to being the first kin ECPC Master Trainer. According to him, the essence of a green building is to cut down or eliminate waste. Essentially, one needs to stop wasting energy, water or any natural resource along with reducing waste of labour.

Elaborating on the moot point as to why the UK government opted for BIM, the reasons range from financial sustainability to environmental sustainability. His organization, AECOM and the 350 staff comprising engineers, architects, structural engineers (mechanical, electronic, electrical, etc.) are essentially hard-wiring or hard-coating software to carry out operations their way. It gives us energy water and all kinds of sustainable materials, patent related figures real time as we go through or skip through different kinds of options. He continued to describe the different types of software, their redesigning, and the overall emphasis on sustainability. A million things are not created as rear shapes; the rear shapes emerge because those shapes need the performance criteria—financial performance criteria, energy performance criteria, and wellness performance criteria. So, essentially, BIM helps in generating a certain type of life cycle for every project.

Speaking about how the green building movement initiated from the 'buildings syndrome' (dates back to the 1980s), Mr Das reiterated the significance of making proper choices to check the further advancement of the environmental crisis around human beings today.







From left: Mr. Deb A. Mukherjee, Mr. Sutanu Ghosh, Dr. Sanjeev Chopra, and Dr. Annapurna Vancheswaran

**S**pecial Remarks: **Mr Sutanu Ghosh**, President, The Bengal Chamber of Commerce and Industry  
 Valedictory Address: **Dr Sanjeev Chopra**, IAS, Additional Chief Secretary to Government of West Bengal  
 Closing Remarks: **Dr Annapurna Vancheswaran**, Senior Director-SDO &YE, TERI

**Mr Sutanu Ghosh**, in his Special Remarks, summarized the overall theme and discussions of the Kolkata Regional Dialogue. Describing the Dialogue as the first in the run up to WSDS 2018, he emphasized on its importance to chart the road ahead for the conference next year. The recommendations and deliberations recorded during the Conference would be circulated to all key stakeholders—government and non-government—for perusal, follow-up, and subsequent action.

Next, **Dr Sanjeev Chopra**, initiated his address by acknowledging the role of the Bengal Chamber of Commerce and Industry in organizing the Conference. Speaking about how there is no such thing as waste; he mentioned that there is no equivalent term of waste in Sanskrit. Every thing goes into something else. Essentially, everything comes from panch bhoothas and it goes again to panch boothas, so nothing is waste. However, waste is an outcome of the Industrial Revolution. A is the product, B is the by-product, and C is waste; therefore, today, there is paddy from which one gets rice while the rest of it is waste. Human beings and their work is all determined by technology and this particular determinism is an important factor in the analysis of sustainability. As long as the industrial sector determines the importance and relevance of sustainability, there will be a rise in the manufacturing (of products), thus, identifying the waste and how the waste is converted to consumable products. In this context, it is only the ecological resources which impart value and so, it is imperative to preserve the same. Further to this, there is a need to define waste? Can waste be produced in this post-industrial world?

He went on to describe the core of sustainability as working together and understanding that everyone has a point of view and that every such point of view has some relevance. All 'sustainability' is to understand what is to be used where and in what particular quantity; that is where the big challenge of humanity lies. Further, Dr Chopra spoke about the infiniteness of the human mind, imagination, ability to love, practice compassion, and perform good deeds in the context of ensuring sustainability and managing challenges.

Next, **Dr Annapurna Vancheswaran**, in her closing remarks, acknowledged the addresses of Mr Sutanu Ghosh and Dr Chopra and introduced the audience to the upcoming events at Fiji scheduled in May 2017 followed by others at Bengaluru, and Mumbai, respectively.



Dr. Annapurna Vancheswaran during the Valedictory Session



Teri staff and other participants of the conference





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